# WINDS OF HISTORY

## At the Providence Public Library, a huge trove of meticulously recorded whaling logbooks opens a window for climate-change research

**Timothy Walker, a maritime history professor at the University of Massachusetts Dartmouth, and Caroline Ummenhofer, a climate scientist at the Woods Hole Oceanographic Institute, are examining the logs for clues to how wind patterns have changed.** PHOTOS BY BOB BREIDENBACH/THE PROVIDENCE JOURNAL

**Alex Kuffner**
Providence Journal
USA TODAY NETWORK

PROVIDENCE – On Saturday, Aug. 20, 1836, the third mate of the Isaac Howland reported the weather conditions encountered by the whaling ship in ocean waters far from the western shores of Central America.

"First part of these 24 hours strong winds and flying cloud heading up ship and under single reefed topsails," he wrote in elegant script.

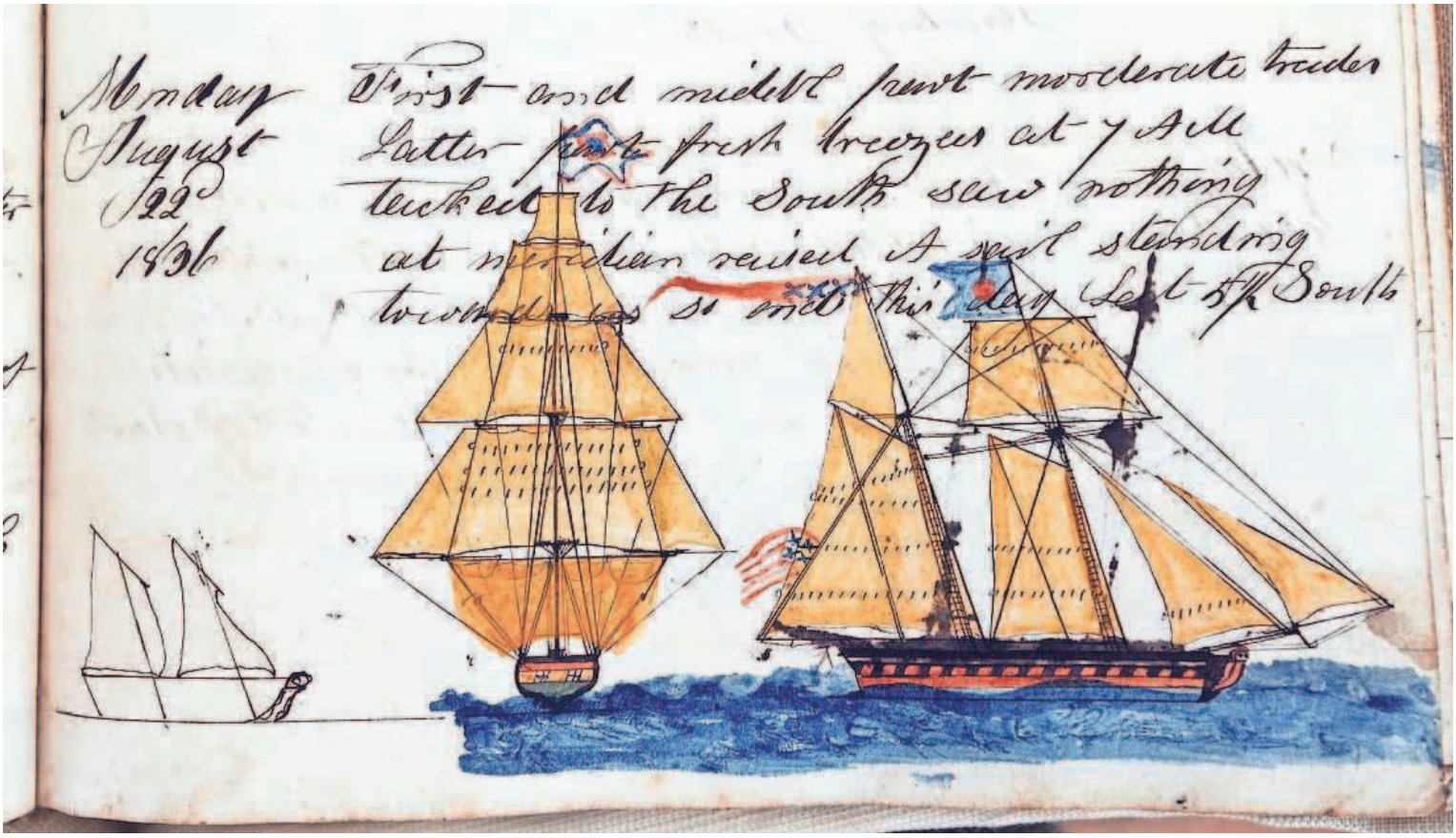
There was nothing exceptional about what he observed that morning on the deck of the wooden ship that had set sail from New Bedford the previous summer. It was just one of more than 1,000 entries over the course of a three-year voyage to the Pacific Ocean that he made in the logbook, which has been preserved in the Providence Public Library.

But the often-meticulous observations of the weather that he and other sailors recorded on thousands of whaling trips long ago are finding a new use in modern climate science.

Researchers Caroline Ummenhofer and Timothy Walker are searching through information collected on the Isaac Howland and other 18th-, 19th- and early 20th-century whalers to find clues about how global wind patterns are changing.

The logs are valuable for the painstaking detail of the record-keeping and because of the brutal efficiency of the New England whaling industry. As whalers exhausted hunting grounds up and down the Atlantic coast, they had to venture farther afield in search of prey prized for the oil that was used to light lamps in the age before fossil fuels. The ships

**See LIBRARY, Page 10A**




**An illustrated entry in an old whaling logbook at the Providence Public Library, which contains the second-largest collection of such logbooks.**
BOB BREIDENBACH/THE PROVIDENCE JOURNAL

# Library

Continued from Page 1A

sailed as far north as the Bering Sea off Alaska and as far south as the waters below Cape Horn off Chile — places that no other vessels had reason to visit. And all the while on their marathon journeys, sailors on board the ships collected troves of information about sea conditions, winds and rain.

"The whalers went to areas where no one else went," said Ummenhofer, a climate scientist at the Woods Hole Oceanographic Institution. "And that gives us data that you can't find anywhere else."

She and Walker, a maritime historian at the University of Massachusetts Dartmouth, didn't come up with the idea for mining historical documents for weather information. A whole subfield of climatology is devoted to using church records, harvest dates and other archival material to reconstruct past conditions. Indeed, researchers have used the logs of Spanish galleons, from as early as the 1690s, to understand weather patterns in the Pacific.

Much of the work on maritime records has focused on logbooks that were used to create the original pilot charts of the winds and currents to guide voyages along the safest routes at sea.

"They function as a form of weather routing, allowing ship masters to time their passages with the trade winds, or avoid especially stormy times, or seasonal adverse winds in different places," said Kevin Wood, a research scientist with the National Oceanic and Atmospheric Administration.

About a decade ago, Wood and other scientists joined with historians and volunteers on an international research project known as Old Weather that set out to glean even more data from the original source material.

The work started in the United Kingdom in 2010 with World War I-era measurements of barometric pressure taken by Royal Navy ships. It expanded to the United States with a similar focus on instrument measurements taken by Navy and Coast Guard vessels that were recorded in logbooks stored in the National Archives.

But those records went back only to the mid-1800s, so researchers turned to whaling logbooks that in some cases are nearly a century older.

One focus has been on whalers' descriptions of conditions in the Arctic, in particular the timing and extent of sea ice. Scientists like Wood have used the observations to help determine how ice has receded as the planet has warmed.

Ummenhofer and Walker believe they're the first to utilize whaling logbooks to understand long-term changes in winds and the pressure systems that cause storms in poorly observed places like the southern Indian Ocean.

Their work could shed light, for example, on how the Roaring Forties and other wind belts close to Antarctica that were named for their latitudes have shifted over time, affecting global weather. While scientists have documented changes in recent decades, they

**Continued on next page**

Continued from previous page

don't know for certain where those wind currents were centuries ago. The logbooks may offer clues.

Wood, a coordinator of Old Weather, confirmed that that project has never looked at winds in the Indian Ocean.

"We generally support all comers who want to take on what is a very challenging task," he said.

**Connecting science and history**

The partnership between Ummenhofer and Walker bridges very different academic disciplines.

Walker's expertise is in Portuguese history and colonialism, but he's also written a book on the Underground Railroad and the little-known stories of Black people who fled the South by sea. Ummenhofer's field is climate science. Her research focus has been on how conditions in the Indian Ocean can cause extreme weather in East Africa or South Asia.

Walker, a New Bedford resident and experienced sailor, always had an interest in whaling logbooks and started thinking about a collaboration that could use them about four years ago.

"The whaling industry is the best-documented industry of the early modern world," he said. "The Yankee whalers wrote down everything and they kept it."

He got Ummenhofer's name from a colleague and emailed her with his idea.

"I was like, 'Whoa, absolutely, I want to be involved,'" she said.

One reason nobody else had tried to use the logbooks in the same way may be because most records made by whalers have yet to be digitized. Old Weather relies on a cadre of citizen scientists to go through books that have been uploaded to a central repository. While hundreds of logs have been made available on the web, there are thousands more that haven't.

For the work with Ummenhofer, Walker, along with some of his students and other researchers under his supervision, have been visiting the various collections of logbooks around New England and going through them page by page. They've started with the New Bedford Whaling Museum, which has the largest number of books, as well as the Nantucket Historical Association, and they plan to get to Mystic Seaport, too.

**Although mariners from the whaling era did not have equipment that could precisely record the weather, their observations reflect a common language learned over their years at sea.** PHOTOS BY BOB BREIDENBACH/THE PROVIDENCE JOURNAL

They are about to start delving into the Nicholson Whaling Collection at the Providence Public Library, which has 800 books documenting about 1,000 voyages from 1762 to 1922. It is the second-largest assemblage around, representing about a fifth of the total number of whaling logbooks in existence.

"During the decades over which this collection was built, cataloged and digitized, no one involved expected it would be used for critical research like this," said Jordan Goffin, head curator of collections at the library. "The current project is a testament to the enduring and evolving power of historical artifacts."

The books represent a huge trove of data. On a typical day at sea, the captain or whoever else was in charge of a log would write down the ship's position on its journey — the latitude and longitude — and the weather conditions in the morning. They would then make observations twice more, describing wind speed and direction, precipitation, sea state and cloud cover.

So far, the team has gotten through about 50 logbooks, which adds up to some 13,000 days at sea and about 40,000 entries.

They were slowed by the pandemic, which delayed their trips to read the books in person, but the endeavor is set to ramp up with the help of a $450,000 grant from insurance company FM Global that will be used to pay a half-dozen researchers over the next three years.

"We're building this mosaic of data that allows for some fairly sophisticated modeling," Walker said.

**Words to describe the wind**

The climate modeling is being done by Ummenhofer. And it's far from straightforward.

It's not just because there's so much information. It's also because it has to be interpreted.

While observations of sea ice can be comparatively straightforward — essentially where and when it was encountered — descriptions of the wind are more nuanced. Sailors didn't have the tools to garner precise measurements, so they used adjectives for the wind — strong, stiff, fresh, moderate, light — and nouns, such as breeze or gale.

The words are inexact, but they're not entirely subjective. Sailors shared a common language learned in their years at sea.

"The captains were working in a very tight industry," Walker said. "They often knew one another and they were trained and brought up to the sea in much the same way. They're using very standardized language to describe the weather. And they're doing it because the logbook has to mean something to other people."

By the mid-19th century, the Beaufort Scale, a standardized system to describe wind conditions, had been developed, but many of the logbooks Ummenhofer and Walker are using predate its wide adoption. So they've had to match the whalers' language to points on the scale, which in turn correspond to knots or meters per second, which can then be entered into their database.

To cross-check their findings, they've been looking at whaling trips along busy trade routes across the north Atlantic frequented by merchant vessels. So far, the data compiled by Ummenhofer and Walker correspond to what those other ships found.

And that means they can concentrate on their real interest in the far reaches of the oceans, where no other ships collected information. They have only started analyzing that data. It's too soon to draw any conclusions, but the prospects are promising, says Ummenhofer.

**Thousands of logbooks to read**

On a recent afternoon in a reading room inside the Providence Public Library, Ummenhofer and Walker were seated at a table with a couple of logbooks on stands in front of them.

Walker carefully paged through the Isaac Howland's book, which appeared to be in remarkably good condition.

The entry for July 15, 1836, is eye-catching, with stamped figures representing the killing of three sperm whales that rendered 60 barrels of oil. But most days were filled with observations of the weather, interspersed with colorful drawings of whales, boats and sightings of land.

Over the course of a two- or three-year voyage, a ship would kill maybe 20 whales and take about two days to strip each body of blubber and boil it down to oil. There were bursts of intense activity and long periods of tedium. The keepers of the logbooks had time to fill. Some wrote narratives. Others doodled in the margins.

Walker opened another book to a drawing of a dolphin with a speech bubble above its head. "At your service," it says.

"The thing about these logbooks is that every single one of them is different," Walker said.

"Some of them are funny, some are laconic, some are all business. They can be quirky, depending on who was writing them."

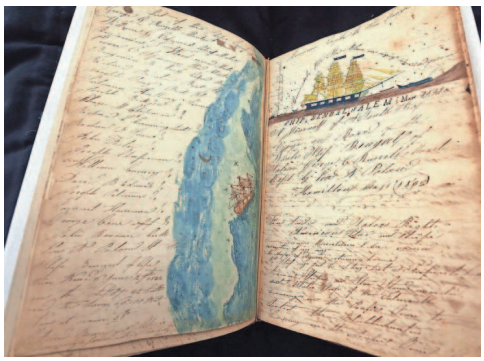
Which could make them all the more difficult to get consistent data from. Nevertheless, the goal is to comb through all the books that the team can get its hands on, an estimated 4,000 in total.

"I'm planning on doing this for the next 10 years at least," Walker laughed.

He and Ummenhofer are adamant that the books are more than mere curiosities. Once unlocked, the information inside them can have real-world implications.

They may tell us when past monsoons occurred in India and if their timing has changed. Or they could provide details on droughts in Africa or Australia.

"To understand anything about rainfall or water resources — where water is or the lack thereof — you really need to look to the oceans," Ummenhofer said. "That's where the water comes from and that's where the answer lies."



**An entry in the logbook from the whaling ship Bengal, out of Salem, Massachusetts.**