# CAREERS

**OUTLOOK** US universities will be tightening belts, predicts Moody's **p.279**

**NETWORKS** Women benefit from informal relationships in and outside work **p.279**

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OCEAN BIOLOGY

# Marine dreams

*Scientists in a glamour field offer tips — and reality checks — for the next generation of marine biologists.*

**BY CHRIS WOOLSTON**

Whenever George Matsumoto gets a call from an unfamiliar number, he has a good idea of who will be on the other end: a young person who dreams about living on a boat and communing with dolphins, whales and otters. As a marine biologist and education specialist at the Monterey Bay Aquarium Research Institute (MBARI) in Moss Landing, California, Matsumoto is a public face for a branch of science that has been glorified and romanticized through films and television shows. Young people from the coast of England to the plains of Kansas are making plans to study sea creatures, and they want to know how to get into the club. "I get phone calls and e-mails non-stop all year long," Matsumoto says. "They're almost always from high-school students. I just got four different e-mails from the same high school in Florida. I don't know how they find me."

Like many researchers, Matsumoto has devoted much of his career to education and mentorship. But as a marine biologist, he is in a tricky position: he has to turn wide-eyed enthusiasm into a grounded understanding of day-to-day research — which often combines the thrill of staring at numbers on a computer screen with the joy of seasickness — without breaking too many spirits.

It is a challenge shared by other marine biologists around the world, whether they are studying tuna or plankton, coral or seaweed. They do not want to discourage anyone from science. But in a field that is already crowded with PhD graduates looking for meaningful work, they want to make sure that the next generation arrives with the right motives and a realistic understanding of the prospects. Newly independent principal investigators who are being chased down by starry-eyed high schoolers and undergraduates should equip themselves with a broad knowledge of education options, a feel for the job market and a deep pool of empathy. After all, they probably once had a few stars in their eyes themselves.

## RIGHT MOTIVES

Matsumoto says that he is always happy to make time for those who reach out to him. About a dozen times a year, he will carve an hour out of his schedule to sit down with students who visit the lab. One of his first pieces of advice to callers and e-mailers is for them to check out the website 'So You Want To Be A Marine Biologist?' (see go.nature.com/gqwbum) created by Milton Love, a fisheries researcher at the University of California, Santa Barbara. The site bluntly advises that anyone who wants to become a marine biologist so as to establish some sort of cosmic new-age connection with dolphins should aim for another line of work. "In our experience," it says, "people who feel this way last about 6.5 minutes in any biology program." The site also discourages anyone who wants to get rich from taking up marine biology. "Five years after getting my PhD, I was making slightly less than a beginning manager at McDonalds," Love writes.

Speaking from his office, Love says that despite the warnings on his highly read site, he continues to receive a steady stream of queries from high-school students, undergrads and even people with PhDs in other fields who want to break into ocean science. "I sympathize with these people," he says. "I believe that there's a place in science for anyone with a seeking mind. But I don't want them to get crushed down the road." (Love takes another, more in-depth look at the ins-and-outs of the profession in a follow-up website 'So You Want To Be A Marine Biologist? The Revenge!" (see go.nature.com/utmbiw).

KIMBERLY SWAN

KIMBERLY SWAN

**The Watsonville Area Teens for Coastal Habitats programme sets high-school students to work sampling fish in lagoons and estuaries.**

Some of the most enthusiastic marine-biologists-to-be have yet to start university. Every year, a group of high-school students visits the University of New Hampshire's Shoals Marine Laboratory on Appledore Island, giving executive director Jennifer Seavey a chance to work with people at the very beginning of the marine-biology pipeline. "It's a field that attracts a lot of young students," she says. "In the 1970s, everyone wanted to become a marine biologist because of Jacques Cousteau." Now, she says, the big draw is *Dolphin Tale*, a 2011 film about a dolphin that receives a prosthetic tail, and Shark Week, a much-hyped binge of shark programmes on the Discovery Channel in the United States.

"The most common thing I hear is that they want to be marine-mammal veterinarians. I tell them that there are maybe five really successful marine-mammal vets in the world," she says. "The rest are techs at SeaWorld", a chain of theme parks in the United States.

Once at the facility, students quickly learn that marine biology does not always follow the heart-warming Hollywood script. Among other endeavours, students get a chance to practice wildlife forensics — taking a close look at dead seals and sea birds, for instance, and trying to work out how they met their demise.

Matsumoto takes groups of students from underserved high schools to field sites along Monterey Bay through the Watsonville Area Teens for Coastal Habitats programme. Almost all the students are Hispanic, and many are still learning English. Language barriers aside, the science is solid. "They pick their own topics," Matsumoto says. "We give them a research site and time to explore, and they come up with their own hypotheses." Ongoing projects include measuring crab density and biodiversity, and identifying plankton. The kids really get into the work, he says, even if it does not exactly fit into their preconceived ideas of ocean research.

The fascination with marine biology is not restricted to high-school students. Many undergraduate students remain enthralled, which explains the pile of applications that MBARI receives for its ten-week internships for university students. "We get 200–300 applicants every year for 12–20 positions," Matsumoto says. Those lucky enough to get an internship are rewarded with a valuable dose of reality. Matsumoto says that they will often have a glorious day of research that is seemingly pulled from the pages of *National Geographic* magazine, then spend weeks and weeks working on the data. "Some of the interns realize it's not for them," he says. "For us, that's a success story." Although for better or for worse, the summer of 2014 had no such 'successes'. "We had humpback whales feeding 200 feet off the beach pretty much all summer," he says. "The interns could watch them during their lunch breaks. After that, none of them wanted to get out of science."

## SHARKS AND SEAWEEDS

Andrew Davies, a marine ecologist at Bangor University, UK, is not surprised that so many people want to study the ocean. "It holds incredible biological diversity from the tiniest microbes to the largest organisms on the planet," he says. "And it's not just kids. We have mature students who want to change careers." Whatever their age, the newcomers that he runs across tend to have highly idealized and simplistic ideas of the profession. "The media has developed a myth that now surrounds marine biology, and indeed many careers in the natural sciences," he says. "Students arrive at university with an almost single-minded focus on coral reefs, marine mammals or large predators such as sharks."

One of Davies's jobs, he says, is to show them other possibilities. "I want to expose them to organisms that they've never come across before, such as worms that build large reef-like structures out of sand particles, or long-lived forests of algae that create their own ecosystems." Davies himself started out studying seaweed — a practical choice, he says. "There are far more job opportunities out there on seaweeds than on sharks, often with less competition." But it still took him months to find a job after getting his PhD. "I spent that time working on publications and doing some volunteer work. Now I'm an academic, and I've never looked back. I have loved pretty much every day of my entire career. I work long hours mixing research with teaching, but every day is different."

Competition is a common theme throughout the natural sciences, where the supply of PhD students and postdocs far outstrips the positions in academia. And because so many people want to become marine biologists, university scientists often have to act like gatekeepers. "We can be leery about bringing on graduate students who have their sights set on academia," says Rita Mehta, an evolutionary biologist at the University of California, Santa Cruz's Long Marine Laboratory. "We have to ask ourselves, is this person really ready to fight for a job?"

***"Because so many people want to get into the field, you need dedication and creativity."***

When talking to undergraduates, she says, she sometimes steers them away from marine biology altogether towards a more general and potentially more marketable degree perhaps in evolution or molecular biology. She says that even at her own institution, ocean science gets an outsized share of student interest even though plenty of terrestrial biologists are doing excellent work. "Marine biology is thought to be the pinnacle of majors, but that's because people don't understand what else is out there."

EDUCATION

## *Those who can, teach*

With so many young people eager to learn about ocean life, marine education can be a promising career path. Whether as a full-time job at an aquarium or at a summer camp on the high seas, explaining marine science to kids can be very rewarding, says Cause Hanna, research manager of the Santa Rosa Island Research Station, part of the California State University Channel Islands. "As a researcher, you can be plugging away on a problem for years," he says. "As an educator, you can get phenomenal results in a day."

According to Jennifer Seavey, executive director of the University of New Hampshire's Shoals Marine Laboratory on Appledore Island, "there are a lot of marine-science camps and courses for kids, and they all need people to teach them". Many of the jobs are at the sorts of places that attract so many people to marine biology. SeaTrek BVI, a company that offers adventure summer camps for teens in the British Virgin Islands, hires biologists to teach kids about coral reefs, mangroves, plankton and other ocean topics. The Marine Discovery Center at New Smyrna Beach in Florida employs biologists to guide dolphin tours, give talks about sharks and starfish to the general public and teach at summer camps for kids and teens.

California's Catalina Island Marine Institute — a non-profit school for children aged 9–17 — is one of the best destinations for early-career marine biologists who have a penchant for teaching, says George Matsumoto, education specialist at the Monterey Bay Aquarium Research Institute in Moss Landing, California. "It has a large network of alumni all over the world," he says. "Having that on your CV will only help you."

For those who prefer more stable work, Seavey notes that a bachelor's or master's degree in ocean science can be a good foundation for a career teaching at pre-university levels. "It's not uncommon to find high-school teachers with a background in marine biology," she says.

Researchers do not necessarily need formal training to share their knowledge with others, but Matsumoto says that it is important to hone teaching skills when you have the chance. "Postdocs should look around at local community colleges to see if they can get an adjunct or guest lecturer position," he says. "PhD students should ask their professors if they can teach some classes. I did that with my professor, and he was more than happy to oblige." C.W.

Mehta assures students who are willing to look beyond academia that jobs are out there. "There are quite a few public research opportunities," she says, including positions with aquariums, non-profit organizations and governments at the federal, state and municipal level. Tetra Tech, a consulting firm based in Research Triangle Park, North Carolina, is seeking an aquatic ecologist, and the Alaska Department of Fish and Game in Dutch Harbor wants a fishery biologist, for example. The inexhaustible pool of interest in ocean science among the general public also opens up opportunities for researchers with a penchant for teaching, Mehta adds (see 'Those who can, teach'). If an early-career scientist knows a few things about sea lions, great white sharks or oysters, there will always be people who want to hear about it.

But none of those jobs are easily won. "There are numerous career options," says Erich Hoyt, a researcher with the global non-profit organization Whale and Dolphin Conservation in Chippenham, UK. "But because so many people want to get into the field, you need dedication and creativity." He says that he received more than 200 applications when he recently put out a call for an assistant.

Studying marine mammals in the field requires an especially diverse skill set, Hoyt says. Among other things, he says, researchers need to be able to handle boats of all sizes, take photos, make sound recordings, sort through streams of data and write papers. Hoyt does all these, as well as giving regular talks and writing popular books, including the 2013 children's book *Weird Sea Creatures*, a side career that has undoubtedly sent more young people down a path towards a career in ocean science.

What opportunities will those students have? It depends on the student. "There are no guaranteed jobs post-graduation in any field, especially in a competitive area such as marine biology," Davies says. But the picture is not hopeless. "There is always a need for enthusiastic, motivated and hard-working graduates who have the confidence to tackle challenges head on." If that challenge involves spotting blue whales from a boat or scuba diving with a pod of dolphins, so be it. It is a tough job, but some marine biologist will have to do it. ■

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UNIVERSITIES

## Gloomy outlook

US universities will probably face financial pressure until at least mid-2016, including an erosion of federal funding, says a report by Moody's Investors Service in New York. The report, *2015 Outlook — US Higher Education: Slow Tuition Revenue Growth Supports Negative Outlook*, released on 1 December, predicts that universities will continue to battle for tuition-fee revenue, state funding and federal grants. Moody's, a credit-rating agency, expects federal grant amounts and activity, especially from the US National Institutes of Health and the US National Science Foundation, to decline in the next 12–18 months. It says that the contraction will be a result of discretionary spending cuts, federal budget pressures and the continuing effects of last year's across-the-board funding sequestration. Research will increasingly be funded through private donations and gifts, the report predicts. The continued negative outlook, in effect since January 2013, means that Moody's is more likely to give poor credit ratings to US universities, which will incur higher borrowing costs and might be forced to scale back hiring plans.

CAREER PROGRESS

## Informal relations

Women are more likely to realize career benefits from informal relationships with colleagues and others if they are in a discipline that comprises at least 15% women and are not simply tokens, finds a study. *Cultural Correlates of Gender Integration in Science* analysed accounts of scientific success in psychology, psychiatry and the life sciences, which have large proportions of women, and in engineering and physics, in which women tend to be underrepresented. The authors found that informal relationships (including those with colleagues and contacts made through conferences or other means) help women to integrate and stay in their career just as much as mentorships and other formally structured relationships. They suggest that the benefits come from the extra support and opportunities these relationships can provide. Early-career female researchers should assess the collegiality of their fields and workplaces as they make career decisions, says co-author Cindy Cain, a postdoc at the University of Minnesota in Minneapolis. "Friendly relationships may increase women's sense of professional role confidence, thus helping them to fit in and be productive — as long as women have surpassed the 15% tokenism level in that discipline," Cain says.