

Researchers on a mission

Marine biologists are developing an appreciation for conservation, a change that is creating new jobs. **Emma Marris** reports.



Many marine biologists are now as interested in preserving species as in ensuring fish stocks.

Dennis Apeti and Andrew Mason spend most of their day collecting samples of water, sediment and oysters at varying depths in the Gulf of Mexico. In the wake of what many term the worst environmental disaster in American history, Apeti and Mason, both scientists at the US government's National Oceanic and Atmospheric Administration (NOAA), are trying to assess the consequences as plumes of oil continue to spread. There is little doubt that the Gulf's plants and animals will be affected, potentially threatening species and ecosystems.

Apeti and Mason are not conservation biologists, but they're well aware of what results such as theirs could indicate for the futures of pelican and plankton. They also realize what such disasters mean for the conservation field. "The number of conservation jobs is going to increase with public awareness," says Mason. "People are going to demand more answers."

The scientific-research response to a disaster such as the Deepwater Horizon oil spill exemplifies how conservation biology, once largely a specialized terrestrial field,

has become part and parcel of mainstream marine biology in the United States: when a marine ecosystem is transformed, scientists now often not only study the impact, but also suggest ways to conserve the affected species.

Humanity's disruptive effects on the ocean have turned many former basic-research scientists into conservationists. At the same time, the culture of science is changing and fewer scientists believe that their work can ever be truly value-neutral. Many marine biologists have dropped their traditional objections to some kinds of science advocacy, or at least to experiments designed to inform conservation. "You cannot deal with the biology of turtles or whales without looking at habitat modification by humans," says fisheries scientist Daniel Pauly of the University of British Columbia in Vancouver, Canada. "Noise, chemicals, removal of habitat by trawlers, you name it. You are forced to take a position. It is somehow unavoidable."

For those considering entering marine biology, this trend — more conservation

in marine biology and, sometimes indistinguishably, more marine in conservation biology — should provide more jobs, in potentially new areas, say some in the field. The trend also makes it easier to move between non-governmental organizations, academia and posts in government. "We have more options than we had ten years ago," says Heather Leslie, an assistant professor of environmental studies and biology at Brown University in Providence, Rhode Island. "You can choose where you want to be on that spectrum." Whether that means basic, applied or advocacy-driven research, interdisciplinary skill sets — including the

tools to understand sociology and humans' interactions with their natural surroundings — have become increasingly important.

In 1997, Elliott Norse a marine biologist and president of the Marine Conservation Biology Institute in Bellevue, Washington, put together the first symposium on marine conservation biology in a conscious effort to start a new field. "There were fisheries

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people meeting coral biologists meeting mammalogists,” he says. At one point in the conference, held in Victoria, British Columbia, big names in marine biology and conservation were sitting in clusters on the lawn, engaged in impassioned discussions. Norse recalls a colleague who turned to him in excitement and said, “This is Woodstock!”

The marine biology that existed when Norse founded the Marine Conservation Biology Institute in 1996, save for that done by a small number of forward-thinking people, was either applied or purely academic, he says. “But the application was something like how many fish are in the sea so we could catch more of them.” Norse and other biologists who were concerned about the sea have made a conscious effort to change that. As a result, engagement by the marine community in conservation biology is increasing. Back in 1996, Norse and a colleague examined papers in nine volumes of the journal *Conservation Biology*, and found that just 5% of the total covered marine topics (K. E. Irish & E. A. Norse *Conserv. Biol.* 10, 680–681; 1996). An unpublished analysis performed recently on behalf of *Naturejobs* reports that in the past three-and-a-half years, marine topics have represented 9% of the journal’s total — still a minority, but a significant increase.

Culture shift

Not everyone believes that the old divisions are dead and buried, however. Evolutionary ecologist Les Kaufman still urges young scientists interested in the academic path to take what he calls “the stealth approach”: putting the emphasis on pure science until they are well established, and only then turning their research programmes towards conservation. Kaufman, a professor of biology in the marine programme at Boston University in Massachusetts and a principal investigator at Conservation International, a non-profit organization based in Arlington, Virginia, says that conservation experience counts for little in traditional academic evaluations. But he admits that this gambit has a downside — while researchers are biding their time, attempting to secure tenure, “the oceans are falling apart”. Kaufman believes that marine biology is building up a “critical mass” of good, rigorous scientists who also count themselves as conservationists. When they represent the majority — hopefully before it is too late for the oceans — scientists will no longer be forced to put conservation on the back burner until later in their careers.

That time may already have come, says Leslie, who studies the social and ecological dynamics of coastal systems, including the design and evaluation of conservation plans. Employers took interest in her as a job candidate, she says, because her research programme had explicit connections to policy and management. Many of the

VOYAGES INTO CONSERVATION

Three early-career marine biologists share the moments when they dived into conservation. For each, taking the plunge also meant learning about a terrestrial species: humans.

FISHER’S-EYE VIEW



Janna Shackeroff, international coordinator for the US National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program, based in Silver Spring, Maryland.

For Janna Shackeroff, a third-generation Californian and an avid swimmer and participant in beach clean-up from childhood, the conversion to conservation happened early. But it wasn’t until just before she started her graduate degree that she made the connection between her beloved sea and the people who live on its shores.

Before starting her PhD at Duke University in Beaufort, North Carolina, Shackeroff spent a few months helping her sister film a documentary about native fishermen in Hawaii. As she held the boom mic for the interviews, she became fascinated with the wealth of information

about the sea held by non-scientists. For her graduate research, she went on to talk to fishermen, diving-shop owners and aquarium-fish collectors on the Kona Coast of Hawaii’s Big Island, gathering thousands of pages of data and perspectives. “Dive-shop operators often will dive in the same reef a couple of times a week for 30 years,” she says. Her PhD in marine ecology and anthropology is “equally footed in the natural and social sciences”.

After earning her PhD in 2008, she went to work for NOAA, first at a marine protected area — a region where human activity is restricted to preserve resources — in Hawaii, and then in “office buildings, conference rooms and embassies”. Day to day, the team she manages helps other countries with tasks such as establishing marine protected areas and writing management plans. Shackeroff says that she chose a government position to be as close as possible to policy and management decisions.

KEEPING A DOOR OPEN



Vera Agostini, scientist at the Nature Conservancy’s Global Marine Initiative, Miami, Florida.

When Vera Agostini earned her fisheries PhD from the University of Washington’s

School of Aquatic and Fishery Sciences in Seattle in 2003, the department was still quite focused on industry-oriented fisheries management, and she didn’t mingle much with conservationists. “I was just too busy in my PhD programme; I didn’t reach out to the conservation world,” she says.

But once she had her degree, she wanted to do something to help the sea — and to use her communication skills. She took a position at the Pew Institute for Ocean Science at the

University of Miami, where she tried to “bridge a gap between conservation and fisheries”. She is still based in Miami, now working for the Nature Conservancy. “In a typical work day, I might be talking to the mayor of a small town, or giving a presentation at the United Nations,” she says. But she also researches the life cycles of fish including anchovies and hake. “I produce the science that will help my policy colleagues go out and effect change.”

Her career doesn’t leave much time for peer-reviewed papers. But Agostini keeps at it, in case she ever wants to go back to academia. These days, universities no longer view a candidate as ‘tainted’ by advocacy work for non-governmental organizations, she says, “as long as you can keep your CV rich with what an academic would look for — publications”.

CHANCE FAVOURS THE PREPARED



Michael Webster, programme officer with the Wild Salmon Ecosystems Initiative at the Gordon and Betty Moore Foundation, Palo Alto, California.

Michael Webster got his zoology PhD in 2001 at Oregon State University in Corvallis, on basic population biology and community ecology. It wasn’t until he began a postdoc with Bruce Menge and Jane Lubchenco, also at Oregon State, that he wondered whether pure science was for him. Menge focused on pure science, whereas his wife, Lubchenco, was involved in the interface of science and policy. “It was interesting to think which of these paths I would like to go down,” says Webster.

In the end, he chose Lubchenco’s path, moving into applied science. “I felt dissatisfied in ecology,” he says. “There is a lot of activity

that focuses on getting degrees, getting grants, writing papers, but little incentive to apply that work and make it useful in the real world.”

He began looking for work at non-governmental organizations and government agencies in 2004, but there were few jobs available. An advert for a job at a foundation intrigued him, and the next thing he knew, he was managing grants, funding science that will inform salmon conservation. Marine-biology foundation jobs are hard to find, so Webster recommends having a plan B. But, he says, once one looks beyond the well-trodden academic path, all kinds of jobs like his are possible.

He has some advice for those wanting to go into conservation: “You have to be interested in more than the science: communication, policy, grassroots organizing,” he says. “Very little of it, for most people, is about being in the field and collecting data and writing papers.”

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marine-biology PhDs of her generation, she says, are coming out of the conservation closet much earlier — or never going in. “We didn’t want to wait until we were senior scientists to do this kind of work,” says Leslie.

A new conservation-focused mindset is apparent at the University of Washington’s renowned School of Aquatic and Fishery Sciences in Seattle, which was known until 2000 as the School of Fisheries — a name that was proving unappealing to potential students. “We were losing undergraduate interest among those who were more conservation oriented,” says school director David Armstrong. “Our department has diversified a lot in the past eight to ten years.” It was once a powerhouse for producing government fisheries scientists, but many of the school’s graduates now move into tenure-track academic positions or non-governmental organizations, and staff and students alike have a more conservationist outlook. Faculty member Julian Olden, hired in 2006, won the Early Career Conservationist Award from the Society for Conservation Biology this year for his research on the spread of invasive aquatic species and their effects on ecosystems.

Staff such as Olden might help to convince a new generation that fisheries science is not incompatible with conservation. “Classical fisheries science is so closely associated with failure, there is a real risk that we won’t get good students,” says Pauly. Those failures are notorious: fish stocks collapsing into nothing despite being managed by trained scientists. But now, many graduates of fisheries programmes are tackling the problem by finding new applications for quantitative models that were developed to maximize fisheries yields; they are modelling fish populations to learn how best to conserve them. Instead of asking how many fish can be taken out one year without depleting stocks the next, they seek to determine how many fish can be removed without damaging a functional ecosystem in which fish from all age classes are well represented.

Jobs growth

The infiltration of conservation into traditional fields and the birth of marine conservation biology have both spawned jobs in the past 15 years. These have come about through the addition of conservation-science positions in government, particularly at NOAA; the expansion of marine interests at the big non-governmental conservation organizations; and the growth of new institutes that specifically focus on marine conservation.



The Gulf of Mexico oil spill has raised awareness of marine conservation issues.

The Marine Conservation Biology Institute is one such establishment, and the Scripps Center for Marine Biodiversity and Conservation, based at the University of California, San Diego, is another. Academic departments at the University of British Columbia, Brown University, Duke

University in Durham, North Carolina, and others have also opened their doors to marine conservation.

Still, Norse bemoans the lack of funds for his pet field. At most institutions, he says, money comes through grant committees rooted in traditional disciplines: oceanography, biology and social sciences such as economics. There isn’t a lot of funding for interdisciplinary marine studies, although this represents the biggest research need, says Norse. Filling the gap for now are groups such as the David and Lucile Packard Foundation in Los Altos, California, and the Pew Charitable Trusts in Philadelphia, Pennsylvania.

Marine biologists in these new roles spend a surprising amount of their time

studying a terrestrial species — humans. The researchers interviewed for this story were unanimous in recommending that young marine biologists with a conservationist bent develop experience in the social sciences by completing courses in sociology, anthropology and economics, or by including humans

in their research projects (see ‘Voyages into conservation’). An interdisciplinary background is key. Some argue that managing the ocean is primarily a social question with a scientific component, rather than the other way around.

Although marine conservationists do sometimes design marine protected areas with limits on human activity, many doubt the feasibility of ‘fortress conservation’ — the concept of preventing all human use of nature to which some terrestrial conservationists aspire. Instead, the marine conservationists are looking at problems through a “sustainability lens”, says Barry Gold, programme director for the marine conservation initiative at the Gordon and Betty Moore Foundation in Palo Alto, California. This means managing use rather than just banning it. Managers have a variety of tools, from laws to educational campaigns to complex financial incentives, for avoiding by-catch of threatened species, dumping into the sea, illegal fishing and even the destruction of reefs by recreational divers.

Interdisciplinary researchers might survey the species in a coral reef while interviewing local fishers and householders about which fish are considered tastiest and which are most culturally significant — or they might combine modelling the populations of a single species in a specific area with lobbying meetings of the regional fisheries management councils. “I am not sure,” says Joshua Cinner, a coral-reef expert at the Australian Research Council, “that the prospects for someone who can only count fish or look into a microscope are particularly bright.”

Emma Marris is a freelance writer based in Columbia, Missouri.



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— Daniel Pauly