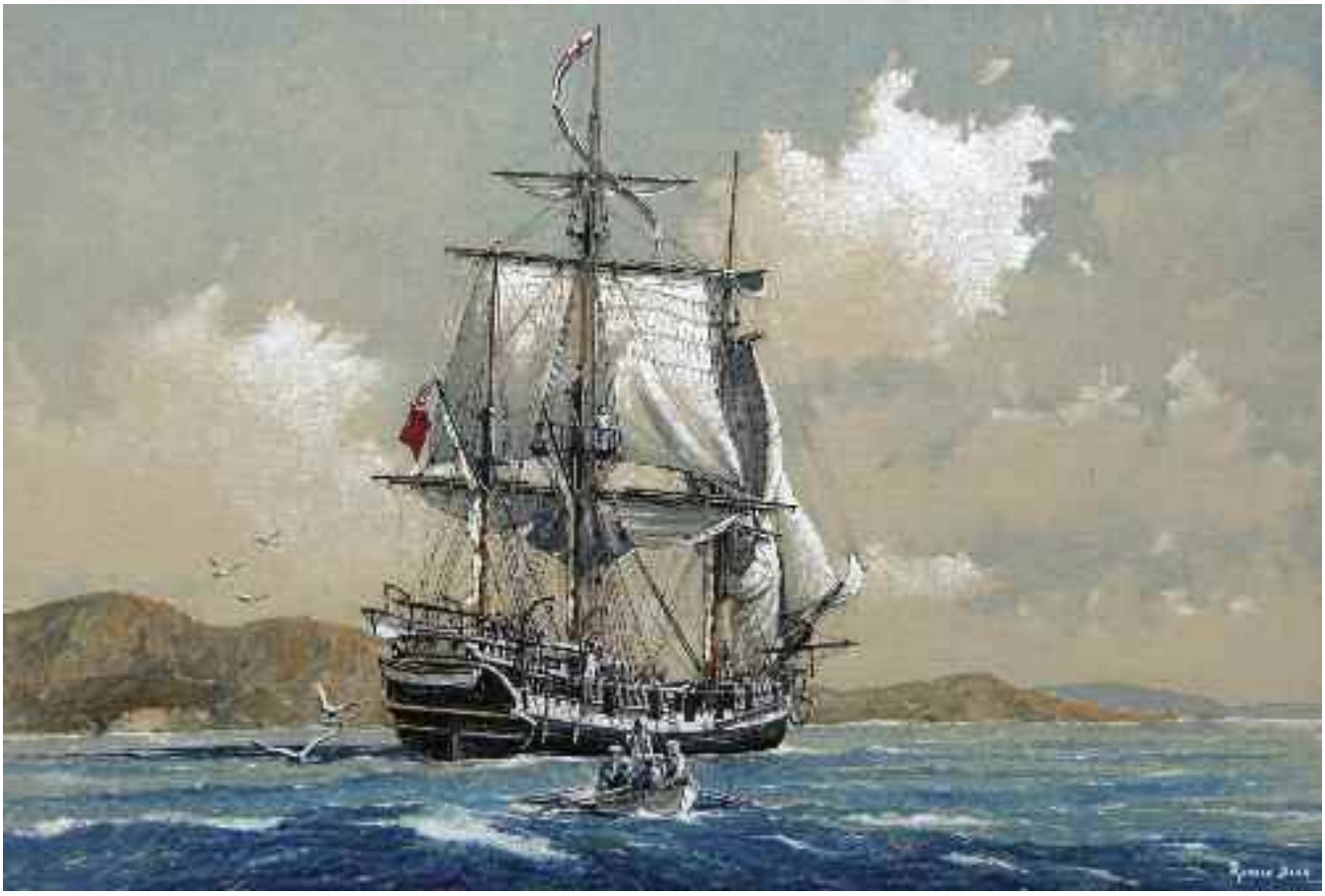
Ecotourism and Other Invasions

STEVE NASH

Darwin's 200th birthday comes to a conflicted Galápagos with shorter horizons.



Charles Darwin arrives in the Galápagos, by Ronald Dean, Royal Society of Maritime Artists.

"It seems to be a little world within itself, the greater number of its inhabitants, both vegetable and animal, being found nowhere else," Charles Darwin wrote. His reconnaissance of the Galápagos Islands in 1835 was characteristically detailed and usefully perplexed.

After he and the *HMS Beagle* returned to England, Darwin hinted that this odd, isolated archipelago had sparked a subversive line of inquiry: "One is astonished at the amount of creative force, if such an expression may be used, displayed on these small, barren, and rocky islands," and, "We seem to be brought somewhere near to that great fact—that mystery of mysteries—the first appearance of new beings on this earth." The origin, as he later phrased it, of species.

Darwin could not have guessed that 200 years after his birth, the islands—

BioScience 59: 106–110. ISSN 0006-3568, electronic ISSN 1525-3244. doi:10.1525/bio.2009.59.2.3

now part of Ecuador—would be a kind of shrine to him and to evolutionary theory. Nor that the ecosystem he explored, although still remarkably intact, faces accelerating disruption. The root cause: other visitors, led by their own ravening fascination with the islands.

"The Galápagos is the workshop of evolution," says research ornithologist Glyn Young, of the Durrell Wildlife Conservation Trust. "We have one last chance to keep an oceanic archipelago ecosystem intact. Hawaii, the Pacific Islands, the Mascarenes, and other island groups have become an absolute mess." A new joint report by Ecuadorian government agencies and the Charles Darwin Foundation (CDF) estimates that the islands still support 95 percent of their original, highly endemic biodiversity.

UNESCO (United Nations Educational, Scientific and Cultural Organization) has designated the Galápagos and its surrounding marine reserve a World Heritage site, but in 2007 added them to another list: World Heritage in Danger. An assessment team warned that without fundamental changes in how the islands' human population is managed, the chances for conservation of its natural systems are "slim." Ecuadorian President Rafael Correa issued an emergency decree stating that Galápagos National Park is "at risk" and called its conservation a national priority.

The birds are strangers to man. So tame and unsuspecting.... They approached so close that any number might have been killed with a stick.

—Darwin

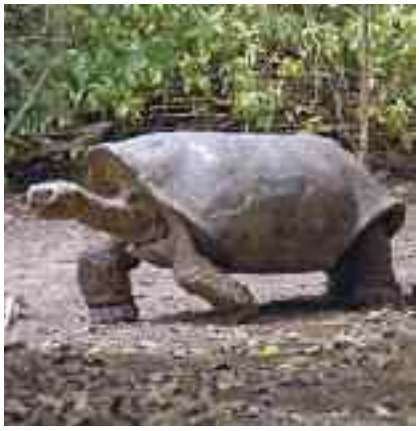
Still nearly true. "Galápagos changes people's lives," says Graham Watkins, former CDF executive director. "You can have experiences that are, from a natural perspective, mind-blowing...because the animals are not frightened of people; you can get very close." To swim alongside sea lions and penguins, approach marine iguanas, giant frigate birds, and blue-footed boobies within the length of your shadow, or to have one of Darwin's legendary finches land on your hat—these can be moving and instructive encounters.

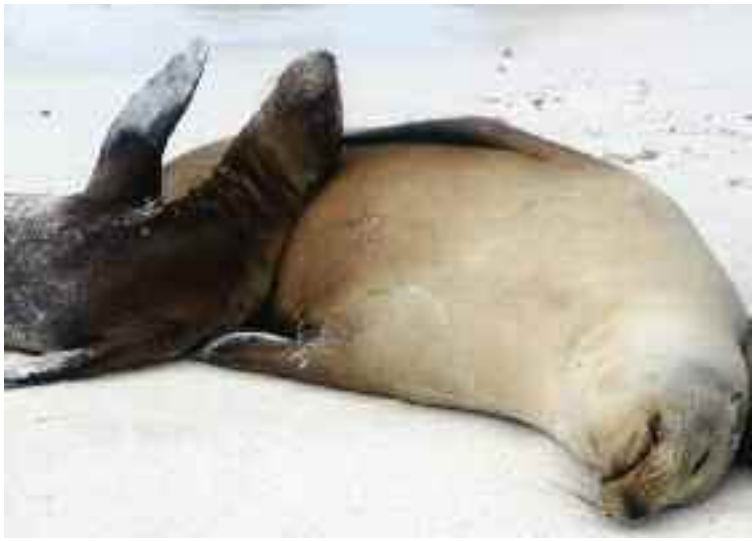
This small ground finch, two or three years old, is no stranger to humans. Photograph: Steve Nash.

That news is now, emphatically, abroad, and Darwin's "little world within itself" cracked open. It's pricey, but tourism here has spiked beyond all expectation. Some 18,000 people visited in 1980, and 10 times that number came in 2008. A new record is expected this year. Darwin's bicentenary also marks 150 years since the publication of *The Origin of Species* and 50 years since the establishment of the national park.

Our crush on Galápagos plays a paradoxical role. In most respects, tourists here are tightly managed. Each pays a $100 entrance fee, and flights arriving at the Baltra Island airport are fumigated. Human settlement is restricted to a tiny fraction of the islands' land mass—97 percent is national parkland. No signs for vacation condo developments are on view. Most tours are run from comparatively small cruise ships staffed by government-certified naturalist guides. Tour groups visit only a few of the islands in the archipelago, and they must troop around to see tortoises, iguanas, sea lions, and birds on well-marked paths with knowledgeable, vigilant guides. Compare all that with, say, Yellowstone and its environs.

The Ecuadorian government has earned applause, Watkins says. Innovative projects in concert with conservation groups are common, and UNESCO reports "globally outstanding successes."





As in Darwin's time, sea lions and and other Galápagos wildlife can be approached easily. Photograph: Celeste Nash.

Among them: eradication of wild pigs, goats, rock doves, and fire ants from several islands, requiring several millions of dollars and years of effort; captive breeding and repatriation of more than 1000 giant tortoises on one island and land iguanas on another; and effective control of a damaging alien scale insect.

All of this is necessary but insufficient. The islands confront much higher risks today than ever, Watkins adds.

I frequently got on [the tortoises'] backs, and then giving a few raps on the hinder part of their shells, they would rise up and walk away; but I found it very difficult to keep my balance.
—Darwin

Like Darwin's tortoise, a healthy ecosystem here supports everything else, but the poorly managed and quickly growing infrastructure of tourism is a rapid destabilizer. Just the same, the strongest guarantee of government concern for the islands may be the annual $250 million that tourists contribute to Ecuador's gross domestic product. Economist J. Edward Taylor, of the University of California in Davis, calculates that Galápagos is one of the fastest-growing economies on the planet, and tourism is "far and away the major driver."

The need for labor that tourism generates is an irresistible magnet for Ecuadorians fleeing the high unemployment and 47 percent underemployment of a chaotic, impoverished mainland economy. Research by Taylor and colleagues Jared Hardner and Micki Stewart found that each $3000 spent by tourists pulls in one more Galápagos immigrant. The resident population of 25,000 to 30,000 may have doubled in the past decade—official figures are suspect—and is now increasing by 6.4 percent or more each year.

In the wake of the UNESCO declaration, President Correa heralded the end of uncontrolled immigration (supposedly outlawed since 1998). A thousand "irregulars" were reportedly sent back to the mainland last fall, and another 2000 were given a year to leave. Population growth is a certainty just the same, as the families of permanent residents reproduce. The law also grants their close relatives the right to settle here.

Taylor's research concludes that the strategy of directing the rewards of a growth economy to the local population—a chief tenet of what might be called ecotourism theory—may work only in a closed system. Open immigration quickly depletes both natural and social capital.

Add more tourists and residents, and the need grows for more housing, food, fresh water, diesel fuel—thousands of tons of a thousand different things every month. Everything multiplies, including the dread scourges of island biogeography: invasive alien species. Uninspected traffic is a conveyor belt, carrying invasives a thousand kilometers over the Pacific to once-isolated Galápagos.

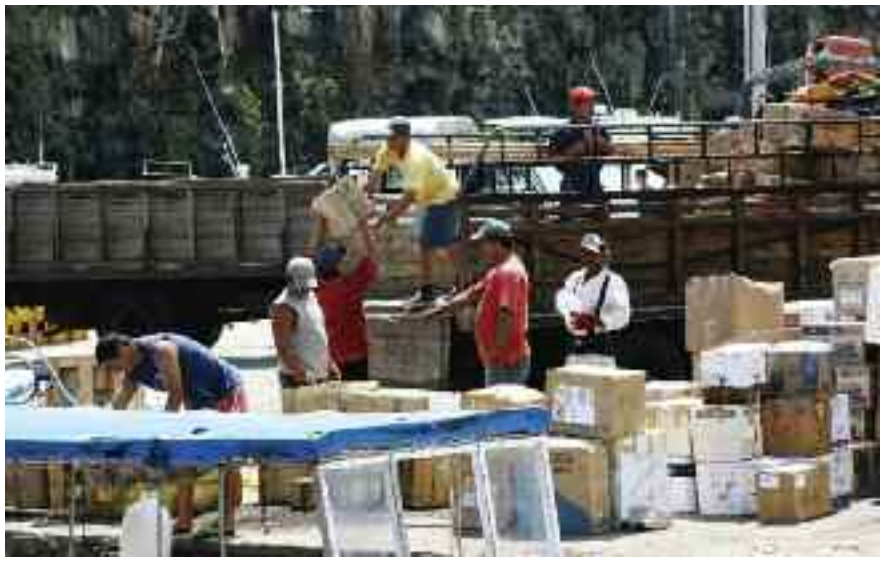
In many islands the native productions are nearly equalled or even outnumbered by the naturalised; and if the natives have not been actually exterminated, their numbers have been greatly reduced, and this is the first stage towards extinction.
—Darwin

Here's the rollcall for Galápagos just now: about 740 species of alien plants, and only 500 of native plants. At least 540 species of alien insects and other invertebrates, 55 of them serious threats to native flora and fauna. Alien insects are now a quarter of the islands' total. Thirty species of introduced vertebrates, 13 of them considered invasive and a threat.

According to one of the more colorful passages in the UNESCO report, the old cargo boats that come over from the mainland, which have no refrigeration, systematic decontamination, rodent control, or cleaning protocols, "could hardly be better breeding grounds for all types of potential invasive species and diseases, as organic residues rot among pools of stagnant water in their rat and cockroach infested holds."

Despite official acknowledgment and repeated, urgent calls for a functioning inspection system, none exists. The number of inspectors actually declined by 20 percent as cargo doubled between 2001 and 2006, and inspectors are frequently furloughed because there is no money to pay them.

The CDF/government report summarizes tests of the airport inspection system: When volunteers intentionally carried organic products and attempted to avoid detection, the interception rate was zero percent. Only 1 out of 8230 organisms was intercepted in another evaluation. There are no penalties for infractions. Incoming aircraft routinely release ants, roaches, moths, mosquitoes, and other insects from cockpits, cabins, and cargo holds.



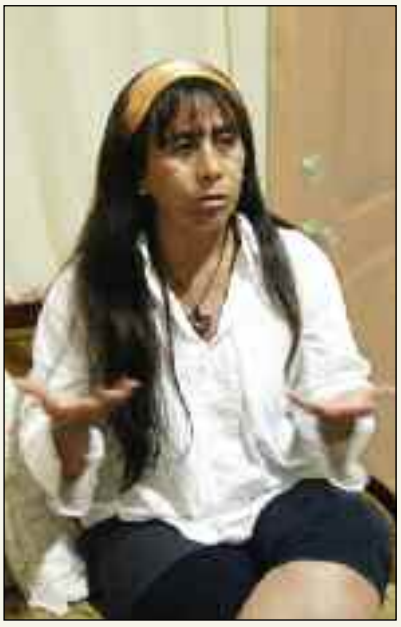
Workers unload uninspected cargo at the Puerto Ayora docks. Photograph: Steve Nash.

The impacts are showcased along a trail within the national park that rises steeply to Cerro Crocker, the highest point on Santa Cruz island. Exotic smooth-billed anis, introduced by local farmers, account for most of the visible bird life. Hikers have to step around mounds made by one of several species of introduced fire ants. This trail ran through a highland thick with native *Miconia* bushes until the 1990s. Then alien quinine trees invaded thousands of hectares, shading out and killing native vegetation and altering the rest of the ecosystem. Years of arduous tree-by-tree

A park director on the wheel of ill fortune.

Raquel Molina had an unusual plan when she became director of Galápagos National Park: enforce the law, and don't temporize with political pressure. She declined to wait for incremental progress in protecting the park—a strategy that by many measures plainly isn't working here anyway. "I thought this was a time to put things in order," Molina said. She preached rigid fairness as the only legitimate hope for satisfying the islands' many interest groups while making the ecosystem the first priority. That didn't work, either.

Osvaldo Rosero, of the conservation group WildAid, calls Molina "the proper person, at the right time. Just a very tough woman, very strict. But zero political skills....When you want to change things that are happening here, it will not happen in one day. You have to negotiate."



Raquel Molina, former director of Galápagos National Park, was fired last year. Photograph: Steve Nash.

Molina battled the tour industry, the scuba-dive operators, illegal fishermen, and other interest groups, and she was the target of protest marches, petitions, bad press, and threats. She was also beaten by uniformed thugs under the gaze of the *comandante* of the local air force base, and hospitalized with contusions and a jammed cervical vertebra. She could be seen wearing a neck brace for weeks at meetings around Puerto Ayora. Some of the resulting indignation—on behalf of civil governance, if not for Molina herself—seemed diluted by a kind of that's-how-things-are acquiescence, but she stuck to the job.

She was the first biologist and the first woman to enter the revolving door of the directorship; there had been a dispiriting dozen people occupying it during the three previous years. With a master's degree in coastal environmental management and years of work on environmental projects with community and school groups, Molina was a *tecnico,* not a *politico.* Her appointment was the culmination of the first merit-based, open, agreed-upon competitive process.

"This is a very small island, and when you have to put things in order, sometimes your best friend or your relative or your neighbor—somehow everybody—is involved," Molina says. "You have to ignore that pressure. The law is for everyone. There are no exceptions. My predecessors did not solve many problems. I was the heir of those problems. I had to try to figure out what to do."

In her version of the incident at the Baltra air base, she accompanied park rangers who had been threatened while trying to close down an illegal tourist operation run by the military. Its patrons were camping, kayaking, and dumping feces in protected sea turtle nesting habitat. There was no public trial, and details are disputed, but after the assault the *comandante* was transferred, another official was demoted, and a low-level military man was briefly jailed. Molina herself received an official reprimand.

After two years in office, she was fired last March by the national environmental minister after denying entry to a cruise ship whose official papers were a matter of controversy. Conservation personnel have mixed, somewhat melancholy views about her departure. Molina was doing a good job, "really pushing the rules forward, and eventually it was something that made her fail," Charles Darwin Foundation avian research biologist Birgit Fessl says. "She was also a strong woman and had a strong character. When I see parks and preserves that work in Europe, they all have crazy people at the top. I think you need to be really very boneheaded, with very strong opinions, to come through."

Galápagos Conservancy President Johanna Barry thinks it would be a mistake to paint things one way: "Raquel Molina was a beneficiary, and a victim, of political posturing and political maneuvering." You could call her a champion of conservation or "a silly person who threw a punch at the head of the air force on Baltra.... Some would say that is a noble, Gary Cooper, shiny-star-on-the-shirt-new-sheriff-in-town thing. Some would also say it was politically naive and unnecessarily confrontational."

Rosero recalls that, "At the end of her term, she was fighting 25 hours a day, against everyone. Your enemies get together. She didn't really have time to work.... She was not afraid of anything. She was like a bull, running full speed ahead. And that was something good too, because that showed the people that somehow, sometime, somebody has to stand up and say, this is not okay, this is wrong."

Molina, replaced by a *politico,* now coaches her teenage son's basketball team and tells students in the local schools about conservation. "In the end, I know I did my best," she says.

application of herbicide by teams of laborers has created a forest of dead snags. But their work has reclaimed only a tiny fraction of the parkland that the quinine trees now dominate.

Through the brush, beyond a small stream and under a low rock ledge, are nests of the critically endangered Galápagos petrel, and this area is one of its main breeding sites. The adults cannot readily escape from predators when quinine trees block their flight. There's a short length of plastic pipe baited with rat poison on the ground nearby. On most of the islands, introduced rats are major predators of birds, including the petrel and the nearly extinct mangrove finch.

Blackberry, another nonnative, thrives here, too. It can be killed by herbicides, but its prodigious seed crop springs back, outcompeting native plants. Atop the ridge, the view includes distant, broad swathes of African elephant grass that look like green mange. It rolls back increasingly rare forests of endemic *Scalesia* trees, a keystone species.

Invasives aren't the only problems. Global warming and ocean acidification loom. An estimated 850,000 gallons of diesel and gasoline fuel are shipped to Galápagos each month, mostly to power the cruise boats and electric power generators. Groundwater supplies on the inhabited islands are inadequate and increasingly polluted by sewage.

The spectacular grounding of the tanker *Jessica* off San Cristobal Island in 2001 loosed 1080 cubic meters of diesel and fuel oil into the marine reserve, causing damage that was only partly eased when currents moved offshore. Nothing now prevents a recurrence.

In the marine reserve, illegal fishing of several kinds persists within a boom-and-bust cycle governed largely by the tastes of Asian markets. Fishermen are described as "despondent" by UNESCO after the collapse of the sea cucumber and lobster fisheries because of overharvesting, though it continues. Asian shark-fin soup is claiming up to 400,000 sharks in the marine reserve each year (despite Ecuador's complete ban on the practice of "finning" since 2004). The effects are unknown, but dive operators report far fewer shark sightings. Meanwhile, "urchin barrens" featuring blankets of bottom algae predominate in the reserve, indicating an absence of predators. Habitat-forming species such as corals are largely missing.

When speaking of these countries...on the whole, perhaps, more credit is due for what has been done, than blame for that which may be deficient.
—Darwin

Local government conservation officials and nongovernmental organization representatives gathered last fall under blustery skies on a pier at Puerto Ayora, the major town of Galápagos. Marine iguanas were draped along the moorings, breezes kicked up the banners, and spirits were high. The vessel *Tiburón Martillo* had been refitted as a kind of motorless floating platform and was now ready for its assignment at the marine reserve near remote Wolf and Darwin Islands to the north. This is an area where incursions by industrial fishing fleets, from Costa Rica and elsewhere, have been especially brazen.

There was poignance, too. This day was supposed to have been celebrated a very long time ago. "It's taken seven years to get this done. I can't believe it," said one onlooker involved in the project. "If we were swimming, we could have gotten out there faster."

Rafael Correa, president of this fragile democracy, has a PhD in economics from the University of Illinois and has often displayed a well-informed environmental consciousness. He is also the architect of a new national constitution, approved by a 70 percent majority of Ecuadorians a few days after the *Tiburón Martillo*'s launch. The new charter is the first national constitution in the world to proclaim, in exhilarating language, legally enforceable ecosystem rights. It states in part that "Nature...has the right to exist, persist, and maintain...its processes in evolution."

Its achievements notwithstanding, the government has often been unable to move beyond what has been called a "ceremony of words." There were eight presidents between 1996 and 2006. Ecuador ranks 151st among 180 nations on Transparency International's compilation of corruption indexes, between Ivory Coast and Laos.

But this scatter of tiny, magnificent ark-islands may yet be allowed to bear its passenger lists through the next post-Darwin century. The elements for creating a sustainable society are here, Graham Watkins says, much more than elsewhere. "So if you can't do it here, can you really do it anywhere else?" he asks. "If it's successful, then you have a model to export to the rest of the world, while maintaining a very, very special place."

For more information, visit these sites:

www.galapagos.org/2008/index.php?id=98

http://whc.unesco.org/en/list/1/documents/

www.darwinfoundation.org/en/library/pubs/2007/galapagos_at_risk

www.galapagos.org/2008/index.php?id=97

Steve Nash (e-mail: snash@richmond.edu) teaches journalism and environmental studies at the University of Richmond. He is the author of Millipedes and Moon Tigers: Science and Policy in an Age of Extinction *(University of Virginia Press, 2007) and* Blue Ridge 2020: An Owner's Manual *(University of North Carolina Press, 1999).*