

In the EYE of the STORM

She set out to revolutionize US ocean management — but first she faced the oil spill. Jane Lubchenco is Nature's Newsmaker of the Year.

BY RICHARD MONASTERSKY

Jane Lubchenco smiles as a dolphin leaps out of the water, arcs in the air and splashes back down just a few metres away. The 63-year-old marine ecologist is out on a boat near Pascagoula, Mississippi, with a team of researchers studying how the recent oil spill in the Gulf of Mexico has affected dolphin communities there.

On this October day, Lubchenco wears starfish-shaped earrings and a cap emblazoned with the letters 'NOAA', for National Oceanic and Atmospheric Administration. Her shirt sports a NOAA logo, as does her life vest. Rarely does she venture out in public without some symbol of the US government agency she has proudly run since March 2009. A sprawling department of 12,800 people with a budget of US\$4.7 billion, NOAA has responsibilities stretching from the bottom of the sea to the top of the atmosphere and even to the Sun, which it monitors for signs of solar storms. That mandate put Lubchenco at the centre of the government's response to the BP Deepwater Horizon oil-spill disaster — a brutal test for a scientist with little previous management experience.

On board the boat, she relishes the chance to talk about dolphin behaviour with the NOAA researchers, but seems to get the biggest kick when the pilot gives her a turn at the wheel. Gripping the throttle, Lubchenco has to be reminded to stay below the speed limit as she motors through the narrow waterway.

Going slow does not come easily to the NOAA leader. As a celebrated scientist and vocal conservationist, she made her name urging other researchers to speak out on issues of public importance, a stance that not all of her academic colleagues were comfortable with. Now, at an age when many of her cohort are easing back, she is taking on the most ambitious challenge of her career: reorienting how the nation responds to pressing environmental problems such as dwindling fish stocks, rising seas and a changing climate. She has bold plans to strengthen scientific research at NOAA, make it more relevant to society and improve the health of ecosystems and coastal communities.

But the path has not been smooth for Lubchenco, who took over the

Lubchenco testifies at a Senate hearing on the Deepwater Horizon oil spill.



agency in troubled times. With the economy in a nose dive and many coastal communities struggling, NOAA's policies to limit fishing have proved so contentious that members of US President Barack Obama's own party called for Lubchenco to resign. And the oil-spill disaster has severely tested her political skills. Some of her natural constituency — scientists and environmentalists — have accused her of quashing independent researchers, suppressing information and misleading the public.

Although she admits to some communications problems during the crisis, Lubchenco shakes off the broader criticisms. "I'm very proud of what we did during the heat of the moment," she says. NOAA closed down fisheries, forecast where currents would sweep the oil, monitored storms during one of the most active hurricane seasons on record, protected endangered marine species and is leading the effort to assess damage done by the oil. "I give her very high marks as a leader in what has been a difficult time for NOAA," says Michael Jackson, who was deputy director of the US

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Department of Homeland Security in 2005, during Hurricane Katrina.

Throughout this day on the Gulf of Mexico, Lubchenco keeps up a hectic pace, visiting multiple sites in the Alabama and Mississippi area. This is her eleventh trip to the Gulf of Mexico region since the Deepwater Horizon oil rig exploded on 20 April, unleashing the largest single marine spill in US history.

In person, Lubchenco makes an easy connection with strangers. She looks them in the eye and asks about their jobs and how the spill affected them. Before lunch, she meets more than two dozen teachers from across the Gulf and starts by telling them how much she appreciates their work. “My sister is a middle-school science teacher. My daughter-in-law is a high-school science teacher, and I was strongly affected by teachers,” she says.

The teachers introduce themselves and talk about how the spill touched their students, many of whose parents were put out of work when the spreading oil closed fishing grounds and drove away tourists. The teachers thank

Lubchenco for all the information that NOAA posted on its website, which their classes used to find out which fishing areas were closed, where the winds were going and whether currents would carry the oil out of the Gulf. “We would check your site every day,” said one teacher. “We used so much of that data.”

CRISIS MANAGEMENT

With the well capped and the oil dispersing, Lubchenco has entered calmer waters after the tumultuous spring and summer of the crisis. She was one of the ‘principals’ — the top administration officials working on the spill, who regularly briefed President Obama and rarely rested. Two weeks after the rig exploded, she ran into an old friend at a party in Washington.

“Jane, you look really tired,” he told her.

“Yeah, I’m sleeping three or four hours a night,” she confided to him.

Such was the toll of running the lead ocean agency during one of the biggest environmental disasters in US history. The task was

complicated by a series of communications missteps, her own and those of other officials, which drew accusations that she had withheld information about the environmental toll of the spill.

The first flashpoint was the question of how much oil was leaking from the wellhead and where it was going. Days after the spill, when BP was estimating that 1,000 barrels of oil were pouring out each day, a NOAA researcher arrived at a far higher figure of 5,000–10,000 barrels — a “very rough estimate”, his e-mail warned. But that was not released to the public. Instead, a Coast Guard admiral in charge of responding to the spill said in a press conference on 28 April that “NOAA experts believe the output could be as much as 5,000 barrels”.

That figure stood as the sole government estimate for a month. At the same time, independent researchers came up with estimates in the range of 25,000–100,000 barrels a day. Months later, the government concluded that the well had gushed 62,000 barrels a day initially and then declined to 53,000 (a figure

that BP contends is too high).

Other issues also suggested to some that NOAA and the rest of the government were downplaying the magnitude of the problem. In mid-May, academic scientists working in the Gulf started finding evidence that untold amounts of oil were spreading away from the wellhead and forming vast plumes some 1,200 metres below the surface¹. NOAA initially questioned the evidence and dismissed media reports as “misleading”, even as more evidence emerged. Donald Boesch, president of the University of Maryland Center for Environmental Science in Cambridge and a member of a commission that subsequently reviewed the government’s response, says that was a mistake. “Jane was too dismissive about the fact that there could be a significant deep-water plume there,” he says. On 8 June, after analysis of more data collected by academic scientists, NOAA acknowledged the presence of diffuse plumes of oil beneath the surface.

THE FATE OF THE OIL

On 15 July, BP finally succeeded in capping the well, but there were still major questions about what had happened to all the oil that had escaped over the past three months. In early August, NOAA and other agencies released an ‘oil budget’, which tallied the fate of all the released oil. Carol Browner, director of the White House Office of Energy and Climate Change Policy, announced on television that three-quarters of the oil was “gone”. But that did not match the government’s own numbers.

Later that day, Lubchenco appeared with Browner at a White House press conference and corrected the record. “It’s important to point out that at least 50% of the oil that was released is now completely gone from the system,” said Lubchenco. Illustrating her statistics with a pie chart produced by NOAA and other agencies, Lubchenco said that containment efforts had removed roughly a quarter of the oil and another quarter had either evaporated or dissolved. The rest had dispersed as tiny subsurface droplets or as visible oil, and some of that had been collected from beaches or naturally degraded.

But in making that correction, Lubchenco made a different mistake by saying that the oil budget had been “peer reviewed”, a statement at odds with the reports of scientists who supposedly reviewed it. Academics and members of Congress also criticized NOAA’s decision to release the four-page oil budget without uncertainty ranges or the background data that justified the conclusions.

Reacting to the series of gaffes, the national commission investigating the oil spill declared in October that “the federal government created the impression that it was either not fully competent to handle the spill or not fully candid with the American people about the scope of the problem”. At the very least, those issues undermined the public’s trust in the



The Deepwater Horizon disaster posed a brutal test for a scientist with little previous management experience.

government, said the commission.

For Lubchenco, the judgement was both troubling and ironic. Given her record of urging scientists to speak out, she says, “I would be the last person in the world to be not valuing or promoting communication”. She says that she initially balked at the 5,000-barrel-a-day flow-rate statement. “My inclination was to correct the record, but in the grand scheme of things, since we didn’t have the accurate numbers and we were working on getting them, it didn’t seem to be that important relative to all the other stuff that was going on.” Knowing how much oil was flowing would not have helped the effort to contain it, she argues — an assertion challenged by the oil-spill commission, which says that knowledge of the true flow rate might have helped BP to avoid some problems in its attempts to cap the well. “In hindsight,” says Lubchenco, “it took far too long to come up with the eventual answer.”

During a press conference in November, she also acknowledged that she had erred in declaring that the oil budget had been peer reviewed. In a subsequent interview, she took personal responsibility for the miscommunication. “I misunderstood what kind of review it had had, so that was my mistake,” she said.

But Lubchenco defends her agency’s statements about the subsurface plumes, saying that NOAA was just insisting on careful science. “It’s frustrating to get crosswise with my academic colleagues when we thought all we were asking them to do was to be good scientists and to double check and make sure that what they were finding was in fact what they thought it was.”

Some scientists are still bothered by NOAA’s slow acknowledgement of the deep oil, but others

agree with her approach. “There was a lot of speculation early on,” says Richard Camilli of the Woods Hole Oceanographic Institution in Massachusetts, who led a cruise that uncovered signs of a deep plume of oil in June. “Good science requires peer review. If you’re going to say something public it should go through peer review first,” says Camilli, who published his findings in *Science* in August².

Many scientists laud NOAA’s overall performance during the spill. Boesch, although critical of Lubchenco’s initial response to reports of deep plumes, says that she and NOAA provided “very critical science support to help direct the spill response where it was needed”. And he praises the agency for doing something that gets little mention — successfully keeping the nation’s seafood safe by closing fishing areas and reopening them only after rigorous testing. “That protected the public,” he says, “and in the long run protected the industry.”

DEFYING EXPECTATIONS

By late October, the sheen of oil had disappeared from the surface of the Gulf and NOAA had shifted towards assessing the damage. “It’s far from over,” says Lubchenco. “It’s going to be years, if not decades, before we really understand the impact this massive infusion of hydrocarbons has had on this system.”

In Mississippi Sound earlier that day, Lubchenco relished the chance to spend part of her weekend on the water. As a scientist, she has studied ocean ecosystems for 40 years — an unlikely focus for a girl growing up in the 1950s in Denver, Colorado, in the middle of the continent. But the women in the Lubchenco family

C. COLE/ POLARIS/ EYEVINE

have long challenged expectations.

In the early 1900s, her paternal grandmother left her parents' cotton farm in South Carolina to train in medicine, only to find that the dean of one of the nearest medical schools, in North Carolina, would not accept a woman. She finally wore him down, became the first female graduate in 1912 and then married a Ukrainian agricultural researcher who had visited her family's farm years earlier. (He narrowly made it to her graduation ceremony, after having missed the steamer he had originally booked to America — the *Titanic*.)

Lubchenco's parents were also doctors, and her mother worked part-time so that she could have a career and raise her six girls. In that household, everybody was expected to follow their interests. "Mom and Dad were always great about encouraging us to explore. Of the six of us, we all do completely different things," says Lubchenco.

In secondary school, young Jane was a classic overachiever: an athlete, scholar and leader, she won the school's highest award. But rather than go to a powerhouse university, she chose tiny Colorado College in Colorado Springs and enrolled in an unusual programme with no classes, no grades and no tests. She discovered that she liked biology and took a summer class at the Marine Biological Laboratory in Woods Hole, Massachusetts, where she fell in love — with invertebrates and research. "That whole summer was magical for me," she recalls. "It made me decide I was going to go to grad school and it was going to be marine science."

After getting her PhD at Harvard University in Cambridge, Massachusetts, and teaching there for two years, Lubchenco took what some considered a step down by moving to Oregon State University in Corvallis, where she and her husband, ecologist Bruce Menge, bargained to split an academic position. It was perhaps a first in the United States, and it gave them both a chance to teach, conduct research and raise their children. The two also split their research on tidal communities, with Lubchenco studying the herbivores and seaweeds and Menge the predators and prey.

At the time, ecology was largely a descriptive science, but Lubchenco was part of a group pushing to introduce experimental approaches. In graduate school, she started moving herbivorous snails around tide pools to tease apart the factors controlling the distribution of seaweeds.

Most researchers had assumed the answer had to do with physical limitations, such as how much a tide pool dries out. But Lubchenco demonstrated that the herbivores had an important role in controlling the plant populations³ — a finding that also turned out to be true in some terrestrial ecosystems. Her simple, elegant experiments became a staple in ecology courses, and her papers garnered hundreds of citations.

Lubchenco also made a name for herself by urging fellow ecologists to speak out on environmental issues. As vice-president of the Ecological Society of America in 1988–89, she chaired a panel that called for ecologists to

communicate to the public and policy-makers. "It was a coming of age for our society, to admit that relevance was not a four-letter word," recalls Lubchenco (see page 1032). Later, while serving as president of the American Association for the Advancement of Science — the premier scientific organization in the United States — in 1996–97, she continued to push scientists to become more socially relevant.

Now she has a chance to bolster science and its connection to policy-making at the highest level. NOAA has a long history of conducting some top-notch science and has nurtured pioneering researchers such as ozone specialist Susan Solomon and climate modeller Syukuro Manabe. But it has been perpetually strapped for cash, and previous administrations have at times focused less on the science than on the divisions that provide services, such as forecasting weather and managing fisheries.

When Lubchenco discussed the NOAA post with Obama soon after he was elected in 2008, she told him that one of her goals would be to renew that commitment to science. Obama's response to this proposal and others that she made, she says, was "let's do it".

Once she took office, Lubchenco set out to resurrect the chief-scientist position at NOAA, which has been vacant for 14 years. But she got a lesson in the slow ways of Washington. Much to her frustration, it took months for the Obama administration to approve her choice, Scott Doney of the Woods Hole Oceanographic Institution, and

A global reach

The mandate of the National Oceanic and Atmospheric Administration (NOAA) reaches from space to the sea floor. It faces challenges on all fronts.



THE NATIONAL MARINE FISHERIES SERVICE (NMFS)

What it does: Manages marine life and habitat in US federal waters, up to 370 kilometres offshore.

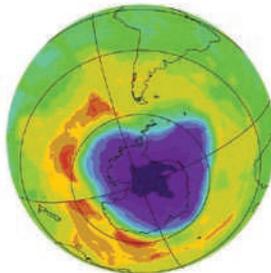
Challenge: Ending overfishing for depleted stocks by 2010 and setting catch limits for all others by 2011.



THE NATIONAL ENVIRONMENTAL, SATELLITE, AND DATA INFORMATION SERVICE (NESDIS)

What it does: Manages environmental satellites and disseminates data.

Challenge: Sorting out a satellite programme that was years late and billions of dollars over budget.



THE OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH (OAR)

What it does: Research to support services such as climate modelling and weather forecasting.

Challenge: The new Climate Service will absorb parts of OAR, which will have to reorient.



THE NATIONAL WEATHER SERVICE (NWS)

What it does: Provides forecasts and warnings for weather and climate.

Challenge: Monitoring the 2010 hurricane season, one of the most active on record, with 19 named storms, 12 hurricanes and 5 major hurricanes.



THE NATIONAL OCEAN SERVICE (NOS)

What it does: Oversees many non-fisheries aspects of marine areas, including water quality.

Challenge: Tracking the oil and assessing environmental damage from the 2010 oil spill in the Gulf of Mexico.

LEFT TO RIGHT: NOAA; M. FARLOW/NAZL GEOPGR./GETTY IMAGES; NASA; L. MEHMEN/AP; J. DERMANSKY/POLARIS/EYEVINE

a senator this month put a block on Doney's nomination to protest against the administration's moratorium on offshore drilling. In the meantime, Lubchenco has increased the number of senior scientific positions at NOAA from 10 to 25, and altered the career structure within the agency so that scientists can advance in seniority and salary without having to leave research for a purely management position.

Lubchenco has made significant progress on her other priorities, say many who have watched NOAA under her leadership. "She's done the job certainly as well — and I would argue better — than anyone else," says Andrew Rosenberg, a senior vice-president at Conservation International and deputy director of NOAA's fisheries service from 1998 to 2000.

When Lubchenco arrived in Washington, one of the first problems she had to tackle was the National Polar-orbiting Operational Environmental Satellite System (NPOESS). Designed to collect weather and climate data, it was running years late and more than \$5 billion over budget. Lubchenco and her colleagues in the administration developed a plan to split the unwieldy system into a military part and a civilian part to be jointly managed by NOAA and NASA — a step that could finally get the NPOESS back on track.

Lubchenco has also pushed forward an initiative to create a NOAA division called the Climate Service, which the agency had been discussing since just after it was founded in 1970. The goal is to gather NOAA's decentralized climate expertise into a single office to enhance the science and provide an authoritative voice on climate information. The biggest reorganization in NOAA's history, this office — which awaits congressional approval — will give the public and businesses forecasts such as long-term temperature projections and flooding maps that take into account sea-level rise.

FISHING WOES

For environmentalists, one of the biggest successes of Lubchenco's tenure so far has been the administration's new ocean policy, which Obama signed on 19 July. A centrepiece of the policy is a strategy — long championed by Lubchenco — called coastal and marine spatial planning, which seeks to assess and balance human activities in particular ocean regions so that they do not conflict with each other or harm ecosystems. In the past, the government has tended to manage activities such as fishing individually, without considering how other factors, such as oil drilling and coastal development, might interact with them.

"What Jane has done is catalysed the most important transformation in ocean

management in our history," says Elliot Norse, president of the Marine Biology Conservation Institute in Bellevue, Washington.

All that change has brought some strong criticism, especially from the fishing industry. Under her leadership, NOAA has moved to implement the 2007 Magnuson–Stevens Reauthorization Act, which requires the agency to end overfishing. NOAA's actions so upset some fishermen in Gloucester, Massachusetts, that they built a life-sized model of Lubchenco hanging fishermen. The rhetoric in Congress, with the calls for her resignation, was only slightly less inflamed.

The source of the strife in New England goes back long before Lubchenco took office. Oversight of fishing in US federal waters is complicated; NOAA shares management duties with eight regional councils made up of federal and state government officials and members of the public, including the fishing



Jane Lubchenco and her husband, Bruce Menge, with students in 1997.

industry. The councils choose how they want to control fishing and propose annual limits on each type of seafood. NOAA assesses the plans and then approves or rejects them.

In the past, NOAA had given management councils more latitude, but when Lubchenco took office, she made it clear that she expected them to meet the congressional deadline to end overfishing by this year. As part of that, NOAA last year encouraged the councils to consider a strategy called catch shares. In this scheme, councils allocate fishing 'shares' to individuals or groups, usually on the basis of how much they have previously caught. The recipients of shares can use or sell them. Proponents say that catch shares give fishing communities a long-term economic incentive to rebuild stocks.

Although the strategy has been used around the world and in parts of the United States for decades, the transition to a catch-shares system can be difficult. "It has to be done very carefully. It has to involve the community, from the bottom up," says Brian Rothschild, a professor of marine science at the University of Massachusetts at Dartmouth who has close ties to

the New England fishing community. He contends that NOAA and the New England Fishery Management Council moved too quickly in May to implement a programme based on catch shares, without properly involving the local fishing community or explaining the system. Some fishing communities say that the policy has caused major job losses.

Lubchenco and others argue that New England's policy was five years in the making and the community had ample time to get involved. They also contend that fishermen in the area have been struggling economically for years — long before the management council adopted the new programme. "The reality is that this isn't about catch shares," says Lubchenco. "It really is about the economy."

Peter Baker, manager of the Pew Environment Group's New England overfishing campaign, agrees. He says that Lubchenco "has taken a stand to fix things for the future".

Those who have criticized her policy have not offered a viable alternative, he says. "I'm not sure that anything would be enough to appease her detractors."

As difficult as this year has been for Lubchenco, the next few will offer further challenges. NOAA's budget increased by 21% during the past two years, but Obama and Congress are now committed to cutting spending and the outlook for NOAA is bleak. The agency has never enjoyed the same support in Congress as some other science agencies, such as the National Institutes of Health. But Lubchenco thinks that the recent crises deliver a message on the value of NOAA's research and science-based management.

"It seems NOAA's relevancy has been more obvious in the last couple of years," she says.

Nowhere is that clearer than out on the Gulf of Mexico, where signs of dead coral and other long-lasting effects of the oil spill are starting to appear. While travelling through the region, Lubchenco recalls that she turned down Obama's transition team several times when she was first offered the job. Leaving her husband and research behind in Oregon seemed too big a sacrifice. But in the end, she says, she believed in the new president and in the opportunity to achieve her lifelong goals. "I came to NOAA to lead and enable change where it would make a difference," she later explained. The rough days so far have not discouraged her. "Meaningful change is not for the timid." ■ SEE EDITORIAL P.1002

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- Schrope, M. *Nature* **466**, 680–684 (2010).
- Camilli, R. *et al. Science* **330**, 201–204 (2010).
- Lubchenco, J. *Ecology* **64**, 1116–1123 (1983).