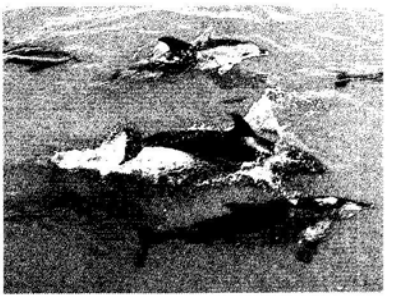
Bar Coding with a Porpoise

The U.S. Fisheries Services launches a Marine Mammal Investigation with bar code at the helm.

Ruth Bauman



Even seasoned practitioners of automated data collection might be surprised to learn that the National Marine Fisheries Service is counting harbor porpoises in the North Atlantic by means of bar code. The Fisheries Service, an arm of the U.S. Department of Commerce's National Oceanic & Atmospheric Administration, needs an accurate census of marine mammals in order to answer the following important question: Do the accidental killings caused by commercial fishing threaten the survival of these remarkable animals?

Thousands of harbor porpoises and other marine mammals get entangled in fishing gear and drown each year in the rich fishing beds off Cape Cod and Maine. It is not known, however, if these accidental deaths inflict long-term damage to the population and disturb the ocean's natural balance.

The Fisheries Service has the responsibility of managing the ocean's fisheries, maintaining the stock of fish, and seeing that fish are harvested responsibly, according to Nan Garrett Logan, computer specialist with the Marine Mammal Investigation. "To take steps to protect marine mammals, we needed a better knowledge of their numbers and habits," she says. How many and what types of marine mammals live in the waters of the North Atlantic? Where do they spend their time? Where are their nurseries? Are they breeding successfully? What is their natural mortality rate? Is fishing activity detrimental enough to the marine mammal population to warrant changes in fishing gear, season, or location of the fleet? And finally, what is the best way to maintain the health of the marine mammal population while ensuring the viability of the fishing industry?

To study these questions, the Fisheries Service launched the Marine Mammal Investigation from Cape Cod, Massachusetts, in 1987. Every year, scientists sail on summer research cruises in the Bay of Fundy, and late winter cruises in the North Atlantic's Gulf Stream to sight and count marine mammals. While maintaining a record of sightings of harbor porpoises; finback, humpback, and minke whales; and other species, the researchers also collect some basic descriptions of their behavior.

Harbor porpoises are migratory animals that spend the summer and early fall in the Bay of Fundy/Gulf of Maine area. Biologists are particularly worried about harbor porpoises because they share the habitat and feed on the same food supply as the table fish of the North Atlantic. The population, which numbers about 45,000, winters in the waters between Cape Cod and North Carolina. Scientists estimate that as much as 5 percent of the population is lost each year as a result of commercial fishing activity.

Keeping an accurate count of the animals is a key to any action to protect them. Until this year, the method used to keep track of whale and porpoise sightings was manual—observers with pencils and paper forms would sit out on the ship's crow's nest and make checks on a list whenever they saw a marine mammal, noting the circumstances of the sighting, and the animal's behavior. It was difficult to improve on this old-fashioned, low-tech method.

"There's nothing more efficient than a clipboard and a pencil," Ms. Logan points out. And, indeed, paper and pencil data sheets are undeniably inexpensive, compact, and simple to use. Where improvements were clearly needed, however, was in the step between data

collection and data analysis. To transfer the data into a computer-usable format, a data entry person had to type in numerical codes by hand from paper records. This was a laborious and nonproductive task, and often meant delays in getting the information from the boat to the laboratory. In addition, there were inevitable errors made in transcribing the data—errors that could undermine the integrity of the mammal studies.

Wanding in the Whales

That's where automated data collection came in. Before this project began, Ms. Logan's experience with bar code technology was pretty much limited to watching groceries get scanned at the supermarket checkout. But when she looked into automated data collection, she found that other scientists, including fish and wildlife biologists, had applied bar code technology to observations of animal behavior. Happily, the Fisheries Service found that a local company, Barcode Data Systems, was an expert in automated data collection and a regional dealer in bar code equipment.

The data collection method had to meet strict specifications for size, price, and convenience. Radio frequency communication was rejected because of possible interference from shipboard electronics. Computerized graphics tablets were too expensive and too demanding of the user's attention to the screen. Ms. Logan envisioned a method that would be almost effortless. "Entering data should be so easy that the observers can do it without really taking their eyes off the water." And because the observers are jammed into cramped spaces open to the weather and 50 feet up in the air, it was critical that the technology be compact and extremely durable. "Bar code seemed like the technology that was most adaptable to our environment," Ms. Logan concluded.

The Fisheries Service chose data collection devices from LINX Data Terminals, Inc. LINX data terminals are built on true multitasking computers, which means they support simultaneous input from multiple bar code readers. They also eliminate the need for a dedicated network host, which makes for a simple wiring scheme, according to Chris Kapsambelis, president of Barcode Data Systems, the systems integrator. "We wanted to run the least amount of cable through the ship," he explains. Because of the built-in intelligence of the LINX III scanning station, users validate each sighting as it happens; they can interact with the data in real time. LINX terminals are also ruggedized. They can withstand the sodden conditions and freezing temperatures of the North Atlantic in March.

Shakedown Cruise

The first test of bar code data collection came in July 1992 when the research vessel *Able J* was outfitted with a LINX III and two LINX I terminals, which were configured into a network. Two observer positions were built into the bow of the ship, high up in the crow's nests, able to accommodate three observers each.

Ten scientists, under the direction of Chief Scientist Debra Palka, sailed for 40 days, covering the entire Gulf of Maine between July and August of 1992. They collected information by hand the conventional way, and, at the same time, took swipes at the bar coded menu to record sighting information. The menu of data items listed the same information recorded on the pencil-and-paper data sheets. Scientists noted the familiar antics of porpoises—behaviors such as wave riding, surfing, diving, and just hanging out, or milling. While on the cruise, users helped design improvements to the menu—for example, they suggested rearranging and color coding the scanning area and making the scanning targets larger.

The job of observing, by the way, is not most peoples' idea of relaxation: observers endure 12-hour shifts with brief breaks in a confined space, sometimes wearing full foul-weather gear. The animals seldom come out of the water, so the job requires a special ability to concentrate and overcome boredom. Moreover, it takes a lot of experience to assign animals to a species from a mere fleeting glance. These trained observers must discern subtle characteristics and movements in the water.

After the sightings are scanned in at the data terminals, they are uploaded (via the network) to a DOS-based personal computer, which stores the data. This link to standard PC computing enables users to run the preliminary data through familiar statistical programs and print out hard copy reports while still at sea.

During last summer's pilot project, the ship's bearing, distance, and location had to be entered and logged by hand. But when the *Able J* goes back to sea this summer, the data collection system will be interfaced with the shipboard inertial navigation system, so that navigational details will be automatically correlated with the sighting information. By passing formatted files between the data collection terminals and the ship's navigation system, the position of each mammal sighting can be fixed on a chart within inches.

The software for this application took about six weeks to develop, according to Ms. Logan. The software code was written using a library of software routines that are supplied with the LINX systems. Equipment and software cost was under $4000, not including the PC, which the Fisheries Service already owned.

The next test of the system will come when the summer 1993 cruise of the *Able J* is over and the crew gets off the ship with verified information available immediately in an electronic format suitable for analysis back at the lab. "Instead of wasting time getting observations from paper into the computer, we'll go directly from the scanning system into the computer," says Ms. Palka. The future of a priceless ocean resource depends very directly on having these complete records of the sightings of the marine mammal population. □

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APPLICATION PROFILE

Company Name:
Marine Mammal Research Investigation
National Marine Fisheries Service
Woods Hole, Massachusetts

Business: Government agency responsible for protecting ocean's resources, including fish and marine mammals.

Hardware/Software: LINX III and LINX I data terminals with RS-422 communication ports, networked Dauphin 386-DOS-based PC

Primary Application: Collecting research data

Primary Benefit: Research data available immediately in electronic format suitable for uploading to computers, increased accuracy

Resources:
Barcode Data Systems
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