1) Summary
This project focuses on conserving the leatherback turtle (*Dermochelys coriacea*) in the Atlantic through work in waters off Nova Scotia, Canada. The project includes both a science and community outreach focus. The science concentrates both on a tagging and recapture program and on identifying source populations for leatherbacks found in Canadian waters. The community outreach focuses on building strong, cooperative relationships with commercial fishers, those who interact with leatherback turtles most often in Canadian waters and who are in the best position to implement practical conservation measures at sea to protect the turtles.

2) Introduction
The critically endangered leatherback turtle forages in waters off Atlantic Canada. Recent research has confirmed that turtles that occur off Canada and the Northeastern United States represent a single, contiguous foraging population (James et al., 2005). Fieldwork conducted by the Nova Scotia Leatherback Turtle Working Group (NSLTWG) has confirmed that source populations for these turtles include Columbia, Costa Rica, the Lesser Antilles, French Guiana, Suriname and Trinidad. Conservation of leatherback turtles in Canadian waters, the site of the proposed project, is crucial to the conservation of this species throughout the Atlantic.

The NSLTWG has a history of working collaboratively with commercial fishers to conserve sea turtles in Atlantic Canada. The program’s scope and achievements are unique in marine turtle science. It is crucial that the NSLTWG’s successful relationship with fishers, those in the best position to implement the practical conservation of marine turtles at sea, is nurtured and expanded. The climate for conserving endangered marine species in Canada ahs changed significantly since the adoption of the Species at Risk Act, which may deter resource users from participating in conservation programs out of fear for their livelihoods (Martin and James, 2005, *Chel. Cons. Biol.*). Recognizing this and in light of the reality of the anthropogenic threats facing sea turtles in Atlantic Canadian waters, the NSLTWG
program is designed to focus on renewed personal outreach in the fishing community (Martin and James, 2005, *Chel. Cons. Biol.*).

Determining the origins of turtles that forage in Canadian waters through our tagging and recapture program will provide results necessary for determining priorities for international collaborative recovery efforts and for promoting Canada’s participation in international marine turtle conservation initiatives, including the Inter-American Convention for the Protection and Conservation of Marine Turtles.

3) Methods

Phase 1

**Activity:**
- Collect morphometric and other data from up to 60 turtles
- Mark untagged turtles with flipper tags and microchips

**Methods:**
- We conducted fieldwork in two areas off the coast of Nova Scotia, Canada: off mainland Nova Scotia (~44ºN, 64ºW), where we observed and live-captured leatherback turtles from July until early August, and off northern Cape Breton Island (~47ºN, 60ºW), where fieldwork was terminated in early September, as no leatherbacks were sighted during vessel surveys of the study area.
- We collected morphometric and other data, including DNA samples, and also applied flipper tags and PITs to 19 live-captured leatherbacks.
- Additional samples were obtained from two turtles that were found entangled in lines associated with fixed fishing gear.
- All turtles were sampled in continental shelf waters (depth < 200m).

Phase 2

**Activity:**
- Conduct community outreach with members of the NSL TWG and coastal communities in order to educate fishers about disentanglement techniques for incidentally caught leatherbacks.
- Continue fishing community outreach programs, with a focus on leatherback biology, ways in which fishers can mitigate threats to turtles in Canadian waters, etc.
- Distribute sightings posters at fishing wharfs across Nova Scotia.
- Maintain a toll-free marine turtle sightings line for fishers to call.
- Maintain written correspondence with fishers.
- Produce outreach materials to support research.
Methods:
- We visited fishing wharves across Nova Scotia, Canada, to distribute “Have You Seen This Turtle?” posters, which include not only biological information about leatherback turtles, but also information on properly disentangling leatherbacks from fishing gear, as well as contact information for the Nova Scotia Leatherback Turtle Working Group.
- We maintained a 24-hour, toll-free turtle hotline for people calling with information on leatherback turtle sightings or with questions about sea turtles.
- We researched, wrote, and published our annual newsletter, The Leatherbacker, distributing it to all of our commercial fisher volunteers.
- We held informal education sessions on fishing wharves for fishers about safe disentanglement techniques for sea turtles.

Phase 3

Activity:
- Conduct a series of leatherback turtle disentanglement workshops in targeted fishing communities in Nova Scotia.

Methods:
- We hosted six events in fishing communities across Nova Scotia (Jeddore-Oyster Pond, Yarmouth, Barrington, Lockeport, Louisbourg and Ingonish).
- We advertised the event using posters put up in fishing communities by volunteer fishers, and by sending personal letters and copies of the posters to fishers in the communities we were visiting.
- The program included a hands-on display with items ranging from a leatherback skull and carapace sample to flipper tags and educational brochures. The talk included information on the general biology of leatherback turtles as well as on the threats they face in the Atlantic. The lecture also detailed the results of research to which the volunteer fishers had contributed, and finished with a screening of the NSLTWG’s leatherback turtle disentanglement video.

Phase 4

Activity:
- Establish the relative contribution of nesting colonies to the Canadian leatherback foraging population.

Methods:
- Wrote article.
4) Results

Note: There was no formal logic framework in place for this grant. We combined the section on Outputs and the section on Post-Project Outcomes for ease of reading. It should be noted that there were no major discrepancies between the stated activities and the outcomes. It should also be noted that there will be continued monitoring of post-project outcomes beyond the life of this grant.

Phase 1

Activity:
- Collect morphometric and other data from up to 60 turtles
- Mark untagged turtles with flipper tags and microchips

Short-term output:
- Increased understanding of Canada’s leatherback turtle stock
- Increased understanding of the scope of Canada’s international role in protecting Atlantic leatherbacks

Indicator:
- Number of turtles captured
- Number of previously tagged turtles captured
- Number of DNA samples collected

Baseline Value:
- 0
- 0
- 0

Predicted Value:
- 15
- 1
- 15

Actual Value:
- 21
- 2
- 19

Discrepancy:
N/A

Predicted Post-Project Outcomes:
- Better understanding of the relative contributions of nesting colonies to the Canadian leatherback turtle foraging population.
Progress Toward Achieving Post-Project Outcome:

- Published a paper (James et al., 2007) outlining the relative contributions of nesting colonies to the Canadian leatherback turtle foraging population.

Phase 2

Activity:

- Conduct community outreach with members of the NSLTWG and coastal communities in order to educate fishers about disentanglement techniques for incidentally caught leatherbacks.
- Continue fishing community outreach programs, with a focus on leatherback biology, ways in which fishers can mitigate threats to turtles in Canadian waters, etc.
- Distribute sightings posters at fishing wharfs across Nova Scotia.
- Maintain a toll-free marine turtle sightings line for fishers to call.
- Maintain written correspondence with fishers.
- Produce outreach materials to support research.

Short-term output:

- Increased number of leatherback turtles safely released from fishing gear
- Increased participation in sightings program
- Increased public sensitivity, particularly among fishers and coastal community members, to marine turtle conservation issues.
- Maintenance of the NSLTWG’s unique partnership with fishing community members, which is critical to the success of marine turtle conservation and research activities in the region

Indicator:

- Number of posters distributed
- Number of fishing wharves visited
- Number of sightings reported
- Number of new volunteers
- Number of fishers with whom we corresponded

Baseline Value:

- 220
- 175
- 0
- 15
- 475
Predicted Value:
- 220
- 175
- 25
- 14
- 475

Actual Value:
- 217
- 175
- 157
- 32
- 497

Discrepancy:
N/A

Predicted Post-Project Outcomes:
- Fishers begin to develop a sense of responsibility for conserving leatherback turtles and are eventually willing to help modify their gear to mitigate entanglements

Progress Toward Achieving Post-Project Outcome:
- Despite a difficult political climate, fishers continued to participate in NSLTWG programs in increasing numbers

Phase 3

Activity:
- Conduct a series of leatherback turtle disentanglement workshops in targeted fishing communities in Nova Scotia.

Short-term output:
- Increased number of leatherback turtles safely released from fishing gear
- Increased public sensitivity, particularly among fishers and coastal community members, to marine turtle conservation issues.
- Maintenance of the NSLTWG’s unique partnership with fishing community members, which is critical to the success of marine turtle conservation and research activities in the region

Indicator:
- Number and location of disentanglement workshops
- Number of attendees
Baseline Value:
- 0
- 0

Predicted Value:
- 6
- 120

Actual Value:
- 6 workshops held in the following communities in Nova Scotia: Jeddore-Oyster Pond, Yarmouth, Barrington, Lockeport, Louisbourg and Ingonish.
- 91

Discrepancy:
N/A

Predicted Post-Project Outcomes:
- Fishers begin to develop a sense of responsibility for conserving leatherback turtles and are eventually willing to help modify their gear to mitigate entanglements

Progress Toward Achieving Post-Project Outcome:
- Despite a difficult political climate, fishers continued to participate in NSLTWG programs in increasing numbers

Phase 4

Activity:
- Establish the relative contribution of nesting colonies to the Canadian leatherback foraging population.

Short-term output:
- Increased understanding of Canada’s leatherback turtle stock
- Increased understanding of the scope of Canada’s international role in protecting Atlantic leatherbacks

Indicator:
- Publication of data

Baseline Value:
- 0

Predicted Value:
- 1
Actual Value:

- 1

Discrepancy:

N/A

Predicted Post-Project Outcomes:

- Better understanding of the relative contributions of nesting colonies to the Canadian leatherback turtle foraging population.

Progress Toward Achieving Post-Project Outcome:

- Published a paper (James et al., 2007) outlining the relative contributions of nesting colonies to the Canadian leatherback turtle foraging population.

5) Discussion & Adaptive Management

a) Lessons Learned and Transferability

i) The hope for the leatherback turtle in Canadian waters, and consequently in other parts of its range, rests primarily in the hands of commercial fishers, who can disentangle it from fishing gear. The climate for conserving endangered marine species in Canada has changed significantly since the adoption of the Species at Risk Act. Resource users are reticent to participate in conservation programs out of fear of repercussions for their livelihoods (Martin and James, 2005, Chel. Cons. Biol.). Our community outreach this year focused on solidifying and expanding our relationship with the commercial fishing community. The greatest testament to the success of the NSLTWG’s 2005-2006 outreach is that despite challenges posed by SARA, reports of entangled and dead turtles made to our sightings line by fishers increased notably, as did our volunteer fisher membership. Often groups will shy away from difficult circumstances, anticipating animosity from the other “side.” We have learned that continuing to interact with resource users in a consistent, straightforward, and respectful manner despite difficult circumstances is crucial to maintaining and building trusting and cooperative relationships.

ii) We were particularly glad to have carefully monitored the attendance and composition of our community outreach presentations. It is often easy to get discouraged when you put a lot of effort into planning and executing an event that is then only attended by a dozen people. By comparing our event statistics with similar events in our province, we learned that our numbers were actually above average. We had been thinking of abandoning the seminars as unsuccessful, and now we can say with assurance that, instead, they are a strong conservation tool.
iii) We will continue to build on our relationships with commercial fishers to increase their understanding of the intrinsic worth of leatherback and other marine turtles, and to help develop their sense of responsibility for conserving these animals at sea. Recent research has identified fixed fishing gear as a leading cause of leatherback mortality in coastal temperate waters (James et al., 2005). We plan to collect fine-scale movement data to clarify how foraging behaviour makes leatherbacks vulnerable to becoming entangled in lines associated with these fisheries. We hope eventually to combine our understanding of what causes entanglement with an increased stewardship ethic amongst local commercial fishers to mitigate bycatch in fixed-gear fisheries.

b) Dissemination
i) Results of the work completed during this project have been disseminated in the following ways:
   - Publication of research in the peer-reviewed journal *Marine Ecology Progress Series* (MEPS) (James et al., 2007). MEPS has an impact factor of 2.32, the highest of all of the primary marine ecology journals.
   - Our work was reported on 16 times in the national and international print media, and was featured in a half-hour documentary that aired nationally in Canada and on satellite television.
   - We distributed 217 “Have You Seen This Turtle?” posters at 175 fishing wharves across Nova Scotia.
   - We corresponded with 497 fishers.
   - We distributed 507 copies of our newsletter, *The Leatherbacker*.
   - We hosted six educational events across coastal Nova Scotia and presented to 91 attendees.
   - We made our results available to both the Canadian Atlantic Leatherback Turtle Recovery Team and the Canadian Pacific Leatherback Turtle Recovery Team, the groups responsible for developing recovery plans for the species in Canadian waters.
   - We collaborate with colleagues studying the growth (L. Avens, National Marine Fisheries Service), genetics (P. Dutton, National Marine Fisheries Service), thermal biology (N. Mrosovsky, University of Toronto), ophthalmology (I. Schwab, University of California at Davis), and cardiology (G. Webb, Charles Darwin University, Australia) of leatherback turtles. In addition, stranding response, including necropsy of leatherbacks and other marine turtles, has enabled us to supply various provincial museums (New Brunswick and Nova Scotia) with tissue and bone samples (including skulls) for archival purposes.

ii) Attachments:
   - Posters advertising the disentanglement workshops
   - *The Leatherbacker* newsletter
Copies of four peer-reviewed articles. Note: NFWF is acknowledged as a funder in James et al. 2007, which grew directly from NFWF-funded research. Although the remaining three publications were published during the 2005-2006 funding cycle, they were submitted for publication well before NFWF began funding our project; hence, NFWF is not acknowledged in the papers as a funding source.

Bibliography of media coverage for 2005

6) References

James, M. C., Martin, K., and P. H. Dutton. 2004. Hybridization between a green turtle, *Chelonia mydas*, and loggerhead turtle, *Caretta caretta*, and the first record of a green turtle in Atlantic Canada. Canadian Field-Naturalist 118:579-582. Note: Although the paper is dated 2004, the issue of the journal it is published in was produced in March 2006.


Print Media Coverage (2005)


**Television Coverage (2005)**

The leatherback turtle has long been one of the world’s most mysterious reptiles. Although leatherbacks have existed since the time of the dinosaurs, scientists have puzzled over simple things like where the turtles travel in the ocean. Commercial fishermen and scientists with the Nova Scotia Leatherback Turtle Working Group have begun to unlock the secrets of the leatherback. **Come and learn what we’ve discovered and see a short film about this amazing animal.**

**Tuesday, March 14**

Jeddore-Oyster Pond Fire Hall  
[Old Trunk Road/Hosking Lane]

6:30 p.m.
The leatherback turtle has long been one of the world’s most mysterious reptiles. Although leatherbacks have existed since the time of the dinosaurs, scientists have puzzled over simple things like where the turtles travel in the ocean. Commercial fishermen and scientists with the Nova Scotia Leatherback Turtle Working Group have begun to unlock the secrets of the leatherback. **Come and learn what we’ve discovered and see a short film about this amazing animal.**

**Sunday, March 19**
Yarmouth Knights of Columbus Hall
10 Collins Street
2 p.m.

We are grateful for the support of our sponsors: Canadian Wildlife Federation, Endangered Species Recovery Fund, Habitat Stewardship Program for Species at Risk, and the National Fish and Wildlife Foundation.
The leatherback turtle has long been one of the world’s most mysterious reptiles. Although leatherbacks have existed since the time of the dinosaurs, scientists have puzzled over simple things like where the turtles travel in the ocean. Commercial fishermen and scientists with the Nova Scotia Leatherback Turtle Working Group have begun to unlock the secrets of the leatherback. **Come and learn what we’ve discovered and see a short film about this amazing animal.**

**Tuesday, March 21**
Barrington Recreation Centre
Park Lane
6:30 p.m.
The leatherback turtle has long been one of the world's most mysterious reptiles. Although leatherbacks have existed since the time of the dinosaurs, scientists have puzzled over simple things like where the turtles travel in the ocean. Commercial fishermen and scientists with the Nova Scotia Leatherback Turtle Working Group have begun to unlock the secrets of the leatherback. Come and learn what we’ve discovered and see a short film about this amazing animal.

Thursday, March 23
Lockeport Fire Hall
6:30 pm

For years scientists didn’t believe leatherback turtles regularly came to Atlantic Canada. Learn how Nova Scotia’s fishing communities helped change their minds.

Presented by:
THE NOVA SCOTIA LEATHERBACK TURTLE WORKING GROUP

www.seaturtle.ca

We are grateful for the support of our sponsors: Canadian Wildlife Federation, Endangered Species Recovery Fund, Habitat Stewardship Program for Species at Risk, and the National Fish and Wildlife Foundation.
For years scientists didn’t believe leatherback turtles regularly came to Atlantic Canada. Learn how Nova Scotia’s fishing communities helped change their minds.

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**Saturday, March 25**
Louisbourg Legion, Branch no. 62
7569 Main Street
6:30 p.m.

We are grateful for the support of our sponsors: Canadian Wildlife Federation, Endangered Species Recovery Fund, Habitat Stewardship Program for Species at Risk, and the National Fish and Wildlife Foundation.
The leatherback turtle has long been one of the world’s most mysterious reptiles. Although leatherbacks have existed since the time of the dinosaurs, scientists have puzzled over simple things like where the turtles travel in the ocean. Commercial fishermen and scientists with the Nova Scotia Leatherback Turtle Working Group have begun to unlock the secrets of the leatherback. **Come and learn what we’ve discovered and see a short film about this amazing animal.**

**Sunday, March 26**
Ingonish Fire Hall
2 p.m.

We are grateful for the support of our sponsors: Canadian Wildlife Federation, Endangered Species Recovery Fund, Habitat Stewardship Program for Species at Risk, and the National Fish and Wildlife Foundation
Conserving Sea Turtles in Canada: Successful Community-Based Collaboration Between Fishers and Scientists

KATHLEEN MARTIN AND MICHAEL C. JAMES

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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 watch-
ning 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 ex-
ample, 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 relation-
ship with fishers.

Eliciting Information. — Many projects that draw on
traditional or local ecological knowledge use specific meth-
ods, 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 sci-
entists, 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 uncomfort-
able and decidedly reticent to speak with us. We did care-
fully 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 presenta-
tion often sparked interest on the part of their parents.

Accuracy. — One of the generally acknowledged chal-
enges of attempting to integrate traditional or local ecologi-
cal knowledge with science is ensuring that the data are
accurate (Ferguson and Messier, 1997; Neis et al., 1999b;
Fischer, 2000; Maurstad, 2000; Pålsson, 2000; Zwane
burg 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 protect-
ning 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 volunteer-
ing the data they provide. They will receive no remuneration
for their efforts.
3. Only fishers who have either called us with a leather-
back 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 demon-
strated 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.
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.

<table>
<thead>
<tr>
<th>Year</th>
<th>New fisher members</th>
<th>Total fishers involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>209</td>
<td>209</td>
</tr>
<tr>
<td>1999</td>
<td>152</td>
<td>361</td>
</tr>
<tr>
<td>2000</td>
<td>29</td>
<td>390</td>
</tr>
<tr>
<td>2001</td>
<td>36</td>
<td>426</td>
</tr>
<tr>
<td>2002</td>
<td>33</td>
<td>459</td>
</tr>
<tr>
<td>2003</td>
<td>41</td>
<td>500</td>
</tr>
</tbody>
</table>

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
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, Pállsson (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 NSL TWG, offers valuable opportunities for sea turtle research and conservation in Canada and elsewhere.

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LITERATURE CITED


MARTIN AND JAMES — Conserving Sea Turtles in Canada


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The Need for Altruism:
Engendering a Stewardship Ethic Amongst Fishers for the Conservation of Sea Turtles in Canada

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Abstract Enforcing conservation measures for marine organisms is challenging, as the vastness of the ocean makes monitoring human activities at sea nearly impossible. Sea turtles face multiple anthropogenic hazards, including entanglement in fishing gear. Conservation of these animals at sea must largely depend on the involvement of the fishing industry. The Nova Scotia Leatherback Turtle Working Group (nsltwg), a sea turtle research and conservation organisation, has been working to conserve the critically endangered leatherback turtle (*Dermochelys coriacea*) by collaborating with commercial fishers in Atlantic Canada. One of the nsltwg’s primary goals is to engender a stewardship ethic amongst fishers that will result in the active conservation of sea turtles. There are signs that fishers are embracing opportunities to assist in the recovery of the leatherback.

Introduction

The Nova Scotia Leatherback Turtle Working Group is a collaborative sea turtle conservation initiative involving commercial fishers, tour boat operators, coastal community members, and scientists in Atlantic Canada, a region that encompasses the country’s easternmost provinces: Nova Scotia, New Brunswick, Newfoundland, and Prince Edward Island (Figure 1). Formed in 1998, the nsltwg is an organisation built on the premise that the lasting conservation of marine species can only be obtained through cooperation between fishers and scientists. The nsltwg is comprised of approximately 500 volunteer commercial fishers (Martin and James 2005) and has contributed new and important information to the study of sea turtles, particularly the leatherback (*Dermochelys coriacea*), both globally and in Canadian waters. The efforts we have made to engender a stewardship ethic amongst the fishers we work with have been crucial to the success of our research and conservation programmes to date.
The leatherback is classified as globally critically endangered (Hilton-Taylor 2000) and as endangered in Canada (James 2001). Leatherbacks are one of the world’s largest reptiles; they can grow up to two metres in length and regularly weigh 500 kilograms (Zug and Parham 1996). Atlantic leatherbacks nest on beaches in Florida, the West Indies, South and Central America, and on the West Coast of Africa. After the eggs hatch, the turtles spend their lives at sea. Male turtles never return to land, and females return only to nest. Leatherbacks have the most extensive geographic range of any reptile, with migrations that can cover entire ocean basins (Eckert 1998; Ferraroli et al. 2004; Hays, Houghton, and Myers 2004). This, combined with the difficulty of locating the turtles at sea, makes studying this species anywhere but on a nesting beach difficult. Commercial fishers are in the best position to implement practical conservation of leatherback turtles at sea because they observe and interact with them more than any other human group.

It is not a secret amongst people who work on species that interact with fishing gear, that it is difficult -- some would say impossible -- to effectively police fishers’ activities at sea. Vessels are widely dispersed, and as we have observed, the fishers’ social code generally demands that they do not report each other for infractions, such as transferring bycatch to vessels that have licenses to harvest the species, fishing beyond a quota in order to maximise the value of the take (by discarding the less profitable catch), et cetera. On the other hand, fishers we have worked with are quick to point out that they believe they are subject to unreasonable constraints on their fishing activities by management agencies. A ‘we-they’ dichotomy exists between the groups that is often perceived as, or is in fact, adversarial.

One of the primary goals of the NSLTWG was to implement true and lasting change in fishers’ at-sea conduct toward sea turtles. In order to do this, we needed to work with fishers as partners. In addition to our respect for their traditional eco-
logical knowledge (TEK) about the species we study and our genuine belief that they have much to contribute to leatherback science, we were certain that the only way to truly conserve sea turtles was to ensure that commercial fishers were working cooperatively with us (Martin and James 2005). But, they had to do more than pay lip service to our goal. Their conduct at sea had to be driven not by regulations, which they might be tempted to ignore, but by an earnest desire to help the turtles.

The premise is altruistic. It is important to remember that most fishers with whom we work are self-employed and, in Atlantic Canada, where the landed value of shellfish has nearly tripled in recent years, many are operating thriving businesses (Fisheries and Oceans Canada 2002). Altruism and any profit-oriented business are a difficult mix, particularly when the implications of that altruism might have a detrimental effect on the business’ bottom line. Fishers are keenly aware of the potential for profit or loss implicit in fishing gear modification and, in our experience, many will structure their responses to fact-finding initiatives focused on species conservation (informal interviews, printed questionnaires, et cetera) to protect their business interests and by extension, the business interests of others in their community. The first challenge facing the NSL TwG was to generate sufficient interest within the fishing community in sea turtles to encourage reporting of turtle sightings. The second was to maintain and nurture this interest despite publicly acknowledging the problem entanglement in fishing gear poses for turtles. Added to these challenges was our definition of ‘interest,’ which required that the fishers working with us act as volunteers.

Voluntarism is at the heart of our sea turtle work with fishers and is one of the things that separate our efforts from the majority of fisher-scientist data gathering initiatives. There is a history of scientists working with fishers to obtain data on sea turtles (for example, Bleakney 1965; Goff and Lien 1988; Rakotonirina and Cooke 1994; Morreale and Standora 1998) and other marine species (for example, Lien, Staniforth, and Fawcett 1985; Lavigueur and Hammill 1993; Zwanenburg, King, and Fanning 2000). But, fishers are accustomed to being paid or to receiving monetary substitutes (such as opportunities to participate in sentinel fisheries) for their help with scientific studies (Lavigueur and Hammill 1993; Zwanenburg, King, and Fanning 2000, Martin and James 2005). However, providing monetary or other incentives for data is expensive and can be difficult to maintain long term (Lavigueur and Hammill 1993; Best 1998; Zwanenburg, King and Fanning 2000). Conversations we have had with fishers have also confirmed that information they collect for payment rarely has any value to them other than as a means to the reward (Pretty and Smith 2004). From our perspective, paying for the data also clearly controverts engendering a conservation ethic amongst the fishers. It is the normative pull of this ethic that we hope will ultimately override capitalistic values. It is this ethic that is crucial to the success of our programme and, in our mind, to the conservation of all marine species by resource users.

**Signs of Success**

*In the beginning*
The NSL TwG approached commercial fishers across Atlantic Canada to draw on their
tek of the leatherback turtle in this region and to enlist their help in voluntarily contributing data to our initial study of its abundance and distribution in Atlantic Canadian waters (Martin and James 2005). For the most part, the NSLTWG’s collaborative model has been enormously successful as measured by the number of fishers volunteering with the group, the data they have contributed, their active participation in field research, and the signs of changing attitudes toward sea turtles amongst many of the fishers we have encountered and interviewed (Martin and James 2005).

During our first season of fieldwork, which ran from June to November of 1998, we experimented with several methods of enlisting fishers to help us with our leatherback turtle research. We made presentations at fishing organisation meetings, promoted our programme at fishing derbies and community festivals, and visited 175 fishing wharfs across Nova Scotia (where the vast majority of our volunteers are located), covering approximately 6,000 kilometres, in an effort to make direct contact with as many fishers as possible (Martin and James 2005). We soon learned that presentations at fishing organisation meetings were not the most effective way of obtaining fishers’ cooperation, because the assembled group could decide as a whole whether or not to help, and individual fishers were sometimes reticent to express interest in the company of their peers. If organisations chose to help, we could win over a large block of fishers. If they didn’t, we sometimes lost the opportunity to win over individuals, whose personal opinion might differ from that of the majority. The best way to obtain volunteers was to speak to fishers individually or in small informal groups to talk about why we were interested in sea turtles and how we thought fishers could help conserve them (Martin and James 2005).

Fishers were almost always generous in their offers to help once we made personal contact with them. On more than one occasion, individuals mentioned that their interest stemmed from meeting us in person and seeing our enthusiasm for the turtles. Having a personal connection with the research team was crucial for the fishers (Neis et al. 1999a; Neis et al. 1999b; Fischer 2000; Gendron, Camirand, and Archambault 2000; Zwanenburg, King, and Fanning 2000; Martin and James 2005). Equally important to the fishers was our affiliation with a university rather than with a government agency. Many fishers made it clear that they were not willing to assist with government projects. They frequently inquired about our affiliation and made it clear they were not interested in helping many well-known environmental non-governmental organisations, including local, national and international groups, because they perceived them as being radical and unfriendly to fishers’ interests (Martin and James 2005).

Before 1998, there were approximately seventy-three published records of leatherbacks in Atlantic Canada (Squires 1954; Bleakney 1965; Miller 1968; Steele 1972; Threlfall 1978; D’Amours 1983; Goff and Lien 1988; Bossé 1994; Fuller 1998). By the close of our first field season (1998), the NSLTWG had enlisted the volunteer help of 209 fishers and collected 246 geo-referenced sightings of leatherback turtles. The findings served to substantiate the hypothesis put forth by Bleakney in 1965 that had remained virtually uninvestigated: that leatherbacks are regular seasonal visitors to Atlantic Canadian waters. We believe this information has had a global impact on leatherback biology and conservation.

In addition to phoning our toll-free turtle sightings hotline with the details of their encounters with leatherbacks, fishers shared with us both recent and histori-
cal photographs they had taken of these turtles. They seemed genuinely pleased that we were interested in what they were observing. We received dozens of pictures of leatherbacks, some swimming or basking at the surface of the water, others feeding on jellyfish, and some entangled in fishing gear. We believe that these photographs represent the fishers’ increasing interest in the turtles and our research. The entanglement photographs are the most noteworthy and, ironically, the most encouraging. They indicate both the fishers’ concern for the turtles in the photographs and the fishers’ trust in our policy not to distribute the images (Martin and James 2005). On more than one occasion, entanglement photographs were sent by fishers who, although they identified themselves to us, asked that their contributions remain anonymous for fear of negative repercussions from their peers. This was particularly true of those fishers involved in the pelagic longline fishery, who noted that they understood the photographs confirmed that sea turtles were among the bycatch of their highly-controversial gear sector.

A particularly encouraging instance of this kind of selflessness occurred when a fisher not only called us about a turtle that had become entangled and drowned in his fishing gear, but brought the turtle to shore for us to examine. The animal had been so badly entangled in a buoy line that its flipper had to be severed post mortem to disentangle it. Not only was the fisher willing to go to the trouble of bringing the animal in for us to study, he was also willing to do so in the presence of his entire community. The first thing the fisher wanted to know when we arrived was the sex of the animal. We confirmed that it was a female, which distressed him. He understood that the death of the female meant not just the loss of one turtle, but also the loss of her long-term reproductive potential. He was comforted somewhat when we explained how much we were able to learn from a dead turtle and how grateful we were that he had been willing to bring the turtle to shore for necropsy.

In 1999, the NSLTWG expanded its programme to engage fishers not just in collecting sightings and photographs of leatherback turtles, but also in helping with a pilot field research programme to tag leatherback turtles at sea. Once again, fishers volunteered to help us with our work, offering to take us out on their vessels to look for animals and ultimately becoming an integral part of our tagging programme. The knowledge the fisher members of our organisation have contributed to our tagging protocol -- based on their years of work with marine life, their familiarity with the mechanics of boats and fishing gear, and their practical understanding of the marine environment -- has been invaluable.

Continuing Benefits for the NSLTWG
Over the years, the relationship the NSLTWG has developed with fishers has helped our conservation programme to grow both quickly and cost effectively. Not only do the volunteer fishers report sea turtle sightings, photograph animals, and help us with our research on leatherback movements, but they also report dead leatherbacks. During our first field season, a fisher on Nova Scotia’s south shore found a leatherback dead at sea more than a hundred kilometres from his homeport, and recovered it for us to necropsy. As may be obvious, the large size of leatherback turtles makes them difficult to handle. When necessary, fishers have offered us the use of their boats as platforms, on which to conduct necropsies and have been instrumental in transporting turtle remains away from shore for disposal. They have also facili-
tated the movement of turtle carcasses on land, using tools ranging from winches to forklifts. Early in January 2002, in a case that would boggle the minds of those who study sea turtles at tropical latitudes, a fisher helped us hitch a dead leatherback to his all-terrain vehicle enabling us to drag the carcass from the icy shore, where it was spotted on New Year’s Day, to a safer workplace (Figure 2). We currently dispatch volunteer fishers to examine and obtain morphometrics of turtles that have stranded in remote areas of Nova Scotia.

Fishers have also been generous in offering their vessels for other aspects of our research. When we have received reports of dead turtles floating in shelf waters, they have willingly responded to our requests for help in recovering the animals. They have also made trips out on the water to survey for turtles in an effort to help us determine when and where we should conduct our fieldwork. The nsltwg does not operate its own research vessel, although it does conduct at-sea fieldwork for three months of the year. To accomplish this, since 1999 we have collaborated with commercial fishers, using their fishing boats as research platforms and involving them as field research assistants (Figure 3). We have accepted many generous invitations from captains and crews of commercial boats across Nova Scotia to accompany them on trips to study leatherbacks at sea. Such opportunities have included a two-week trip aboard a harpoon swordfish boat, which the captain allowed us to retrofit for our research purposes. The captains of the two fishing boats we use most regularly have also allowed us to retrofit their vessels for capturing and handling leatherbacks at sea and, remarkably, when modifying or renovating their vessels for their own purposes, they have been careful to maintain a design conducive to our fieldwork activities.
Challenges

Fear
Although we generally characterise our work as successful, we are cognisant of the challenges we face. As previously mentioned, altruism and business are a difficult mix when a business’ bottom line is potentially at risk. Our major challenge is engaging fishers in the active conservation of leatherback turtles despite the fact that in many other areas of the world, management agencies frequently regulate changes in how, when, or where fishers operate in order to reduce turtle interactions with fishing gear.

We know that some fishers would never report their turtle sightings, because they are concerned that this information could be used to make management decisions that could restrict their fishing activities. We know that many more turtles become entangled or die in fishing gear each year than are reported to us. We know that even if a fisher has willingly contributed turtle sightings in the past, he will be less likely to call to report a dead animal if one is found entangled in his own gear. And we know that when we question fishers directly about entanglement, some of them choose not to relate their experiences to us.

When we first began our work on leatherback turtles we hypothesised that these animals were not infrequent visitors to Atlantic Canada as they had previously been described in the literature, but that they represented a seasonal aggregation. To better understand the temporal and spatial distribution of leatherbacks in Canadian waters, we asked fishers to document their sightings of turtles (Martin and James 2005). When we began, neither our project nor the information we sought was
perceived as an immediate threat to the fishing community. Instead, nervousness about our work among fishing fleets at that time stemmed from fishers’ past experiences with scientists and environmental groups. Some fishers were worried that contributing data to a scientific study could result in additional regulations that they would characterise as detrimental to their industry and their earnings. They were also apprehensive about working with high-profile environmental groups (Martin and James 2005). It is important to note that many of the fishers we have worked with tend to universalise these experiences. They themselves had not necessarily had a negative experience with either a scientist or an environmental group, nor had anyone in their immediate community. Learning about actual or rumoured temporary closure of fishing areas or regulated gear modifications that affect other fishers -- even those in a different country -- was sometimes sufficient to alarm them, leading to low or decreased levels of cooperation in scientific studies.

For example, in October 2000, the United States’ National Marine Fisheries Service (NMFS) issued a temporary closure of a 90,056 square-kilometre fishing area on the Grand Banks to protect loggerhead (Caretta caretta) and leatherback sea turtles (NMFS 2004). The area was closed to the American pelagic longline fleet from October to April for three years (NMFS 2004). The closure did not directly affect the Canadian pelagic longline fleet (one of the many fishing sectors that work with the NSLTwG), and Canadian management agencies did not implement similar measures at that time. Nevertheless, participation in our project by the Canadian pelagic longline fleet virtually ceased following the US closure, save contributions from a handful of extremely dedicated volunteers.

The Need for Public Education
We are fortunate that fishers in most other gear sectors are not constrained by this type of fear. Approximately 500 fishers work with our group today (Martin and James 2005). Their enthusiasm presents that most desirable of challenges -- maintaining their interest over the long term. When our programme began, part of what engaged the fishers was the broadly held scientific notion that leatherback turtles did not regularly enter Atlantic Canadian waters. They were intrigued by our efforts to collect data on leatherback occurrence in Atlantic Canada in order to corroborate Bleakney’s (1965) suggestion that these animals were seasonal migrants to this part of the world. Fishers were clearly motivated by our rationale for approaching them to assist us: there was relatively little known about the species, because the scientific community had historically not drawn on fishers’ Tbk. The fishers responded as much if not more to the challenge of detailing their observations so that they would be convincing scientifically, as they did to the idea that their contribution would help conserve a critically endangered species. Later, when their geo-referenced observations of leatherbacks were summarised and the regular seasonal occurrence of leatherbacks in Atlantic Canada was no longer in doubt, we were able to engage them with the prospect of developing a novel field research programme to study the biology of these animals in northern waters (for example, James and Mrosovsky 2004; James, Ottensmeyer, and Myers 2005).

Although other scientific breakthroughs have followed in the seven years the NSLTwG has been active, research goals will become less relevant to fishers, as
the science associated with conserving leatherbacks in Atlantic Canada answers the
biggest questions and begins to concentrate on less obviously engaging topics. It
becomes increasingly imperative that fishers’ continued interest in participating in
the conservation of leatherbacks be motivated by the intrinsic worth of sea turtles.
The nsltwg must engender in fishers a broader interest in helping the turtles -- to
convince them that the turtles are an end in themselves.

The most successful way we have found of doing this is by maintaining our
public outreach programme (Martin and James 2005). This programme includes
initiatives, such as visiting fishing wharfs across Nova Scotia each spring and talking
to fishers in person about sea turtles, informing them of recent developments in sea
turtle research, and generally communicating our enthusiasm about the animals. It
involves continuing to put up posters soliciting sea turtle sightings; and it involves
maintaining the annual newsletter we send to our fisher volunteers that focuses on
sea turtle biology, our research, how fishers have contributed and what they can
continue to do. It also means continuing concerted sea turtle outreach programmes
for children in coastal communities.

Public outreach and scientific research must work together, if we are to see
lasting changes in how resource users relate to species of little or no commercial
value -- if altruism is to have a chance of winning out over business interests. As this
is not the standard approach to science, it presents an additional practical challenge:
convincing funding agencies that are conditioned to support traditional research
that funding ‘softer’ aspects of a conservation programme, like community out-
reach, is supporting science (Pretty and Smith 2004).

Why Collaboration Works

The Case of the nsltwg

There are a number of factors that have contributed to the success of the nsltwg’s
programme. We have had no control over some of the factors that we have used to
our advantage. For example, the ability to spot leatherback turtles at sea requires
observational abilities that only those who have fished on the ocean for years can
cultivate. These same skills are required to spot the fin of a swordfish breaking the
surface of the water, which is key in the harpoon fishery targeting this commercially
important fish. Although there is an active harpoon fishery off southwestern Nova
Scotia, the swordfish have all but disappeared from waters off Cape Breton Island,
where the fishery historically flourished (Fitzgerald 2000). ‘Turtling’, the term used
by nsltwg fishers to refer to surveying the seascape for leatherbacks, gives the many
dedicated swordfishers in places like Cape Breton a good excuse to go to sea to look
for animals -- turtles in this case -- while keeping a sharp eye out for unlikely sword-
fish sightings. Turtling also satisfies the love of hunting that many fishers share. They
are able to spend hours at sea in search of a rare animal, and although they don’t
harvest it, they do receive positive reinforcement from our group when they report
their sightings (Martin and James 2005).

Another important factor in our success was that we began work on leather-
back turtles and their presence in Canadian waters before any government agency
did. This allowed us to approach fishers both as separate from a regulatory body and
also with a subject that had never been broached with them by a regulatory body. This gave us the chance to be the first to present a case for fishers helping advance scientific knowledge of leatherback turtles, which enabled us to enlist the fishers as partners from the start -- to change the ‘we-they’ dichotomy into an ‘us.’ Because we initiated the work in Nova Scotia, we had time to establish our programme before other groups with different ideologies entered the picture. Firmly entrenched in the minds of our volunteer fishers -- and in the way we operate the nsltwg -- is that turtle work is collaborative. Fishers are not forced to help us because of regulations. They are the agents of conservation for sea turtles, because they are in the best position to help, and because they want to help. There is a sense of responsibility for the animal that is implicit in this mindset. We think that sense of responsibility is what drives some fishers -- and will hopefully motivate more -- not just to report sightings of free-swimming turtles or to disentangle turtles from their gear, but also to report those turtles that have died as a result of entanglement. We believe that ultimately it will be this stewardship ethic that prompts fishers to help develop and use new gear technology where necessary to conserve sea turtles.

Perhaps the key, however, has nothing to do with serendipity and everything to do with ideology. We believe that collaboration works, and we base our programme on this premise. We make it clear to both the fishers, who volunteer to help us, and to all, who ask about the results of our research, that we could not have learned what we have without the active participation of fishers in our programme. We do not only depend upon commercial fishing vessels for transportation to our field research sites, but also rely on boat captains to be active research assistants. Fishers help in all aspects of handling, measuring, and tagging turtles, and have contributed to and executed the design of associated field equipment. They are given ownership of the programme, and we make sure that we report to them accordingly. We make sure our volunteers are personally thanked for their individual contributions; we give them copies of photographs they’ve taken; we copy them on necropsy reports of turtles they’ve helped recover, measure or dissect; and we provide synopses of the latest research developments in our annual newsletter (Martin and James 2005). On too many occasions fishers have told us about other research projects they have contributed to -- from reporting fish bearing tags to spending hours hauling a full-size whale to shore -- for which they have had no follow-up. We are determined that this will not happen with nsltwg projects.

The Case for Lasting Change
The fact that it is difficult to convince some fishers that species with no commercial value are intrinsically important is undeniable. It will take many years -- possibly decades -- before this mindset is universally adopted by the fishers who currently volunteer for the nsltwg. But there is also no question in our minds that if we hope to truly engender a stewardship ethic that has sway when a fishers’ business interests are potentially at risk, that working collaboratively with fishers is the only option. This has required, and will continue to require, enormous patience, particularly in light of Canada’s Species at Risk Act (Martin and James 2005).

One of the overwhelming lessons we have learned through our work is that most fishers fundamentally enjoy their profession and are generally interested in the dynamic ecosystem, on which they depend. Many are deeply concerned by the
depletion of marine diversity, though they do not always seem to understand -- and even more rarely embrace -- the proactive role they must inevitably take to preserve such diversity. Collaborative efforts like the NSLTwG’s sea turtle conservation programme help fishers see how they can contribute. They give fishers a way to express the value they place on the sea in something other than monetary terms. In a society often overly concerned with economic gain, this is a message of hope not just for leatherbacks, but for all species.

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Notes

1 The definition of altruism assumed in this paper accepts altruism as a relative ethic. It defines altruism as helping another without expecting material reward in return, although it may indeed entail the internal benefit of a good feeling derived from any number of sources, including positive social feedback (Audi 1995). It should be noted, although there is positive social feedback from sectors like the scientific community or the general public, fishers who volunteer with the NSLTwG do not generally receive positive social feedback from their peer group. In fact, the opposite is often true. Fishers participating in voluntary conservation initiatives are often breaking the accepted social code (as discussed later in this paper) for a higher social good that they perceive, which others among their peers do not. There is no way to ‘repay’ the cultural risk entailed in this kind of action; there is no currency for it. It is simply altruistic.

2 The landed value of shellfish (primarily lobster, shrimp and snow crab) has nearly tripled in recent years jumping from $589.2 million CAD in 1992 to $1.5 billion CAD in 2002, with Nova Scotia’s landings representing forty-one per cent of the total value.

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