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Conserving Sea Turtles in Canada: Successful Community-Based Collaboration Between Fishers and Scientists

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ABSTRACT. – **Although the range of the leatherback turtle (*Dermochelys coriacea*) includes waters off Atlantic Canada, information on the biology of the species in this area has been scarce. In 1998, to assess leatherback abundance and distribution, we turned to commercial fishers for assistance because they regularly observe these animals at sea. We developed a public information campaign shaped by the culture of the fishing community to generate interest in the biology and conservation of the leatherback. We drew on the traditional ecological knowledge and data gathering skills of fishers to collect information on the turtles. Our efforts to liaise with and integrate coastal community members in leatherback turtle research and conservation initiatives have resulted in 500 volunteers (the members of the Nova Scotia Leatherback Turtle Working Group), who document occurrences of turtles off Canada's east coast and provide a platform for at-sea field research. This model for collaborating with fishers offers promise for conservation of marine species in Canada and elsewhere.**

KEY WORDS. – **Reptilia; Testudines; Dermochelyidae; *Dermochelys coriacea*; sea turtle; community-based conservation; fishers; traditional ecological knowledge;** Canada

The leatherback turtle (*Dermochelys coriacea*) is globally classified as Critically Endangered by the IUCN (IUCN, 2004) and as Endangered by the Committee on the Status of Endangered Wildlife in Canada (James, 2001). The species has experienced a population decline of more than 60% since 1982, and the total number of nesting females is now estimated at less than 35,000 worldwide (Spotila et al., 1996). Except for infrequent reports of single or small numbers of leatherbacks recorded off the Atlantic provinces (e.g., Miller, 1968; Steele, 1972; Threlfall, 1978) and the report of 20 leatherbacks entrapped in Newfoundland inshore fishing gear between 1976 and 1985 (Goff and Lien, 1988), scientists paid little attention to marine turtles in eastern Canada despite Bleakney's (1965) pioneering analysis of marine turtle records from eastern Canada and New England. Bleakney (1965) dismissed the traditional interpretation of marine turtles as accidental visitors to Canadian waters, and argued instead that marine turtles—leatherbacks in particular—regularly enter temperate waters off Nova Scotia and Newfoundland. In 1995, a record number of leatherbacks stranded on the coast of Nova Scotia, prompting us to investigate Bleakney's hypothesis by attempting to assess the relative numbers and distribution of leatherback turtles in Atlantic Canada.

The behavior of leatherback turtles makes them difficult to study beyond the nesting beach. Atlantic leatherbacks hatch on beaches in Florida, the West Indies, South and Central America, and on the West Coast of Africa (Spotila, 1996). They then spend their entire lives at sea, the females returning to land only to nest. Leatherbacks are massive reptiles, growing up to two meters in length with an average body mass of just less than 500 kg (Zug and Parham, 1996). In addition, they have the most extensive geographic range of any reptile, with movements that span entire ocean basins (Eckert, 1998; Ferraroli et al., 2004; Hays et al., 2004). Canadian waters provide foraging habitat for leatherbacks (James and Herman, 2001), and turtles are distributed over a large area (James et al., 2005). To address the challenge of studying leatherback distribution in eastern Canada, and ultimately the challenge of conserving leatherbacks in Canadian waters, we turned to local commercial fishers for help. Here we describe the methods we used to enlist and maintain their help, and we evaluate the success of this approach.

METHODS

Why Fishers? — When we began our work in 1998, it was apparent that commercial fishers offered the best anecdotal and substantiated data (e.g., photographs and video) on leatherbacks in Canadian waters. In addition to the warm and encouraging response we had from the first members of the fishing community we spoke with, our confidence in approaching fishers was increased because Bleakney (1965) had obtained marine turtle information from members of this community, as had Goff and Lien (1988). We were also aware of an initiative called the Fisherman Scientists Research Society (FSRS) that was integrating Nova Scotia fishers in fisheries-related research (Zwanenburg et al., 2000).

Working with fishers offered us the chance to broaden the scope of our project from the start. Our immediate goal was to involve as many Nova Scotia fishers as possible in helping us obtain information about both the historical and contemporary presence of the leatherback in eastern Canadian waters by reporting sightings of these animals. We

knew, however, that no matter what the numbers and distribution of the turtle were, it was likely that interaction with fishing gear was a leading cause of leatherback mortality here (Goff and Lien, 1988). It seemed to us that the only way to effectively work toward conserving leatherback turtles under these circumstances was to make fishers part of the solution. Fishers are not only in a prime position to observe and record data on leatherbacks, but also to actively conserve the turtles at sea by practicing appropriate disentanglement techniques. Therefore, we wanted to enlist them as more than just data collectors. Our long-term goal was to create a relationship with the fishers that would result in sustained fisher-based monitoring and conservation of marine turtles in eastern Canadian waters.

Fishers as Volunteers. — A founding principle of our program was to enlist the help of fishers as volunteers. This posed some immediate problems, as many fishers in Atlantic Canada were accustomed to being paid to participate in scientific studies or to receiving monetary substitutes, such as opportunities to participate in test fisheries, for their cooperation (Lavigueur and Hammill, 1993; Zwanenburg et al., 2000). There were two main reasons we were intent on pursuing a volunteer-based program. First, paid programs are expensive and difficult to reliably sustain (Lavigueur and Hammill, 1993; Best, 1998; Zwanenburg et al., 2000). Second, and most important in our minds, paying fishers for information rarely fosters in them a genuine interest in the relevance of the information they are gathering. Conversations we had with fishers on the subject confirmed this. We based our work on the premise that genuine interest would support more vigilant data collection and ultimately a relationship between fishers and the turtles that would promote stewardship of the species at sea (Martin and James, in press).

Context. — Our approach to developing a network of fishers, which we established in 1998 as the Nova Scotia Leatherback Turtle Working Group (NSLTWG), was mitigated by the context within which we worked: the Nova Scotia fishing community. As others have also noted, understanding the cultural context is the most important part of developing a successful cooperative working relationship with people in rural coastal communities (Ferguson and Messier, 1997). We learned most about the Nova Scotia fishing community from conversations with the fishers themselves, making a point to compare the information we gathered as necessary with the perceptions of academics, government scientists and members of other local organizations, such as the FSRS.

While there are certainly pronounced differences between fishing communities in different areas of Nova Scotia, many of the issues that pertained to our work were the same throughout the province: the unpredictability of catch and annual income, and with the collapse of some fisheries, the growing sense of uncertainty about the future viability of fishing as a career choice. Many fishers fear having to look for employment in an alternative sector not only because they enjoy their work, but also because their education and training outside of the fishery is generally limited, and because other jobs would most likely require them to leave their communities.

Many fishers tend to be suspicious of science and scientists because they fear that studies—including ones to which they willingly contribute—may later yield recommendations for decreased quota and/or additional regulations. Many fishers, therefore, equate scientists with regulations that directly or indirectly negatively affect their livelihoods. For similar reasons, fishers may also be suspicious of individuals associated with government because, as an already highly-regulated group, they are anxious to avoid any potential additional restrictions on their activities.

We also quickly learned that many fishers are wary of environmentalists or people affiliated with high-profile wildlife conservation organizations because some of these groups have campaigned for fishing area closures, marine protected areas, gear modifications to reduce incidental catch of protected species, or they have demonstrated against various sectors of the fishing industry. These actions have sometimes affected consumer demand for marine products and have disrupted the livelihoods of fishing community members.

Taking this information into account, we made sure that when we approached members of the fishing community, our affiliation and intentions were clear: we were not working for the government, and although we were doing environmental work, we were not interested in so-called "radical" solutions to environmental problems. We were low-key in our approach, and were careful in our use of what we quickly learned was potentially inflammatory language, words such as "marine protected area," "endangered species" and "environmentalist." We took a genuine interest in fishers' concerns about their industry and spent many hours listening to their discussions about them. In turn, we explained to them what we thought was interesting about leatherbacks, describing the turtles' biology and behavior. Because of the paucity of research on the animal in our area, we could honestly say to fishers that we were turning to them to help us determine what scientists to date had yet to discover: the relative abundance and distribution of leatherbacks in Canadian waters. We were emphatic that we thought fishers were the best people in the country to provide this information and, ultimately, to help this species.

Building Trust. — In order to make inroads into the fishing community it was necessary to earn fishers' trust. In addition to being scrupulously honest about our research intentions, one of the key factors in trust building was travelling to every fishing community in Nova Scotia and meeting the fishers there in person. Letters to fishing organization heads and presentations at fishing association meetings produced few results. Fishers were inclined to help in significant numbers only after either a direct face-to-face meeting with one of us on a wharf or based on the knowledge that one of their associates (crew, family member, friend) had spoken with us in person. "Now that I've seen your

face," they would say, "I'll give you a call if I see one of your turtles." We also built trust by enthusiastically responding to fishers' invitations to join them on fishing trips, allowing us to look for turtles. On these occasions, in addition to watching for turtles, we did all we could to help with the work on the boat, gutting fish, hauling gear, etc.

Consistency in image was also important, particularly in the early stages of developing the NSLTWG. For example, in the first year of the project, we drove an old car on our community visits. As the project progressed, we found that our arrival at a wharf was preceded by the news of our visit to a neighboring community. This often eased our introduction into the new community. On one occasion, we drove a rental car to a wharf and, instead of being greeted with standard jokes about turtle soup or with calls of "Hey, Turtle Man," we were greeted with suspicion, questions about the car and who we really worked for. Although we were able to quickly explain that the other car was being repaired, this experience taught us a valuable lesson about the degree to which transparency mattered in our relationship with fishers.

Eliciting Information. — Many projects that draw on traditional or local ecological knowledge use specific methods, such as snowball sampling, to develop a targeted list of fishers for their research (e.g., Neis and Morris, 1996; Gendron, 2000; Hutchings and Ferguson, 2000; Maurstad, 2000). Because we wanted to include as many fishers as possible in our research and we hoped to establish a project that would thrive long term, we simply spoke to every fisher we encountered in coastal communities about our work and invited them to help us.

In order to effectively communicate with the fishers we approached, we worked hard to become familiar with their vernacular, as many of the terms they use are often different from scientific terms and are rarely used by those outside of the coastal culture. Although we did not conduct formal interviews for the purpose of determining language differences, our extensive interactions with fishers enabled us to learn their terms for referencing direction, particular types of gear, marine species, fishing areas, oceanographic features and processes, etc.

Guided by our understanding of the coastal community context, particularly some fishers' nervousness around scientists, we used an informal interview protocol. We used semi-directive personal interviews, but avoided writing down answers to general questions in the presence of fishers. Through experience, we learned that recording notes, as they described, "like a journalist," often made them uncomfortable and decidedly reticent to speak with us. We did carefully record sightings information in front of them, however, making it clear that accuracy in data collection was of paramount importance to us.

We also established a toll-free telephone line so it would be easy for fishers to contact us. They use the line to report marine turtle sightings and to inquire about our research. A staple of other previous Atlantic Canadian marine species research projects involving fishers (Lien et al., 1989; Lien, 1994), the reporting "hotline" was advertised on all printed project materials, and is widely used by fishers in Nova Scotia, Newfoundland, and Prince Edward Island to report both current sightings and historical encounters with turtles.

One of the most important methods of generating interest about the leatherback among fishers was speaking to their children. We supplemented our work on the fishing wharves and at community festivals with classroom visits to coastal schools. Introducing children to the biology of the leatherback and our interest in conserving it helped to foster their interest in the turtle and its protection. Enthusiastic responses from the classes of children we visited not only accomplished this goal, but also yielded excellent contacts among local fishers, as many of the students had parents directly linked to the fishing industry. The students' responses to our presentation often sparked interest on the part of their parents.

Accuracy. — One of the generally acknowledged challenges of attempting to integrate traditional or local ecological knowledge with science is ensuring that the data are accurate (Ferguson and Messier, 1997; Neis et al., 1999b; Fischer, 2000; Maurstad, 2000; Pálsson, 2000; Zwanenburg et al., 2000). We attempt to ensure that the information we receive is accurate by:

1. Not paying for data.
2. Asking for specific quantitative information (e.g., date, time, latitude, and longitude of a sighting).
3. Speaking to each person who submits a sighting so that we can double-check the data and obtain a descriptive location for the sighting that can be compared with the coordinates provided.
4. Asking questions about the sighting to confirm that the turtle reported is a leatherback.
5. Obtaining photographs and videotapes of reported turtles whenever possible.

Ethics. — There is no accepted procedure for including fishers' knowledge in ecological studies, as most of the research in this area is still exploratory (Fischer, 2000; Neis and Felt, 2000). Obviously we were concerned with protecting the rights of the fishers we worked with. But, fishers became clearly uncomfortable when we introduced written formalities into our discussions. Therefore, we did not ask them to sign a release form for the information they provided. Instead we tailored our ethical protocol to the audience:

1. All fishers must be clearly told what the purpose of our research is.
2. All fishers must understand that they are volunteering the data they provide. They will receive no remuneration for their efforts.
3. Only fishers who have either called us with a leatherback turtle sighting or whom we have met in person are considered "members" of the NSLTWG. In both cases, fishers are only considered members if they have demonstrated a clear commitment to participating in our research by personally giving us their contact information (name, address, phone number, e-mail) so that they can be added to our membership and mailing lists.

Figure 1. Nova Scotia Leatherback Turtle Working Group poster (1998) used to solicit leatherback sightings.

4. All contact information, including the names of fishers associated with particular sightings, is kept strictly confidential.

5. Fisher members of the NSLTWG are updated annually in writing on the progress of our research so that they can understand how their contributions have been incorporated into our work, and so that they are made aware of new studies we are conducting.

Supplemental Methods

Poster. — One of the key ways of advertising our project and generating interest in it among those we did not meet in person is our project poster. We modeled our colorful "Have You Seen This Turtle?" poster (Fig. 1) after one created for a successful project involving the Blanding's turtle in Nova Scotia (Herman et al., 1998) and modified it based on input from members of the fishing community. We put the posters on fishing wharves and in other high-traffic areas including gear sheds, fish plants, ice and baiting stations, co-ops, hardware stores, liquor stores, banks, and restaurants.

Newsletter. — We kept our fisher members updated annually through the NSLTWG project newsletter, *The Leatherbacker*. The mandate of the newsletter is to communicate general results from our research, describe future projects, and to educate fishers about marine turtles and the practical ways they can assist with data collection and conservation of these animals at sea.

Sighting Forms. — In the first few years of the project we provided sighting forms to fishers, which we developed with their input. The forms included space for fishers to record the positions of the turtles they encountered, make notes about water temperature, the presence of jellyfish, and the condition of the turtle. The forms were pre-stamped and addressed to encourage fishers to fill them out and return them to us. We stopped using them in the third year of the project because fishers showed a marked preference for reporting sightings using the toll-free phone line, and because we received few sightings forms that had not been preceded by a phone call.

Brochures and Identification Keys. — We produced and distributed a general brochure about the leatherback turtle as well as a laminated sighting key that includes scientific drawings and identification information about the marine turtle species found in Atlantic Canadian waters. The sighting key was developed with input from the fishing community.

Hats. — We distributed baseball hats, an essential item in the fishing community, to the captains and crews that called in substantiated leatherback turtle sightings.

Web Site. — We created a Web site, which although targeted at the general public, includes information relevant to fishers, such as maps of movements of satellite-tagged leatherbacks, sighting forms, and marine turtle identification details.

RESULTS

Membership in the NSLTWG grew quickly in the first two years when most of the fishers we met were new to the project. In the four years that followed, most of the fishers we met were either already part of the project or part of a fishing crew with an NSLTWG member in it, had a family member or friend who was an NSLTWG volunteer, or were not interested in helping. Nonetheless, membership continued to increase steadily in the subsequent four years, averaging 35 new fishers each year (Table 1). We do not have data that reflect the number of fishers who are indirectly part of the group. For example, those who might sight a turtle and give the information to someone else (family member, crew member) to report. As of December 2003, 500 fishers have been involved in the NSLTWG (Table 1).

By the close of the 1998 field season, the NSLTWG had collected 246 geo-referenced sightings of leatherback turtles (James, unpubl. data)—more than twice the extant records of leatherbacks (< 100) in Atlantic Canada (Squires, 1954; Bleakney, 1965; Miller, 1968; Steele, 1972; Threlfall, 1978; D'Amours, 1983; Goff and Lien, 1988; Bossé, 1994; Fuller, 1998). Our findings served to substantiate Bleakney's (1965) claim that these animals are seasonal visitors to Canadian waters. Although 1998 had the highest number of sightings reported, the program still receives significant numbers of

Table 1. Growth of Nova Scotia Leatherback Turtle Working Group fisher membership. Fishers are considered members if they have called us with a turtle sighting or met us in person and only if after learning about the project they demonstrate clear interest in participating in our research by personally giving us their contact information so they can be added to our membership and mailing lists. Numbers current to December 2003.

Year	New fisher members	Total fishers involved
1998	209	209
1999	152	361
2000	29	390
2001	36	426
2002	33	459
2003	41	500

sightings each year. By December 2003, the NSLTWG had collected 942 geo-referenced sightings of leatherbacks in Atlantic Canadian waters reported by 405 individuals (some people called in multiple sightings). Of those individuals, 281 were commercial fishers; 22% of those fishers called in sightings in two or more years. The rest of the individuals reporting sightings were from our secondary target audiences of the general public, including cottage owners, recreational sailors and anglers ($n = 55$); charter boat operators, largely whale watch vessels ($n = 30$); marine researchers, including NSLTWG scientists ($n = 23$); and marine professionals such as seismic and fisheries observers, Coast Guard, Canadian Forces, etc. ($n = 16$) (Fig. 2).

Nearly all of our sightings were reported via the toll-free phone line. The occasional exception was a sighting that was e-mailed to us through our project Web site or a sighting that a fisher told us about in person. Some still send in the details of sightings by mail, but only usually after first reporting the pertinent details by phone.

Letters and written materials, such as our brochure, were not generally effective as a preliminary means of contacting fishers and promoting participation in the NSLTWG. The project poster was an exception to this and has proved successful in attracting many new members. Written communication was most effective when used as a follow-up to personal contact or an initial contact resulting from the poster.

DISCUSSION

Many other marine turtle science and conservation initiatives have integrated traditional ecological knowledge (e.g., Bleakney, 1965; Felger et al., 1976; Kontos and Webster, 1985; Lutcavage and Musick, 1985; Chan et al., 1988; Goff and Lien, 1988; Lien et al., 1989; Rakotonirina and Cooke, 1994; Epperly et al., 1995; Morreale and Standora, 1998; Nichols and Arcas, 1999; Vieitas et al., 1999). We designed our program independently, with the exception of integrating ideas from Bleakney (1965) and Goff and Lien (1988).

Fishers are skilled observers who are regularly at sea, where they disperse widely in coastal and offshore waters. They interact with leatherbacks more than any other human group and are, therefore, ideal research partners. They are also the people best poised to implement practical conservation measures for leatherback turtles at sea. As our relationship with the fishing community has matured, we have placed increasing emphasis on the importance of safely releasing entangled leatherbacks from fishing gear. We have consulted with fishers on effective disentanglement techniques, which we have widely shared as best practices among the fishing community.

We have quantified the overall success of our program in a few ways. First, we were able to assess the distribution and relative abundance of turtles in Canadian waters. In addition to the methods we used to ensure accuracy of the data we received from fishers, we have personally validated the general results of the sightings program through our own at-sea fieldwork.

Second, the network of fishers that comprises the NSLTWG has provided a platform for expanding research on marine turtles in eastern Canada (e.g., James and Mrosovsky, 2004; James et al., 2005). We have implemented a field research program that works cooperatively with fishers.

Third, we have managed to sustain the interest of NSLTWG fishers in the leatherback turtle and continue to see our membership grow. Clearly, for our program to be successful in conserving the leatherback turtle in Canadian waters, the commitment and interest of the fishers in the species' survival is paramount. Although it is difficult to quantify the degree of fishers' personal interest in conserving the turtle, we are encouraged by the fact that the NSLTWG continues to thrive (Martin and James, in press)

When considering the success of our program in light of its potential use as a model for nesting-beach-based marine turtle programs, it is important to note a few circumstances peculiar to our situation. We were the first to investigate the presence of leatherback turtles in Canadian waters in a major way, and marine turtles are not of cultural or economic significance in this country. As the first dedicated marine turtle program in Canada, we had to lay significant groundwork to accomplish our research goals. However, the advantage of this is that we were not faced with the task of

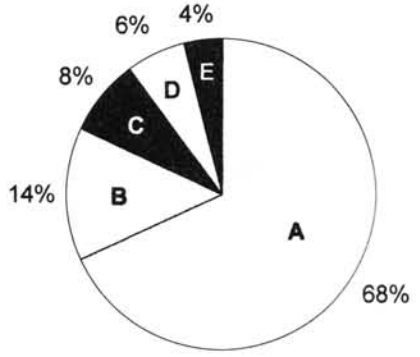

Figure 2. Nova Scotia Leatherback Turtle Working Group membership by audiences reporting leatherback sightings: (A) fishers, (B) general public, (C) charter boats, (D) marine researchers, (E) marine professionals.

overcoming any negative impressions left by a previous project, nor did we have to work to distinguish our efforts from those of a competing research group. We were also able to offer fishers a challenge that many of them told us they found appealing: we wanted them to enlighten traditional science about a species that was largely an enigma in Atlantic Canada.

It is possible that it is easier to ask Canadian fishers to conserve leatherback turtles because the turtles have no evident cultural value here. They are not eaten or used for medicinal purposes as they are in some countries where leatherbacks nest (Suarez and Starbird, 1996). It is also possible, however, that fishers who have no personal investment in the survival of the species would be less inclined to worry about conserving it than those who wanted to maintain it as a food source, cultural icon, etc.

Limitations. — Many of the disadvantages associated with our approach are common across other wildlife surveys involving fishers. NSLTWG members collect data opportunistically; they do not perform transect-based surveys. Therefore, it is possible that some turtles are recorded on multiple occasions. The alternative, and more likely scenario, is that observers fail to detect turtles as they are fishing or travelling to and from fishing grounds. Relatively calm sea conditions are required for spotting turtles from a boat; therefore, visibility is affected by weather conditions and by the fact that the turtles spend the majority of their time beneath the surface. Bias in visibility and reporting may also be related to variation in fishing strategy and gear type. For example, swordfish harpoon fishers may contribute a disproportionate number of sightings because the harpoon fishery depends on continuous vigilance to detect basking swordfish from a distance. Therefore, it is not surprising that these fishers frequently see turtles while looking for swordfish. Crab fishers, on the other hand, usually head out to their gear in the early hours of the morning, when it is still dark. This, combined with the nature of hauling crab pots, which unlike harpooning does not allow for fishers to spend much time scanning the surface of the water, means that crab fishers are less likely to spot free-swimming turtles.

Gear type may modulate reporting of turtles in other ways, as fishers involved in fisheries censured by environmentalists and other groups may be less likely to report encounters with wildlife (Neis and Morris, 1996; Martin and James, in press). For example, the pelagic longline industry is frequently criticized for its bycatch, and fishers in this industry are sensitive to widespread negative public opinion of this fishery. Therefore, this fleet may be less likely to volunteer information of any kind to scientists. Harpoon swordfishers, by contrast, may be more likely to report marine turtles because there is no bycatch in this fishery.

Another weakness associated with this approach concerns the distribution of fishing effort. An absence of sightings from a particular area does not necessarily indicate an absence of turtles. Instead, these areas may host little or no fishing activity. In contrast, highly productive areas that are popular fishing grounds (i.e., edges of Georges Bank, Gulf of Maine) may yield a disproportionate number of sightings because of intense fishing activity. Similarly, area closures will affect the distribution of sightings. Therefore, with this method of data collection, it is difficult to separate observer effort from actual abundance, due to spatial variation in fishing intensity.

Finally, external factors such as fish quota, price, and availability can indirectly affect the amount of data collected by directly affecting fishing effort, and, therefore, opportunities for encountering turtles.

Cost-Benefit. — As others have also noted, programs that rely on traditional ecological knowledge can be a cost-effective alternative to traditional scientific research, offering substantial monitoring and sampling effort at minimal cost (Fischer, 2000; Pálsson, 2000). Conservation-oriented research on large, far-ranging marine species like leatherbacks can be prohibitively expensive. However, by involving volunteers in the fishing community, the NSLTWG has collected much-needed baseline data on leatherbacks and other marine turtle species on a modest budget. As a volunteer program, the NSLTWG concept offers an economically sustainable alternative to costly research programs that invest large sums of money in dedicated aerial and vessel surveys or that provide monetary rewards to encourage data collection by fishers (e.g., Lavigueur and Hammill, 1993; Zwanenburg et al., 2000).

Need for Honesty. — Honesty is, perhaps, the most important element in our work with fishers. Honesty in this sense is more than just operating an ethical organization. Here, it also implies earnestness of intent. To successfully work with fishers, researchers cannot pay lip service to the notion that they have valuable insight to offer science. They must believe it. The history of interaction between science and fishers has left an overwhelming sense of distrust on the side of fishers, as we quickly learned and as others have also noted (Fischer, 2000; Macnab, 2000; Pálsson, 2000; Zwanenburg et al., 2000). This cannot be effectively countered, particularly if the project is going to be long term, by anything except respect for the fishers and their knowledge. As Pálsson (2000) described, empty diplomatic endeavors to bridge gaps between science and fishers can do the opposite when fishers see through them and feel betrayed once again. We are also always careful to credit fishers for their help in our work, including acknowledging them in academic papers.

It is important to note that honesty also requires us to be clear about the purpose of our work. Despite our relationship with the fishers who help us, many of whom have become friends, we never hide the fact that our work centers on doing what is in the best interests of conserving the leatherback turtle. Where the interests of fishers and leatherbacks collide, we make it known that we want to work with fishers to come up with a solution that will work for the leatherback. Although our turtle-centric point of view has likely cost us the help of some fishers, it has still

managed to consistently attract many fishers to our project, as our results indicate.

Approaching Fishers. — Face-to-face meetings with fishers were crucial to our success, as others have also found (Neis et al., 1999a,b; Fischer, 2000; Gendron et al., 2000; Zwanenburg et al., 2000). And, as we have described, they helped to build fishers' trust in our project. We also noticed that fishers responded better to one-on-one or small group conversations than if we approached them collectively at a fishing organization meeting. Conversations with fishers about why this was the case taught us that fishing organizations could act as a group—either unilaterally approving or dismissing—our request for help. In that context, there was the possibility of losing interested volunteers because of peer pressure. Our promise of complete anonymity may have encouraged some fishers to contribute information despite the fact that their peer groups did not agree with volunteering information to scientists or had not sanctioned participation in unpaid research.

Another aspect of face-to-face contact with fishers that should not be underestimated is the capacity enthusiastic researchers have to inspire interest in their subject. On many occasions we've received sightings information or calls about stranded turtles from fishers who say that they never would have paid attention to the turtle had they not met us.

Fischer (2000) categorized fishers' objectives for acquiring knowledge as practical or contemplative. The latter, she explained, satisfies fishers' personal curiosity and is "a rarely considered aspiration that influences observation." Our work demonstrates the extent to which appeals to the contemplative objective can be helpful to science. In our experience, fishers' interest in the ocean and its inhabitants extends beyond the commercial. In general, they seem genuinely fascinated by the sea and are eager to learn more about it. Teaching them about the leatherback—both through our face-to-face meetings and through supplementary written communication, such as our newsletter—serves to further pique their interest in the leatherback. It helps the turtle, in the run of a busy fishing trip, stand out on the seascape.

Commitment. — Regular contact with volunteer fishers is of paramount importance. Because of the structure of fishing communities, we learned that although it was not possible to meet with all members on a regular basis, meeting with one or two members of a community served to keep the others in that community apprised of our work. Timely feedback to fishers is also necessary, as others have noted (Zwanenburg et al., 2000). We answer the toll-free reporting line 24-hours a day. When we miss a call, we attempt to return the message within a few hours. If fishers help us necropsy a leatherback or report a stranded turtle, we provide them with a copy of the necropsy report (modified so that it is easy for the layperson to comprehend) and give them details over the phone of any interesting findings. We send thank you letters to anyone who helps us and respond to fishers' children's requests for help with school projects as soon as we receive them.

Those, however, are the easiest aspects of the commitment necessary to succeed at building a network of committed fishers. A crucial element to our success is the personal commitment required. Volunteer fishers across Atlantic Canada have expressed their interest in dealing with the same person when they report turtle sightings. Although this is not always possible, a key to sustaining volunteer effort has involved maintaining consistency in personnel available to interact with volunteers. To build a program that is sustainable long term, researchers must be in it for the long term. In order to become skilled at eliciting traditional ecological knowledge, Pálsson (2000) noted that researchers need to find their sea legs, which involves being engaged in the fishers' community and "not simply, as many cognitive studies have assumed, the mechanistic internalization and application of a mental script, a stock of knowledge or a 'cultural model'." Over the years, we have learned that in order for the NSLTWG to thrive, at least at this stage of its development, as researchers we must be as consistent in the lives of the fishers as the species they fish.

Who is Eligible. — A researcher's affiliation, particularly in politicized contexts like fisheries, can be crucial to his or her success (Ferguson and Messier, 1997; Neis et al., 1999b; Macnab, 2000). As we became increasingly aware of sensitivities in the industry, we learned that our affiliation with a university and later with the NSLTWG, a non-governmental organization, helped to earn fishers' trust (Macnab, 2000).

Because of the inescapable power dynamic involved in the relationship between government scientists and fishers because of government's regulatory role, it is unlikely that a government-led program would be as ultimately successful in this kind of work.

Threats. — Our collaboration with commercial fishers across Atlantic Canada has been and continues to be successful in collecting important data about the biology of leatherback turtles in temperate foraging areas of the northwest Atlantic. The NSLTWG offers an exciting model for integrating the use of fishers' knowledge in science and for developing a conservation ethic among fishers (Martin and James, in press). We are enormously encouraged by our results to date. However, we have reason to be concerned about the future of our group through, ironically, Canada's Species at Risk Act (SARA), the country's newly-minted endangered species' legislation (Statutes of Canada, 2002).

Federal endangered species legislation is important and necessary. However, it can impede the process of conservation. SARA states: "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species" (Section 32, Number 1). It is not surprising that this restriction engenders fear among resource users in the marine environment, whose gear regularly passively takes species for which it is not directed.

Although it will take some time before we are able to assess the full impact of this legislation on the fishers participating in our group, initial conversations with fishers

have indicated that some are now noticeably nervous about reporting entangled turtles. Our background in working with the fishing community, and the experience of marine turtle researchers in the USA, where endangered species legislation has existed for decades, indicates that information-sharing about entangled turtles, or even about free-swimming turtles, may decrease as a result. We hope that the way in which we have operated our group thus far, including our commitment to confidentiality, will encourage fishers to continue to help with our research regardless of the legislation.

To address the incidental bycatch of leatherbacks in fishing gear, Canadian management agencies may issue an Incidental Harm Permit (IHP) to protect fishers from being prosecuted for accidentally injuring or killing leatherbacks in Atlantic Canadian waters (Fisheries and Oceans Canada, 2004). This permit may encourage fishers to share information about leatherbacks. However, because the permit is government issued and because the level of trust fishers place in management agencies is often low, this still may not be the case as our initial conversations with fishers have indicated.

Even if allowable harm permitting means that fishers are willing to continue contributing to our sightings program, it presents new obstacles in our work to encourage fishers to be proactive in developing ways of reducing leatherback entanglement in fishing gear. An IHP indicates that leatherback mortality in fishing gear is not a fisher's responsibility. Therefore, instead of being able to draw on fishers' commercial interests as a means of promoting cooperative solutions to the issue, we must, once again, appeal to their intrinsic interest in the sea and the leatherback, hoping that both might at some point outweigh their business sense (Martin and James, in press).

Despite these obstacles, we believe that developing a committed network of commercial fishers, like those involved with the NSLTWG, offers valuable opportunities for sea turtle research and conservation in Canada and elsewhere.

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