9 The Pinger Solution

9.1 Introduction

The evaluation of the collaborative development and implementation of porpoise avoidance devices by New England sink gillnetters, conservationists, scientists, and managers is one part of a set of case studies performed by the National Fisheries Conservation Center and intended to assist NMFS and industry in designing more effective cooperative data gathering efforts. As with the other case studies, we relied primarily on interviews and a review of the available written record (see Tables 9.1 and 9.2 and the Methods chapter (chapter 3) for more detail). This review focuses primarily on the activities of the Harbor Porpoise Working Group (Group), an ad hoc effort to assess the ability of pingers to deter harbor porpoises from sink gillnets in New England. It does not examine the subsequent activities of the Harbor Porpoise Take Reduction Team, which operated under the more formal prescriptions of the Marine Mammal Protection Act (MMPA).

Table 9.1. List of interviewees

Name	Title & Organization	NMFS	Fisher	Academic	Other
Laurie Allen	Northeast regional office	X			
Ted Ames	Past Executive Director, Maine Gillnetters' Association		X		
Eric Anderson	New Hampshire gillnetter		X		
Dr. Rollie Barnaby	New Hampshire Sea Grant			X	
Kevin Chu	Northeast regional office	X			
Michael Crowley	Correspondent, National Fisherman				X
Pat Fiorelli	Fishery Analyst and Public Affairs Officer, New England Fisheries Management Council				
Teri Frady	Head of research communications, NMFS, Woods Hole	X			
Scott Kraus	New England Aquarium			X	
Dr. Jon Lien	St. Johns University, Newfoundland			X	
Debra Palka	Research Fisheries Scientist, NMFS Northeast Regional Office	X			
Dr. Andy Read	Duke University; past chair TRT Scientific Review Group			X	
Sharon Young	Humane Society of the US				X
Dr. David Wiley	Senior scientist, International Wildlife Coalition				X

Table 9.2. List of additional sources. NMFS refers to the National Marine Fisheries Service.

Source	Description
NMFS	Summary of multispecies (groundfish) management plan, www.nefmc.org.
NFMS	Petition to list harbor porpoise under the Endangered Species Act.
NMFS	NMFS. 1993. Proposed listing of Gulf of Maine population of harbor porpoises as threatened under the Endangered Species Act. Federal Register 58: 3108-3120, January 07, 1993.
NFMS	NMFS. 1998. Feds and northeast gill netters to reduce harbor porpoise entanglement in gear. Press release, December 1, 1998. www.noaa.gov/public-affairs/pr98/dec98/noaa98-r169.html.
NMFS	G. T. Waring, D. L. Palka, K. Mullin, J. W. Hain, L. J. Hansen, and K. D. Bisack. 1997. Marine mammal stock assessments – 1996. Northeast Fisheries Science Center.
NMFS	G. T. Waring, D. L. Palka, P. J. Clapham, S. Swartz, M. C. Rossman, T. V. N. Cole, K. D. Bisack, and L. J. Hansen. 1999. U.S. Atlantic marine mammal stock assessments – 1998. Northeast Fisheries Science Center.

Source	Description
Publication	Anonymous. 1999. Harbor porpoise factsheet. www.imma.org/porpoise.html.
Publication	R. Barnaby. 1995. Harbor Porpoise Working Group: A solution to bycatch in the Gulf of Maine sink gill net fishery. Nor'easter, spring/summer 1995. Seagrant/gso.uri.edu/region/noreaster/noreasterSS95/bycatchrefs_barnaby.html.
Publication	R. Barnaby. 1997. Using collaborative problem solving: Process in fisheries management decisions. Presented at the annual meeting of the American Fisheries Society, Monterey, CA, August 1997.
Publication	T. Corey and E. Williams. 1995. Pinger Power. Nor'easter, spring/summer 1995. Seagrant.gso.uri.eduk/region/noreaster/noreasterSS95/Bycatch_SS95.html.
Publication	COSEWIC home page: www.cosewic.gc.ca.
Publication	M. Crowley. 1993. Do net pingers shoo away marine mammals? National Fisherman. May 1993, 42-43.
Publication	A. J. Read. 1994. Interactions between cetaceans and gillnet and trap fisheries in the northwest Atlantic. Rep. International Whaling Commission Special Issue 15: 133-147.
Publication	J. Fullilove. 1994. How to make a gillnet 'pinger.' National Fisherman. May 1994, 29.
Publication	S. D. Kraus, A. Read, E. Anderson, K. Baldwin, A. Solow, T. Sprawling, and J. Williamson. 1995. A filed test of the use of acoustic alarms to reduce incidental mortality of harbor porpoise in gillnets.
Publication	S. D. Kraus, A. Read, E. Anderson, K. Baldwin, A. Solow, T. Sprawling, and J. Williamson. 1997. Acoustic alarms reduce porpoise mortality. Nature 388: 535.
Publication	S. Pollack. 1994. A promising collaboration. pp. 57-59, in Win-Win Bycatch Solutions, ed. by B. Warren, National Fisheries Conservation Center and Journal Publications, Seattle.
Publication	D. Schneider. 1996. Can New England fishermen and harbor porpoises co-exist? Scientific American, online edition, September 1996. www.voyagepub.com/stories/0996mar7.htm.
Publication	B. Warren. 1994. Counting porpoises: high stakes guesswork in the Gulf of Maine. National Fisherman June 1994.

9.2 Background

In 1991, members of the New England commercial fishing, conservation, scientific, and fisheries management communities formed an ad hoc working group to discuss the entanglement and death of harbor porpoises in gill nets. This Harbor Porpoise Working Group continued meeting for about four years, disbanding once its studies were successfully completed and as the New England Fisheries Management Council began implementing time-area closures to protect harbor porpoise.

The factions involved in the Group were motivated by the threat of fisheries closures under the MMPA and fears about the implications of a potential listing under the Endangered Species Act (ESA). While it was not obvious what these implications might be, it was clear that, under the provisions of the ESA, "everything would have to be considered differently because it ups the ante." Thus, public opinion, the threat of potential pressure from the judiciary, and a collective desire to end the threat to the porpoise population prompted the activities of the Group. Its early meetings were characterized by confrontation, accusation, and heated argument, but the members eventually resolved themselves into a meaningful collaboration. Though not without continuing disagreement on some points, the Group met regularly and accomplished some notable achievements. Among these was the creation of a program to develop, test, and implement the use of an alarm device, colloquially called a pinger, that can be attached to gillnets to warn porpoises away. In 1998, pingers became an integral element of the federal fishery management plan for the gillnet fisheries from Cape Cod Bay to the Eastern Gulf of Maine. This development of pingers is widely regarded as among the most successful collaborations of its kind.

9.3 The setting

In the 1980s, scientists and conservationists grew increasingly concerned that the entanglement of porpoises in commercial sink gillnets from Cape Cod Bay to the Eastern Gulf of Maine might pose a serious threat to the continued survival of the species. The harbor porpoise *(Phocoena phocoena)* is among the world's smallest cetaceans, growing to an average length of 1.55 meters and weighing 55 kg., and generally inhabiting coastal waters in depths of less than 150 meters. They are migratory, moving from the Bay of Fundy to Cape Hatteras, and very susceptible to incidental harm and mortality from commercial fishing operations world wide. Because harbor porpoises are migratory, reliable populations assessments have proved elusive. However, improved survey and analysis methods used in 1991, 1992, and 1995 surveys produced an average estimated population size of 54,300 for the Gulf of Maine / Bay of Fundy population (Waring et al. 1997).

Most of the information that raised concerns about fishery impacts on the species, however, came not from population studies but from federal and state observation of entanglements in fishing gear. For the period 1990 – 1995, mortality and serious injury from such entanglements were estimated by NMFS to be about 1,833 per year (Waring et al. 1997), and, for the period 1992 – 1996, 1,460 (Waring et al. 1999). This level of bycatch mortality was above the estimated reproductive rate of the population. The 350 or so boats of the sink gillnet fleet, ranging in size from 35 - 50 feet, posed the greatest threat to the harbor porpoises in New England waters. The mammals pursue cod, haddock and pollock into the nearly-invisible nets, which can be up to 3,000 feet or more in length, and become entangled, suffocate, and die. Fishermen try to avoid them not only for conservation reasons, but because the porpoises often seriously damage their gear.

9.4 The story

The story begins as an ad hoc and collaborative effort in the early 1990s to devise a solution to porpoise entanglements through the Harbor Porpoise Working Group and ends years later in the more formal Take Reduction Team process set up by the Marine Mammal Protection Act. Although the circumstances in the two time periods differed, this case does allow for some comparisons between the two kinds of problem solving efforts.

9.4.1 Motivation for collaboration

In 1986, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) confirmed the harbor porpoise as threatened and designated it as endangered in 1990. By 1990, the United States was faced with considering similar designation under the Endangered Species Act (ESA). In February of 1991, the Sierra Club Legal Defense Fund filed a petition, on behalf of the International Wildlife Coalition in Falmouth, MA and several other groups, to list the harbor porpoise as threatened or endangered under the ESA, an action that triggered a formal status review by NMFS. In parallel, however, some conservationists involved in the listing petition also realized that so dramatic a threat to fishing fleets could potentially be unpopular and possibly politically disastrous in some quarters. More importantly, as Sharon Young describes it:

> I know that litigation can push things in unproductive directions … [and] … that people are more apt to do something if they understand why there is a problem and are more invested in the solution.

Therefore, Dave Wiley of the International Wildlife Coalition (one of the parties to the listing petition), Bob MacKinnon (President of the Massachusetts Gillnetters' Association), Sharon Young of the Humane Society, and Karen Steuer of the Center for Coastal Studies met at Dave Wiley's home in 1991 to discuss the possibilities of a collaborative solution to the porpoise bycatch problem. A major outcome of this meeting was their decision to convene a larger group to explore this option further (see next section for more detail).

By 1992, with the listing petition filed and national and New England environmental advocates threatening to pursue this aggressively, fishermen realized the issue would not disappear on its own. Conservationists had recently won significant victories involving dolphin mortality in offshore tuna seines and turtle mortality in Gulf of Mexico shrimp nets. The New England gillnetters therefore realized they possibly faced drastic closures of certain prime grounds when fishing was best but when porpoise were also most numerous. And NMFS, given its statutory responsibility for developing regulatory measures to respond to any ESA listing, began to consider its options for such measures. In 1993, Bill Fox, NMFS's current director, wrote the New England Fishery Management Council, asking them to consider porpoise bycatch as part of the multispecies (groundfish) fishery management plan. The council was at the time developing Amendment 5 to the fishery management plan, which would further regulate a range of gear types, including gillnetting. Fox believed it would be more sensible to develop any regulations needed to reduce porpoise bycatch in the context of the fishery management plan, rather than as a separate ESA activity. Thus, while there was still plenty of room for disagreement and debate about the population statistics and mortality rates, the harbor porpoise issue was clearly on the front burner for all factions.

9.4.2 The Harbor Porpoise Working Group

In 1991, members of the fishing fleet and their advocacy organizations first responded to these developing pressures by raising money and girding for battle. Later in 1991, however, gillnetter Bob MacKinnon and Dave Wiley of the International Wildlife Coalition, following on their earlier meeting at Wiley's home, organized a larger meeting at the New England Aquarium to explore solutions to the porpoise problem. They invited key people already involved in the harbor porpoise conflict. Many of these people had known and worked with each other, not always on the best of terms, in the past during other collisions between fishermen and conservationists over the increasingly stressed marine resources off New England. In addition, there were personal relationships, "Some of my best friends are current or former fishermen," (Sharon Young) and this strengthened the desire to try for a collaborative solution. This personal knowledge of each other is widely cited by participants as a primary ingredient in the eventual success of the pinger collaboration, as was the blend of representation across the spectrum of the various factions. This meeting at the New England Aquarium of what was to become the Harbor Porpoise Working Group included:

- Eric Anderson, a gillnetter and future member of the New England Fishery Management Council;
- Ted Ames, Executive Director of the Maine Gillnetters' Association;
- Dr. Rollie Barnaby, University of New Hampshire Sea Grant, a key motivator and facilitator in this process;
- Doug Beach, National Marine Fisheries Service, Protected Resources Division;
- Ellie Dorsey, Conservation Law Foundation;
- Pat Fiorelli, a staff member at the New England Fishery Management Council, who played a key role as a liaison between the ad hoc group and the council;

- Scott Kraus, New England Aquarium, former fisherman and later chief scientist on the NMFS/NFWF study of pinger effectiveness;
- Bob MacKinnon, fisherman, president of the Massachusetts Gillnetters Association and early promoter of the working group;
- Dr. Andy Read, Duke University scientist familiar with the Canadian porpoise listing
- Ronald Smolowitz, gear developer and fishing industry consultant;
- Karen Steuer, Center for Coastal Studies, Provincetown, MA, an independent research organization; and
- Dave Wiley, International Wildlife Coalition.

The evolution of the working group is best captured in the following comments by key participants.

Rollie Barnaby stated:

> We spent a year doing nothing but calling each other names and yelling. The only reason you go to meetings like this in the beginning is to call each other assholes. Why we kept going back I don't know, but we had all day meetings and we always went to lunch together. At the end of the year, we said, "What are we doing? Let's try to write a goal and figure out why we're meeting together." The goal was so simple: To reduce the take of porpoise with the least possible impact on fishermen.
>
> The next thing we learned was that there were some things we were never going to agree on. We were never going to agree on the population of those animals… So we said, "Let's stop arguing about that one." We got to the point where we could also say, "We're going to have to modify our fishing gear or we're talking about massive closures." That's why fishermen worked so hard in this process. During the entire existence of the working group, we never took a single vote. All our action was by consensus.

Pat Fiorelli remembers that:

> The work group grew from people having heated, polarized discussions to inviting scientists to speak and actually doing some real information gathering since nobody could even agree on the facts of the situation. Conservationists came (to meetings), fishermen came, council staff came. We only took action or wrote a letter to somebody when we had consensus. We eventually all agreed on pingers being a potential solution and wrote to (then NMFS director) Bill Fox.
>
> Part of the group's success probably came from informal social gatherings after hours. We went out together and got to know each other, and we dropped the guises people usually bring to formal meetings. We liked each other. Later, when this got into the formal council process, the coalitions broke down when people gave testimony, but the main work was done.

Scott Kraus added:

> Fishermen don't trust statistics, and there really were serious statistical problems with earlier population and mortality studies. Statistics have been the downfall of fishermen forever, and when they came to the group at first they just wanted to argue that they weren't killing as many porpoises as the environmentalists and NMFS said. I had to convince them that that wasn't good enough and they finally got it because the petition to list porpoises was looming.

> At the beginning of an effort like this, it is necessary to contribute your own time, gratis. I was compelled as a conservationist and former fisherman. The option of just shutting down the fisheries wasn't acceptable.

After agreeing to disagree on the statistics of porpoise population and entanglement, the working group turned its attention to finding ways to reduce porpoise entanglement and death regardless of the statistics. The group perceived pingers as a win-win solution because of the potential to reduce porpoise mortality without extreme restrictions on fishing effort. However, there was resistance to the concept of acoustical deterrence (pingers) within both NMFS and the environmental community for a variety of reasons, including the difficulties of enforcing deployment and ensuring that pingers were actually working once deployed. Members of the Working Group were aware of the animal behaviorist Dr. Jon Lien's (Memorial University, St. Johns, Newfoundland) successful work deterring large cetaceans from highly vulnerable cod traps. Rollie Barnaby contacted him for advice and, as Bamaby describes it, "Jon loaded his pickup truck with pingers and drove for two days, gratis."

9.4.3 Gear development: The pinger experiments

Between 1992 and 1995, three studies took place under the auspices of the Harbor Porpoise Working Group in attempts to determine pingers' effectiveness in deterring porpoise entanglement. The first was conducted by Jon Lien and four fishermen, with virtually no budget. The second was conducted by Lien and the third, which finally led to acceptance of pingers by NMFS and the conservation community, was financed by NMFS and the National Fish and Wildlife Foundation and conducted by Scott Kraus of the New England Aquarium and Andy Read of Duke University. Each study attempted to correct the perceived deficiencies of the previous study.

Study #1, Fall 1992, Jeffrey's Ledge, Gulf of Maine. This was essentially a preliminary experiment, conducted on a shoestring budget, and using Jon Lien's pingers, which were large and designed for whale avoidance on cod traps. Four fishermen volunteered their vessels for the study, which only a small number of sample sets. Many pingers were lost due to a flawed method for attaching them to the nets. There was much variation in where pingers were placed on the nets and the experiment was also criticized for the way in which the locations of experimental and control sets were chosen. Though subsequent studies validated pingers' effectiveness, critics at this early stage suggested that nets with pingers might simply have been set where there were no porpoises. Despite the lack of a rigorous study design, the results of this first study were encouraging to the Working Group, even if they were not completely scientifically defensible. Nine porpoise became entangled in unpingered nets; none in pingered nets.

Study #2. Fall, 1993, Jeffery's Ledge. In the second study, carried out a year later, four boats fished for an entire season with NMFS observers aboard. (NMFS paid the observer costs, a total of about $8,000.) For this study, fishermen built their own, smaller, pingers with Lien's help. They placed pingers on half their gear, sometimes using two pingers per string (one at each end) and sometimes just one. Of the nets with pingers on each end, 32 porpoises became entangled in unpingered nets and only one in pingered nets.

A disagreement arose at this point between NMFS and fishermen on the interpretation of the study's results. This centered around differing approaches to classifying nets as either pingered or control, based on the number and placement of pingers. While valid from a statistical point of view, this disagreement nevertheless frustrated fishermen, who argued they had entangled 41

porpoise in unpingered nets over two years, and only one in a pingered net, and still nobody seemed to believe them.

This rift irked fishermen, threatening the continued viability of the collaboration and the Harbor Porpoise Working Group. Key participants recall that the entire collaboration could have come apart at this point, but that Barnaby's leadership and the group's reservoir of good will saved the project. The group overcame this challenge with its decision to send a delegation of fishermen and conservationists together to Washington, D.C. to lobby for funds for a more scientifically valid study the next year. This presentation of a united front, fostered by the ad hoc relationships in the working group, produced results. Within months, NMFS had agreed to finance up to $250,000 in observer coverage for the next (1994) season, and the National Fish and Wildlife Foundation offered $250,000 for other study costs.

Study #3. Fall, 1994. The Working Group's goal was to mount a study that would resolve the design flaws of previous studies and produce data that would be scientifically and statistically defensible. Scott Kraus from the New England Aquarium agreed to be the principal investigator, and New Hampshire fishermen again agreed to participate. This time, Kraus used 15 boats instead of four, in a double-blind design, so fishermen would not know whether they were fishing pingered or unpingered gear, though they would attach a device to all nets. Pingers were water-activated, so the fishermen didn't know which were live or dummy when they set, though they could tell when they hauled back because the pingers were beeping. (They sound like the alarm of a school bus backing up.) This methodology assured immunity from the criticism of the earlier two experiments, that fishermen could skew the sample by simply setting pingered gear where they were sure there were no porpoises in the area.

Some fishermen resented the need for the double-blind methodology, expressing anger that NMFS just didn't trust them. Fishermen also objected to the NMFS recommendations for the size and placement of the nets. NMFS wanted the nets laid out in a grid, but fishermen objected because this was contrary to common practice, and they prevailed on this point. They did agree to use NMFS recommended groupings of 12 300-foot-long strings of gear. Fishermen agreed to these and other NMFS suggestions, Kraus said, because of the magnitude of the threat to their ability to continue fishing. Time and area closures sufficient to protect the dolphins would have devastated them. "It always helps to have the big sword hanging on the wall," Kraus said.

The results of this third study validated those of the shoe-string studies of the past two seasons: Unpingered nets caught 25 porpoises, pingered nets caught two.

Further studies. 1995 and 1996. Following the 1994 controlled study, four experimental fisheries were conducted to further investigate pingers' effectiveness. In these studies, all nets in a designated area used pingers, but only a portion of these were observed. In 1995, at Jeffreys Ledge, no porpoises were observed taken in 225 pingered nets. In 1996, at Jeffreys Ledge, nine porpoises were taken in 88 observed hauls. In Massachusetts Bay, two porpoises were taken in 171 observed hauls, and, just south of Cape Cod, no porpoises were taken in 53 observed hauls.

9.5 Outcomes

9.5.1 Regulatory time and area closures

During the period described above (1991 – 1994), the New England Fishery Management Council implemented a number of modifications to the Northeast Multispecies (groundfish)

Fishery Management Plan (FMP) that imposed restrictions on gillnetting to reduce the incidental take of harbor porpoise. These closures were executed against the backdrop of increasing pressure for large-scale reductions in fishing mortality to help rebuild depressed groundfish stocks in the region. Amendment 5 to the FMP was intended to reduce fishery mortality by about 50% through a similar reduction in fishing effort, accomplished by capping allowable days at sea, limiting access through a permit moratorium, and other measures. Despite growing concerns about groundfish stocks, however, large area closures were not widely considered at this time.

As a matter of policy, the Council tried, wherever possible, to overlap closure areas intended to reduce porpoise take with those intended to rebuild groundfish stocks. Despite consistent effort, however, the council was not successful at designing closures that simultaneously served both purposes, partly because there were very few closures during the early 1990's intended to reduce groundfish mortality. The closures specifically intended to reduce porpoise bycatch were enacted through the following measures:

- Framework 4, implemented May 25, 1994, which established the initial area closures to reduce the bycatch of harbor porpoise in the sink gillnet fishery.
- Framework 12, implemented October 30, 1995, which expanded the area and extended the time period of the Mid-Coast Closure Area to reduce the bycatch of harbor porpoise in the Gulf of Maine gillnet fishery.
- Framework 14, implemented March 5, 1996, which specified additional area closures.
- Framework 15, implemented September 11, 1996, which detailed additional area closures.
- Framework 16, implemented March 3, 1997, which severely restricted the use of small mesh pelagic gillnets, used as bait nets by lobstermen and tuna fishermen, in the harbor porpoise closure areas. Such nets could only be deployed when tied off to the boat and checked frequently.

During the period these closures were being implemented, pingers were still in a testing phase. The Council supported the use of pingers in certain closed areas under experimental fishing permits in order to assess their effectiveness (see preceding discussion of the three pinger studies). The Working Group' motivation remained the same – to develop methods that would reduce porpoise bycatch and thus stave off widespread time and area closures. However, NMFS's status review of the ESA listing petition was stalled and pressure from this quarter was of immediate significance.

9.5.2 MMPA reauthorization and the end of the Working Group

The reauthorization of the MMPA in 1994 included the establishment of Take Reduction Teams (TRTs) for several species, including harbor porpoises. By this time, the closures described above had had only limited success at reducing porpoise bycatch. This was because these initial closures had closed only relatively small areas. When fishing effort moved to areas just outside the closures, the resultant concentration of boats actually increased bycatch in some cases. Although the council had at first defined the minimum closures possible, every year saw the closures expanded and bycatch reduced. Thus, conservation advocates continued to push for further measures to reduce porpoise bycatch, a position that was strengthened by the MMPA's requirement that bycatch be reduced to a defined level (potential biological removal, or PBR). While the MMPA, under section 118, specifically recognized past efforts to reduce porpoise bycatch (i.e., closures and pinger development), Congress nevertheless set a deadline of April 1, 1997 for reducing mortality to the PBR level. This deadline represented an extension of almost one year beyond the original language in the MMPA, in recognition of the magnitude of the problem in New England.

With the completion of the third pinger study in late 1994, and the pending development of the TRT mandated by the reauthorized MMPA, the Working Group disbanded. Its primary goal of developing a workable porpoise deterrent had been met and many of its participants were soon to take their places on the more formally structured TRT for harbor porpoise. This group was larger, subject to bureaucratic constraints that did not apply to the Working Group, and under constant pressure to develop a Take Reduction Plan (TRP) that would meet the MMPA's statutory deadline of April 1997. As a result, according to several participants in both groups, the TRT was a much more contentious vehicle for collaboration than was the ad hoc working group. Although some participants (mostly fishermen) took issue with NMFS's population and bycatch estimates, the MMPA gave the TRT no authority for altering these.

With the arguments about population and bycatch estimates again off the table, the TRT continued the Working Group's pursuit of a solution that would protect both harbor porpoise and industry's ability to fish. It developed in 1996 a TRP based primarily on closures and the use of pingers. By using pingers, sink gillnetters can fish inside closed areas, unless the area also becomes part of a groundfish closure. In this case, all fishing activity on groundfish must cease. This TRP was a consensus plan, that is, all members of the TRT agreed to its provisions; not all TRTs resulted in consensus plans. Following a suit brought by the Humane Society, the International Wildlife Coalition, and the Center for Marine Conservation in 1998 against NMFS to implement the TRP, it was implemented on December 8, 1998. Shortly afterward, the New England Fishery Management Council approved Framework 28 of the Northeast Multispecies Fishery Management Plan to bring the Management Plan into agreement with the TRP. (Note that the regulations implementing the council's fishery management plan are in force only in federal waters. The MMPA's Take Reduction Plan, in contrast, extends to the shoreline, including state waters.) The Harbor Porpoise Working group thus ultimately met their goal of reducing porpoise entanglement with as little damage to the fishing fleet as possible. The suit mentioned earlier in this paragraph also asked NMFS to make a decision on the 1991 listing petition and NMFS decided in January 1999 not to list the harbor porpoise as threatened or endangered.

Of the approximately 350 boats active in the fishery in 1992, however, about 100 no longer gillnet, primarily those that fished the Eastern Gulf of Maine where closures in response to the collapse of groundfish stocks, along with an unwillingness to use pingers, led this portion of the fleet to abandon the fishery. In addition, the presence of a productive coastal lobster fishery provided a ready alternative for many Gulf of Maine gillnetters. Gillnetters in New Hampshire established a pinger co-op to purchase and maintain the devices. When a skipper heads for the grounds, he orders up the pingers he needs for the trip and picks them up on the dock. The Humane Society and the Center for Marine Conservation used their award of legal fees in the 1998 suit against NMFS to purchase pingers for gillnetters in New Hampshire, Maine, Massachusetts, and Rhode Island who requested them in response to a notice in National Fisherman Magazine.

Fishermen now say that the first generation of pingers could be vastly improved upon, but that they and NMFS are involved in much more critical resource issues and their priorities for activism and action lie elsewhere. Chief among these possible improvements is a change in the alarm frequency to one that would not attract pinnipeds, which treat the pingers as dinner bells. Unlike harbor porpoises, which avoid the pinger alarm, seals are attracted to pingered nets, where they eat fish caught in the nets, resulting in lost or damaged catches.

About 80,000 small cetaceans are caught in fishing nets every year and the success with harbor porpoises has helped to stimulate pinger experiments are going in many places throughout the

world. The results of the collaboration of the Harbor Porpoise Working Group, the Lien and Kraus and Read studies, and subsequent work by gear manufacturers to develop effective, inexpensive pingers are of immense value beyond the New England grounds.

Table 9.3. Timeline for the development of the pinger solution.

Date	Event
1986	COSEWIC confirms harbor porpoise threatened
1990	COSEWIC lists harbor porpoise as endangered
1991	Petition to list harbor porpoise under Endangered Species Act filed
1991	Start of Harbor Porpoise Working Group
1992	1st experiment
1993	Fox request to council to include solution in FMP
1993	2nd experiment
1994	3rd experiment
1994	Framework 4 closes areas to gillnetting to reduce the bycatch of harbor porpoise
1994	Amendment 5 closes areas to gillnetting
1995	Framework 12 expands time and area of Mid-Coast Closure to reduce the bycatch of harbor porpoise in the Gulf of Maine gillnet fishery
1996	Framework 14 establishes additional area closures to reduce bycatch of harbor porpoise in the Gulf of Maine gillnet fishery
1996	Framework 15
1997	Framework 16 prohibits the use of small mesh pelagic gillnets (bait nets) in the harbor porpoise closure areas
1995	Take Reduction Team established
1998	Take Reduction Plan implemented

9.6 Conclusions and lessons learned

Several conclusions are readily apparent from the story described above. We describe these and assess the degree to which these might be applicable in other situations.

9.6.1 Technical solutions can work

This case study provides clear evidence of the viability, in some instances, of technological solutions to bycatch problems. The pinger solution was based on related experience in a similar situation in Canada and some understanding of porpoise behavior. Although the original pinger design had to be modified to fit the different fishing gear in New England, the history of past success in deterring whales and the promising results from the initial trial in New England were enough to encourage continued development and testing. It proved important to make using pingers as easy and convenient as possible. Reducing their size, improving their reliability, and using a pinger coop to relieve individual fishers of responsibility for maintaining the equipment were all useful development. More fundamentally, it was fortunate that some members of the Group were familiar with Dr. Lien's work in Canada; without this the technology would never have been transferred to New England. A readily accessible clearinghouse of information on solutions to bycatch and related problems could be equally useful in other similar situations.

9.6.2 Pending regulation can motivate action

This case also provided a clear example of the power of pending closures or other restrictions and potential increases in administrative requirements in motivating industry to seriously consider

solutions to the porpoise bycatch problem. No one was sure what the results of an ESA listing would be; for example, other marine mammals such as the humpback whale had been listed without major impacts on fishing practices. However, industry members were certain that, at a minimum, the level of administrative aggravation would increase dramatically, as would uncertainty about the future of the fishery. Our contacts were unanimous in their judgment that the combination of apprehension about closures and anxiety about increased uncertainty were the key factors in persuading industry to seek an alternative solution to the bycatch problem.

9.6.3 The threat of legal action can motivate cooperation

Shortly following the filing of the petition to list the harbor porpoise under the ESA, key members of both industry and conservation groups realized the benefit of developing a parallel, less formal process to search for solutions to the bycatch problem. They recognized the downsides to the legalistic listing process, including a possibly lengthier route to a solution, more time and energy spent in administrative and legal procedures, ongoing damage to porpoise stocks, continued and increased uncertainty for industry, and delays in focusing on actual problem solving. The parallel, ad hoc process avoided these shortcomings without closing out participants' options to return to the more legalistic process if the Group's efforts failed.

9.6.4 Effective leadership was essential

Establishing the Group depended primarily on two things – the motivations mentioned above (fear and uncertainty), along with credible leaders who could commit at least a significant portion of their constituency to the ad hoc process. Leadership continued to be important throughout the Group's lifetime. Different leaders were important at different stages, depending on the primary issues facing the Group. Initially, Dave Wiley, Bob MacKinnon, and Karen Steuer were instrumental in selling the idea of a less formal process to a wider audience. As the Group began its work, John Lien provided the technical leadership needed to begin testing and adapting the pingers in the New England environment. At a later stage of development, Scott Kraus and Andy Read developed the more detailed study design needed to substantiate pinger performance and Tim Smith, of the Northeast Fisheries Science Center, helped make the Group's case to NMFS and the National Fish and Wildlife Foundation for funding to carry out the third and final study. The informal structure of the Group, and the trust developed throughout the first year of venting and relationship building, made it easier to shift the leadership role as needed. The question of how to first identify and then enlist and sustain the participation of such leaders cuts across all the case studies and is discussed in the Summary chapter.

9.6.5 Opportunities for venting can be useful

Interviews with key participants suggest that the early opportunity for Group members to vent their frustrations was an important part of the Group's ultimate success. Although it can appear counterproductive at the time, such venting is often necessary in contentious situations where tensions are high and people are feeling threatened and/or misunderstood. It is a chance to get everyone's issues out in the open, discover misperceptions and stereotypes, and identify elements that must be part of any workable solution. By all accounts, while at times uncomfortable, this process was managed well enough that it did not drive participants further apart. In analogous situations, ad hoc working groups should include members who are familiar with and can help manage this early stage of group development.

9.6.6 Find ways to motivate volunteer efforts

Volunteer efforts were essential to the success achieved in this case. The contributions of Lien and the industry members who carried out the early studies laid the groundwork needed to attract the funding for the final, more rigorous, study. These volunteer efforts were motivated by a desire to find a nonregulatory solution to the bycatch problem and the shared belief that pingers would be effective. Where sufficient funding is not immediately available, similar future efforts should ensure that their members include those who can volunteer needed time, skills, knowledge, and materials and/or recruit those who can.

9.6.7 Fishers and scientists view evidence differently

There was a clear tension between scientists' and fishers' different approaches to evaluating and interpreting evidence on pingers' effectiveness. This is a common theme in cooperative studies of this type. Scientists' desire for more rigorous studies, designed to produce statistically significant results, and their different rules of evidence, look like overkill to fishers. Conversely, fishers' willingness to depend on their personal observations and experience, and to base conclusions on smaller amounts of data, can look like wishful thinking to scientists. These differences can be an important source of frustration, especially when time is perceived to be short, because gathering additional data can defer resolution of the problem, delay implementation, and raise costs. In this case, despite their frustration, fishers finally accepted that a more rigorous study was simply a necessity for getting the decision-making system to accept their evidence as valid. Scott Kraus apparently played a key role in this process, both because he represented a more neutral institution (New England Aquarium) and was able to communicate readily with fishers. In other instances, some have suggested that a solution to the tension between fishers' and scientists' approach to evidence is to provide fishers' some sort of basic training in study design. Participants in the pinger case considered this unrealistic; they believe that such information must be directly connected to a pressing problem to be retained and applied. Otherwise, it is simply too far outside the limits of normal, day-to-day activities to be retained.

9.6.8 Strategic outside funding made the difference

Despite the Group's early progress, the outside funding from NMFS and NFWF was the element that finalized the Group's success by providing the resources to carry out the more formal, scientifically valid study (Study #3). It was important that both industry and conservation parties supported this request together. It was also helpful that members of the Group and people they were associated with were familiar with the funding system and helped develop the funding request. In some cases, industry groups are large and well funded enough to pay for such research on their own. For other smaller ones, such as the sink gillnet fishery, outside support can be essential to success. Such efforts should therefore ensure they have access to needed expertise in obtaining additional funding at the appropriate stage in the problem solving effort.

9.6.9 Summary

To summarize, the threat of impending regulatory closures and a common desire to avoid a lengthy and contentious legal process motivated industry and conservation representatives to create an informal, alternative problem-solving process. This process benefited from having a possible technological solution to focus on and from the presence of participants who were able to provide different kinds of leadership throughout the Group's various stages of development. While volunteer efforts were instrumental in gathering evidence for the viability of the pinger

solution, it was not until substantial outside funding was obtained that the Group was able to finally design and carry out the rigorous study that convinced scientists and managers of pingers' effectiveness. As a result, pingers have been recognized in regulations as a practical solution to the harbor porpoise bycatch problem.