

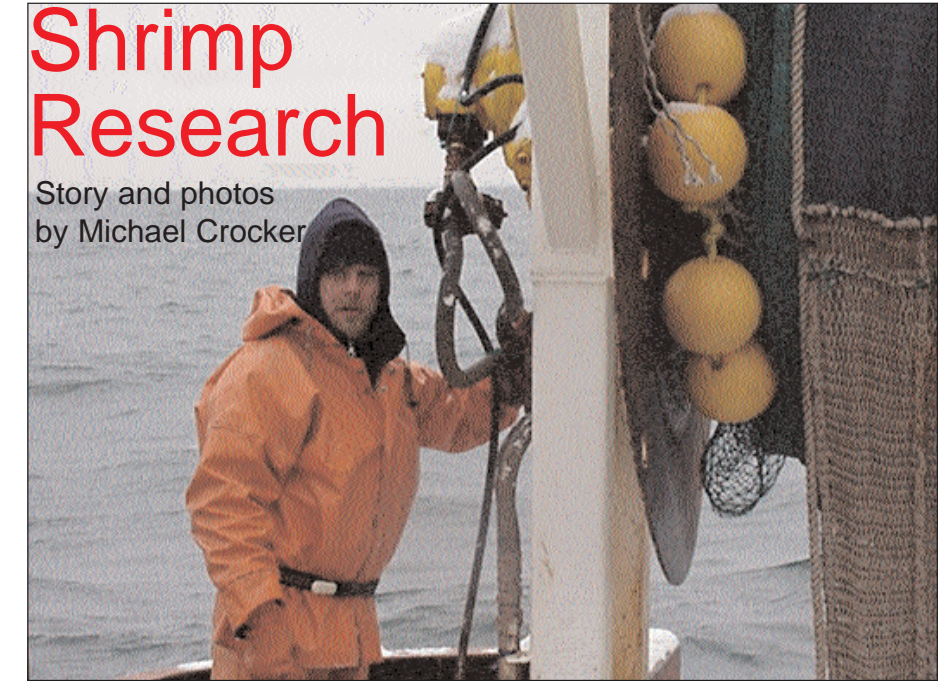
# Collaborations

A monthly report on collaborative research projects in the northwest Atlantic Ocean.

When Captain Craig Pendleton and I met Drew Gowen, a research biologist with Maine's Department of Marine Resources (DMR), on Berlin Mills Wharf in Portland at 4:37 a.m. on January 10th, the temperature was 12-degrees. We walked past three draggers tied to the pier—their tell-tale outriggers cast silhouettes against the swirling snow and pitch sky—before climbing onboard the *Susan & Caitlyn*, Craig's fishing vessel named after his wife and daughter. Her decks were covered with four or five inches of powder from the storm that had started just a few hours before. Drew slid the plywood door to the wheelhouse open, stepped inside, and climbed into a bunk to catch some sleep. Craig handed me a plastic shovel and told me to clean off the decks. I was the new guy.

I finished cleaning the snow off the bow and decks and in between the coils of rope and net at 5:10 a.m., still two hours before sunrise, and my hands and feet were numb. When I stepped inside the wheelhouse, Craig was looking at an electronic chart on the ship's navigation computer. "The trick is to keep moving," he said, sensing my discomfort. "Once your body gets cold, it's really hard to warm up again." Too late, I thought. Craig poured me a cup of coffee from a tall stainless-steel-Thermos. Drew was sleeping and the guy who was to be deck-hand plows driveways in Saco when it snows; he wasn't coming. So Craig called Mike Stinchfield, the Captain he hires to run his boat, to ask him if he knew a fisherman who could go out. At 6 a.m., Mike showed up with Rob Jewers, a salty looking fellow who lives on a lobster boat in Portland Harbor. Jewers spent the past few years fishing for crab and halibut out of Kodiak, Alaska. I had a feeling he would make a better crewmember than I.

We had come in search of Northern shrimp (*Pandalus borealis*), the most commercially valuable of Maine's 30-some-odd species of shrimp. It was five



## Shrimp Research

Story and photos by Michael Crocker

Rob Jewers, a fisherman, stands by to release a shrimp net off the F/V Susan & Caitlyn.

days before the start of Maine's shrimp-season, but we wouldn't keep any of our catch this day; it was a research voyage. Mike had taken Craig's boat out several times, with a biologist from Maine DMR, to determine where the shrimp were and what the conditions were like there. Four other captains from Maine—Kelo Pinkham, Vincent Balzano, Dale Page, and Stan Coffin—have also been participating in the research trips, which have gone out at least twice a week since December.

Craig hadn't been behind the wheel of his dragger in almost a year-and-a-half. His other job, as coordinating director of the Northwest Atlantic Marine Alliance, has had him swamped. Nevertheless, he eased his 54-foot dragger out of its approximately 55-foot berth without so much as a bump. Then, he turned us around and pushed up the throttle. Soon we were steaming southeast at eight knots.

The Northern shrimp is a "pan-sub-artic species," which means it inhabits

the cold waters of the Atlantic and Pacific Oceans, south of the polar icecap. In the Atlantic, these crustaceans are abundant near Norway, Iceland, and Maritime Canada. The Gulf of Maine represents the

(Continued on page 4)

**INSIDE**

The Gulf of Maine Aquarium and a partnership of scientists and fishermen are set to begin the most extensive cod tagging program in history.

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## A MESSAGE FROM THE NEW EDITOR:



the new Collaborations editor

You may have noticed a style change in **Collaborations** this month. Craig and I thought that my arrival brought with it an opportunity to experiment a little with both the writing and design of the publication. Rest assured, our commitment to in-depth reporting on collaborative research projects in the northwest Atlantic, with a special concern for the fisherman's perspective, remains. I hope my article on shrimp research in mid-coast-Maine reflects this mission.

I had only been in Saco a couple of weeks before Craig fitted me for oilskins and a survival suit in January. The morning of the

, we left the NAMA parking lot in a snowstorm at 3:45 a.m., and didn't return until 9:00 p.m. that night. To be sure, it was a long and cold day. Of course, life's toughest lessons are often the ones hardest learned. But in addition to discovering much about the Northern shrimp's behavior and life history, I also came away with something I believe to be more valuable: first-hand knowledge of how difficult it is to be a commercial fisherman in New England. I've run several marathons in my life and, after 26.2 long-miles, I was able to go home and rest, usually for months before my next race.

Day after day, fishermen endure grueling conditions at sea, but often when they return to the docks, their marathon has just begun. They face a waterfall of government regulations, low prices, consolidation, and a mis-informed public. Tired, too often for fishermen there is no rest. I pledge that this knowledge will help me guide whatever I do at NAMA.

Rather than bore you with the biographical details of my life, as is often done with these types of things, those interested can visit NAMA's newly re-designed website at [www.namanet.org](http://www.namanet.org). Beazie Chase, NAMA's development director, worked very hard to get the site up and running and, I'm sure you'll agree, it works great. Please feel free to contact me with any comments, criticisms, or suggestions about **Collaborations** or, better yet, stop by NAMA's new resource center at our Saco office to say hello. I feel honored to have been given the writing opportunity to join NAMA; I promise to give it my greatest effort.

od fishing,

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were shrimp around, now Drew wanted to take a closer look at them.

He dumped the contents of one of the baskets into a plastic fish-box with "DMR-Shrimp Research" written in black marker on the side, and placed it on the stainless-steel hatch that covers the vessel's fish-hold. Wearing our orange oilskin jackets and pants, and with rubber gloves on our hands, Rob and I began helping Drew sort through the pile.

Northern shrimp are hermaphrodites, those peculiar creatures that spend part of their lives as males, go through a transition stage, and become females. The overwhelming majority of these shrimp were females loaded with dark clumps of eggs. In the Gulf of Maine, shrimp spend the first part of their lives as males near the muddy bottoms along the coast. They typically transform into sexually-functioning females at about two-and-a-half-years and then head offshore. They return approximately a year-and-a-half later, in January or February, to "drop" their eggs. Interestingly enough, the eggs don't actually "drop," as is implied, so much as they hatch. Which is to say, the microscopic shrimp embryos sliver out of the eggs and join the billions of other planktonic creatures in Maine's rich coastal stew. Experience tells fishermen and scientists that the ladies like to hatch their eggs in the shallower waters of the coast. Our 250-pound tow at 45-fathoms seemed to confirm this anecdotal knowledge.

Drew was very interested in discovering how big the females were. He slid a small and a big female side-by-side to explain why: "The size of the shrimp gives us some idea of its age. We'd like to know at what age the shrimp are becoming females. If the shrimp are becoming females too soon, it could indicate some kind of stress on the species; and small shrimp don't get a very good price at the market."

The hard outer shell of the full-grown Northern shrimp is an elegant pink color. The crustacean has dark eyes that look like small beads on either side of its face. Long antennae, which help it to feel around the murky ocean floor, protrude from underneath its pointy face and curve backwards over the carapace, a hard-shell covering its face and abdomen. It has jointed legs and appendages on the tail of the shrimp, known as pleopods, act like

paddles and give the shrimp agility and speed with just a quick flex of its back end. A shrimp is measured like a lobster, from its eye-socket to the back of its carapace. The big girl was about 28 millimeters and the little one, half that. The former was probably four-years-old and the latter two-and-a-half.

Drew thought that about 25 percent of the eggs on these shrimp had already hatched. Our fingertips soon became smeared with egg residue. The Nordmore grate seemed to do a remarkable job weeding out the other kinds of fish. About 98 percent of the first tow was shrimp. A few small whiting, hake, and herring were mixed in, along with a couple other species of shrimp, but Drew noted that it "was a great tow as far as bycatch goes; that grate really does its job."

After all the catch was weighed and recorded, Drew dumped the shrimp overboard. Most, if not all, died. I would have been shocked at the waste, if I hadn't seen it coming. Currently, NOAA Fisheries does not allow any of the fish caught on research trips, out of season, to be kept. Craig suggested to officials that instead of letting hundreds of pounds of shrimp simply go to waste that they be sold, with 100 percent of the money going right back into the research project. No deal.

It took almost 45-minutes to sort through the catch. After, Drew attached what is called a CTD or "hydrograph" to the end of the portside cable. The CTD is a white torpedo-shaped device about 24-inches long. It is protected by a stainless-steel frame and contains sensitive instruments that record temperature, salinity, depth, and conductivity on its way to the bottom. The information is stored inside and can be downloaded onto a computer in a DMR laboratory. Rob lowered the contraption and, after it touched bottom, reeled it back in.

We visited four more locations after the first, each in deeper water, up to 100-fathoms; none snagged as big a catch as the first. On the

return trip, Craig stopped several times to record more hydrographic information. Scientists hope to find a pattern that correlates water temperature (and other environmental factors) with the location and abundance of shrimp. If, for example, they find that females are following a particular temperature gradient inshore, managers would know ahead of time when they could open the season, and provide fishermen with a level of certainty that is so often missing from their profession.

"The research is exciting, finally we are trying to couple migratory behavior with environmental conditions. It may help us with short-term management to protect eggs, allowing us to safely open the season earlier, and to help get fishermen the best possible price for their catch," said Dan.

Perhaps we should think of these research trips as snapshots. Scientific understanding is the moving film made out of a series of stills. Each still on its own is incomplete. But, put them together, and our knowledge of marine life in the northwest Atlantic sharpens into focus.



The CTD or "Hydrograph".



A graceful gannet circles the stern of the Susan & Caitlyn, as the sun sets on the northwest Atlantic.

## Cod Tagging (continued)

major recommendations was that institution, like the GMA, be used as a clearinghouse to collect and share it with fishermen and the public.

To that end, workers at the GMA are in the process of creating a website where visitors can check the program's progress. And, on the site, fishermen will be able to enter the serial number found on each tag and trace the fish's history, from where it was tagged to where it was re-captured.

Furthermore, the tagging project

will integrate the considerable amount of data already gathered from previous and ongoing cod research efforts.

"One of the most positive aspects of cooperative research is that it gives fishermen ownership of the science that is used to make management decisions. Our hope is that the program will create a better idea of how well cod have recovered, and help bolster stock assessments," said Meredith.

Paul Parker, executive director of the Cape Cod Commercial Hook Fishermen's Association (CCCHFA), which will be participating in cod tagging for the first time, believes the benefits of the program go even beyond scientific understanding: "This program is also a wonderful opportunity to develop lines of communication between fishermen and MFS [NOAA Fisheries]. Building sustainable fisheries will largely depend on how well fishermen and the federal government cooperate on projects like this; it is a healthy endeavor for the future of cod."

Parker's organization, a non-profit based in Chatham, Massachusetts, which is mainly comprised of fishermen, works to build sustainable fisheries. They have already recruited and trained crews on some 20 vessels to survey the waters off southeastern Cape Cod, Nantucket Shoals, the Great South Channel, and Georges Ledge, areas that represent cod habitat not widely studied in the past.

Accurate information about cod is critical to the health of the species and to livelihoods of fishermen because the government typically manages populations of fish or "stocks" in reference to a species and a region. The effectiveness of management depends largely on how well these divisions reflect the reality of fish's lives and behavior. In the case of cod, for example, evidence has suggested (Wise 1963) that cod in the Gulf of Maine differ in size, growth rate, range, and migration patterns (among other characteristics) than those cod on the adjacent Georges Bank. If managers are not aware of these differences, fishermen may be instructed to take too many fish from one region and less than the population could support in another.

Currently, the program has received funding for one year. Meredith is confident that the federal government will make more funds available for a second year. As soon as the



Shelly Tallack of the Gulf of Maine Aquarium.

GMA distributes tags to fishermen (sometime in March) the tagging will begin. In the meantime, Parker thinks an important aspect of the program has already begun. "For too long, the public has failed to see that many fishermen are very concerned about the health of fisheries and that they work hard to protect them. Programs like this one show how fishermen, from all over the region, are helping to protect cod for future generations."

## Reporting a tagged-fish

If you catch a tagged-cod, reporting the following information will help to better manage the resource and sustain it for future harvesting:

1. The tag number.
2. The time and date of re-capture.
3. The position of re-capture (latitude/longitude or Loran)
4. Depth of water at place of re-capture
5. If possible, the water temperature at re-capture and the length and weight of the fish.

Fishermen can call: **1-866-447-2111** to report a tag. The number is toll-free in the US and Canada, and is found on each tag.

Also, tagging information can be reported by email ([codresearch@gma.org](mailto:codresearch@gma.org)) or it can be reported using the cod tagging website ([www.codresearch.org](http://www.codresearch.org)). All fishermen with a federal multi-species license will be provided with pre-paid, self-addressed envelopes to submit tags and data.

**Note: sub-legal size cod must be released after the tag is removed.**

### Participating partners:

*The Gulf of Maine Aquarium*  
*Department of Fisheries and Ocean-Canada*  
*Island Institute*  
*Cape Cod Commercial Hook Fishermen's Association*  
*Manomet Center for Conservation Sciences*  
*School of Marine Science and Technology (UMASS)*  
*NOAA Fisheries*

# Cod Tagging Project To Begin in March

*Fishermen and scientists team-up for the largest cod tagging effort in history.*

By Michael Crocker

In March, fishermen from Nantucket to Nova Scotia and a partnership of scientists working with the Gulf of Maine Aquarium (GMA) in Portland will embark on the most ambitious cod tagging program in history, in an effort to learn more about one of the region's most important fish.

Since the National Marine Fisheries Service (NOAA Fisheries) selected the GMA to coordinate the \$1.5 million program in October, its staff has been making the preparations necessary to distribute (and eventually recover) as many as 100,000 tags over two years. While the aquarium will oversee the program, seventy-five percent of the NOAA Fisheries' budget was allocated to the partnership of organizations in Maine, Massachusetts,

**"This is an outstanding opportunity to work with fishermen and scientists throughout the region on an important scientific question and a challenging data gathering effort."**

-Shelly Tallack, cod tagging program coordinator

and Canada, to help recruit and train dozens of fishermen to handle and tag fish before setting them free.

"The Gulf of Maine Aquarium is excited to be coordinating the cod-tagging program. This is an outstanding opportunity to work with fishermen and scientists throughout the region on an important scientific question and a challenging data gathering effort. We're pleased to be working with such a broad range of partners—from NMFS, SMAST, CCCHFA, Maine DMR, DFO Canada, Island Institute, and Manomet—and we look forward to the contribution this data can make toward cod management," said Shelly Tallack, the cod tagging program manager at the GMA.

The tagging process goes something



Photo by Bill Lee

like this: first, a fish is caught on a hook or in a net. Details about its size and the time and place of capture are recorded. Then, a small, uniquely numbered, tag is attached near the base of its dorsal fin before setting it free. If the fish is later caught and its tag returned—along with details about the time and place of re-capture—it contributes to a growing database of information about cod's behavior and life history. As incentive, tags returned, with the appropriate information, will be rewarded. Previous cod tagging studies recovered as much as 10 percent of the tags placed on fish.

Tagging has long been used to study fish of all kinds. But, with a species like Atlantic cod (*Gadus morhua*), whose annual migration covers thousands of square-miles, tagging is sometimes the only way to track their movement. Numerous tagging studies have been done on cod since the 1950s, but never before have so many fishermen played such a central role. By utilizing fishermen's vessels, and their unique knowledge of cod,

this project may provide the most comprehensive picture of the groundfish to date.

"The idea of teaming scientists with fishermen is not new. In fact, it goes back to biologists like Bigelow and Schroeder [the authors of *Fishes of the Gulf of Maine*, a definitive work on the region's marine biology]. Fishermen can provide scientists with a wealth of information about the resource. Previously, much of this information remained anecdotal, programs like this one, however, allow us to formalize the data and put it to use," said Dr. Earl Meredith of NOAA Fisheries' northeast office.

According to Meredith, the idea for the program can be traced back to Maggie Mooney-Seus (formerly of the New England Aquarium). In the fall of 2000, NOAA Fisheries hired her to organize a series of workshops, bringing fishermen, scientists, and resource managers from across the region together to discuss what an effective, large-scale tagging effort might look like. One of the workshops'

or fifteen minutes the net, with its two-inch, diamond-shaped holes, rode along the bottom, swallowing up clouds of *Pandalus borealis*, and flushing her unsuspecting creatures back into the sea. “Haul back,” Craig yelled. And, with the flip of two levers, the winches began pulling our bounty back

hern most extreme of its range. For over thirty years, the National Marine Fisheries Service (NOAA Fisheries), and biologists from Maine, New Hampshire, and Massachusetts have estimated the size of the Gulf of Maine shrimp stock, and thus the amount of shrimp they would be harvested, based on information collected each summer. However, in recent years, there’s been a discrepancy between catch predicted in the summer and the actual tonnage of shrimp landed the following season. Many think this is because the amount of shrimp landed is not only related to the size of the stock, but also environmental factors—most notably temperature—that drive the larger female shrimp to lay eggs in January and February to drop

Last year, Dan Schick, a senior biologist with Maine DMR, in cooperation with other scientists and fishermen from the region, devised the first research project to address the environmental factors at play in the shrimp fishery. What also makes this research innovative is the level of participation by fishermen. “A captain sitting at the wheel on his fishing boat on long trips has a lot of time to think about the place where he makes his livelihood. Consequently, fishermen are some of our best sources of information about marine biology. Take shrimp for example: for years fishermen have suggested that snowstorms drive big balls of shrimp inshore. The project gives us the opportunity to test this hypothesis; and quantify other information that fishermen have been talking about for a long

time,” said Dan.

The project’s designers chose to survey two undersea furrows off Maine’s middle and southeast coasts (the Portland and Pemaquid Trenches), because just like cold air moving over land, cold water sinks, tracing the bottoms of submerged valleys and canyons as it moves. The scientists and fishermen had a hunch that when cold Maine water crept inshore at the coming of winter, big female shrimp wouldn’t be far behind.

After one-and-a-half-hours of bumping over four-to-six-foot seas, I was a little queasy. You might be surprised: on a dragger, plowing through the Gulf of Maine during a snowstorm in January, it isn’t the motion that (primarily) makes one seasick;

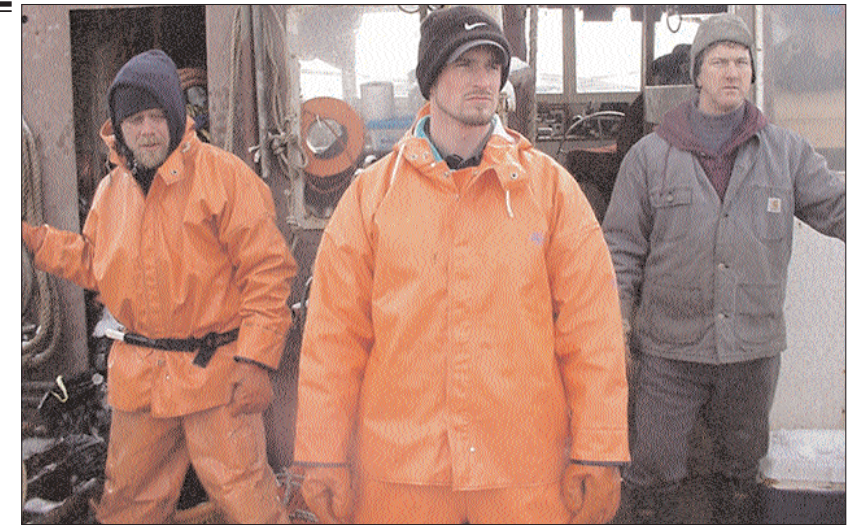
it’s the Diesel fumes. The smell was akin to driving behind an eighteen-wheeler in a convertible. Nevertheless, the shelter of the cramped wheelhouse, even with its aroma of a 380-horsepower engine and four grown men, was more appealing than the fresher, but below-freezing air on deck.

When Craig saw that we were getting close to our first tow-site (about 10-miles southeast of Portland), he looked over at the depth-sounder. At 45-fathoms, he told Rob and Drew to release the net. Drew has been on so many of these trips, he’s a pro at handling the hydraulic winches, found behind the wheelhouse on each side of the boat, which feed the net out with steel-wire cables. This was Rob’s first time shrimping, but he caught on quickly. I tried to stay out of the way.

Heavy iron doors attached to the cables pulled the thick polypropylene-net off a spool, suspended above the stern, like a giant ball of yarn. Pieces of cloth tied to the cables every 25-fathoms allow the crew to know how much wire has gone out. Drew operated the port winch while Rob worked the starboard winch. They called out lengths of cable, watching to make sure their side didn’t lurch ahead or fall behind the other. Friction heated the winches’ brakes, eventually forming steam, which quickly drifted away on a maritime breeze.

It only took a few minutes to feed out 100-fathoms of wire, at which point the winches were locked. I tried to visualize the 87-foot wide net sinking to the bottom: I knew that once the net’s 12-inch rollers settled on the ocean floor, and began wheeling around, the iron doors would open the front of the net, forming it into a 30-foot-by-30-foot circular scoop. At the base of the net, a plastic oval, called a Nordmore grate, would begin to filter out fish, like cod and whiting, and other species, we weren’t trying to catch. For fifteen minutes the net, with its two-inch, diamond-shaped holes, rode along the bottom, swallowing up clouds of *Pandalus borealis*, and flushing other unsuspecting creatures back into the sea. “Haul back,” Craig yelled. And, with the flip of two levers, the winches began pulling our bounty back in.

When the net finally broke the surface, a flock of gulls, which had been following us for sometime, helped themselves to some of the catch—plucking shrimp out of the two-inch holes, cocktail-style—with their little, yellow beaks. A large ball formed at the base of the net as it was raised above the stern. Drew grabbed an orange plastic basket and placed it under the dripping net. Craig grabbed hold of a line attached to the net and shook a knot loose, shrimp spilled out in big batches. It took three-and-a-half baskets to accommodate the entire catch. Each basket holds about 70-pounds of shrimp, which means we caught about 250-pounds in fifteen minutes. So we knew there



From the left: Fisherman Rob Jewers of Portland, Drew Gowen, DMR research biologist, from Newcastle, Maine, and Craig Pendleton. The Susan & Caitlyn frequently participates in collaborative research projects.



Rob and Drew at haulback, and then Drew prepares the catch for inspection.



*Pandalus borealis* or Northern shrimp, 98 percent with eggs.



Too many fishermen? Craig spys a dragger southeast of Portland, the only other fishing vessel seen on the 16-hour trip.