


AN ABSTRACT OF THE THESIS OF

Kristin E. Bird for the degree of Master of Arts in Interdisciplinary Studies in Applied Anthropology, Wildlife Science, and Philosophy presented on April 12, 2002.

Title: Community-Based Sea Turtle Conservation in Baja, Mexico: Integrating Science and Culture.

Redacted for Privacy

Abstract Approved: _____

 John A. Young

This thesis discusses both theoretical and practical considerations inherent in conducting community-based research within a case study of sea turtle conservation in Baja California, Mexico. A brief background, including the general ecology, status and distribution of sea turtles of the Baja peninsula is presented, with an overview of the current and historic use and management of sea turtles. Several sets of theories provide the context within which the case example is analyzed. A discussion of how concepts of "science" and "knowledge" are shaped and how these perceptions impact choices made in natural resource management and planning is presented. This includes a brief discussion of conservation ethics and conservation rationale, as well as a review of the debates surrounding indigenous knowledge and its application in conservation. A review of community-based efforts in sea turtle conservation is also presented.

The data and analysis offered in this thesis is the result of two field seasons working as a member of an interdisciplinary sea turtle conservation team: conducting biological studies, surveys, informal and semi-structured interviews and participant observation. The major goal of this research project was to evaluate a people-oriented

approach to conservation. The objectives of the Baja sea turtle conservation project included: the involvement of fishing communities in the development of conservation projects, the involvement of local students and fishermen in the collection of data and the public sharing of research results on a regular basis.

Results of this case study suggest that through dependence on the host community - for food, equipment, labor and guidance - a special connection was established, fostering trust and building the partnerships necessary for long-term conservation success. For this reason, fishermen and other members of the local host communities were more willing to cooperate with outsiders and share their intimate knowledge of their environment - including information on the daily movements and distribution of sea turtles. It is crucial that the fishermen feel empowered before they choose to participate in the sea turtle conservation efforts. They must be viewed, and view themselves, as an integral part of the conservation team contributing valuable knowledge and ideas, not just acting as boat drivers and guides for outside researchers within the host community. Community meetings served as an outlet to voice concerns and share information. The active involvement and participation of local communities is a highly effective tool in the sea turtle conservation efforts in the region.

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COMMUNITY-BASED SEA TURTLE CONSERVATION IN BAJA, MEXICO:
INTEGRATING SCIENCE AND CULTURE

By
Kristin E. Bird

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Arts in Interdisciplinary Studies

Presented April 12, 2002
Commencement June 2002

Master of Arts in Interdisciplinary Studies thesis of Kristin E. Bird presented on April 12, 2002

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Kristin E. Bird, Author

ACKNOWLEDGMENTS

Over the past several years that I have been involved in this project there have been many people who have helped me along the way, providing support and encouragement where needed. My first thanks must go to Dr. Wayne Decker at the University of Arizona in Tucson (and a good friend of the family) for having the foresight to introduce me to Wallace J. Nichols ("the turtle man"), then a Ph.D. student at the University of Arizona, and opening that initial door into what would eventually develop into my thesis work. I am very grateful for the continued assistance, encouragement and support provided by J. Nichols of WILDCOAST. He has helped me immensely during the course of this research project, and has been a constant source of inspiration in my visions for an integrative approach to natural resource conservation.

While living and working in Baja, many people assisted me in pursuing my research interests. I wish to extend my thanks to Salvador Garcia-Márquez of the School for Field Studies (SFS) Center for Coastal Studies, who helped in the research design and provided me with the opportunity of working with the SFS students. I also wish to thank Carlos de Alba Pérez, SFS Center for Coastal Studies Director, and the rest of the faculty, staff and students at the Center for Coastal Studies in Puerto San Carlos, Baja California Sur, particularly Pam Kylstra and Rodrigo Rangel, as well as the WILDCOAST researchers: Louise Brooks, Barb Edwards, Adan Hernandez and Serge Dedina. *Muchas Gracias* go out to Antonio Resendiz and the folks at *Campo*

Arbelon in Bahía de Los Angeles - for the *cerveza, pescado*, good conversation and company.

I am particularly grateful for the support shown by all of the individuals who granted me an interview and wish to especially acknowledge Isidro Arce Arce, as well as the fishing cooperatives of Puerto San Carlos and Punta Abreojos for allowing me to sit in on some of their meetings and record my observations. A big thanks goes to Cynthia Graber of NPR's *Living on Earth*, for sharing transcripts from her interview with J. Nichols, as well as her company, conversation and assistance during the important cross-regional meetings in Punta Abreojos. Additionally, I would like to acknowledge the Education Foundation of America for providing the financial assistance, which made my second season of work on this project possible.

My work on this project did not end when I left the field. There have been many people who have helped me process all of the information and experiences I brought back with me, providing valuable feedback and critique as well as encouraging me in my interests to present my research at several conferences. In particular, I would like to thank my professors at Oregon State University. My major professor, Dr. John Young did a thorough job of reviewing my drafts and providing valuable critique and suggestions which continually challenged me to produce my best possible thesis. Dr. Court Smith also provided valuable discussion and feedback on several of my early papers, which we eventually developed into the basis of my thesis. I also wish to acknowledge Dr. Peter List for all of the enlightening conversations which challenged me to view my research from multiple perspectives, as well as his assistance

in developing my earlier drafts. Special thanks go to my office “moms” Karen Mills and Loretta Wardrip and my fellow graduates, for always keeping my spirits up during the entire thesis writing process. Last, but not least, I wish to extend my thanks to Charles Tambiah (Community Participation & Integrated Sea Turtle Conservation Initiative) for the valuable feedback, critique and rewarding collaborations, which have enriched my education and experience.

Muchas Gracias a todo!!

Thank you all!

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LIST OF ABBREVIATIONS USED

CBC	Community-Based Conservation
CETMAR	Centro de Estudios Tecnológicos del Mar
COMITE	Comité para la Protección de las Tortugas Marinas
IK	Indigenous Knowledge
PRI	Institutional Revolutionary Party
PAN	National Action Party
PROFEPA	Federal Agency for Environmental Protection (a branch under SEMARNAP)
SEMARNAT	Secretary of the Environment and Natural Resources
SEMARNAP	Secretary of the Environment, Natural Resources, and Fisheries (recently reorganized as part of SEMARNAT)
SFS	The School for Field Studies
UABCS	Universidad Autónoma de Baja California Sur

This thesis is dedicated to my parents, Joyce and Terry Bird,
and to my sister Kim.
For always believing in me.

COMMUNITY-BASED SEA TURTLE CONSERVATION IN BAJA, MEXICO: INTEGRATING SCIENCE AND CULTURE

INTRODUCTION

"The question of how best to promote greater stewardship of marine resources cannot be resolved without also addressing the needs and concerns of the small-scale fishers who depend on such resources for their livelihood."

(p.582 McGoodwin, 1990)

In late May of 1999, I packed my jeep, left my home in a small Southwestern Arizona border town and started a journey deep into the Baja peninsula. I wasn't quite sure what I was getting into, except that I was slated to help in some sea turtle research and conservation projects going on in a place called Bahía Magdalena. At the time I didn't know that I was beginning research that would become the basis of my Master's thesis. I just thought it would be a great way to spend the summer before I started my graduate program.

I first learned about this project by chance. While living south of Tucson, a friend of my family had put me in touch with a researcher named Wallace "J." Nichols who was completing his Ph.D. dissertation at the University of Arizona. J and I met over coffee, he told me about his research on sea turtles and about his research approach and philosophy. Like me, his training was based in the biological sciences, though our interests had broadened into the pursuit of a better understanding of the human dimensions within natural resource use and conservation.

I told J about my experiences: how I had traveled to East Africa as a participant in a “community wildlife management” program offered by the School for Field Studies (SFS) at their field station in Kenya, eager to observe and learn about wildlife species that I had only ever experienced on TV or in zoos, but that the most profound impact of my time there was seeing first hand how the people, land, and all its resources, were connected. While I was still greatly interested in our wildlife resources, I had come to realize that there was much more to the practice of conservation than just working with wildlife. I came back with the desire to understand the human dimension within conservation: what shapes the values and opinions that motivate peoples’ actions towards natural resources?

When J told me that he worked in connection with SFS at their field site in Mexico, I became even more interested in the Baja sea turtle project. My familiarity with the organization also made me more appealing as a research assistant for the project. He told me that I would be working with local *pescadores* (fishers)¹, learning about their lifestyles and their views about sea turtles and the bay and that the research project involved biological and socioeconomic research. J’s main interest was the involvement of local people in the conservation efforts. I saw it as a great opportunity to help educate about sea turtles and the importance of marine resources, while getting an education about the people of Bahía Magdalena, their needs and values. We shared a vision of conservation that involved finding possible solutions to protect the sea turtles *and* the traditional ways of life -- and income -- for these people. Happy in the

¹ The local term *pescadores* will be used in reference to members of the local fishing communities.

recognition that we were of similar mindset, both trying to overcome challenging barriers in the way of truly integrative approaches to resource conservation - mainly those from the "strict scientists" - he offered me a position on the spot and I gladly accepted. A few weeks later I was on my way to Mexico hoping my two years of high school Spanish would at least get me to Magdalena Bay safely.

After 3 months in the field and a nice long, scenic drive north, I started my graduate program at Oregon State University in the fall of 1999. As someone pursuing a future as an environmental anthropologist and conservation biologist, I was happy to be accepted into the MAIS program where I felt I would be able to pursue my conservation interests in a more integrated and holistic approach. I was drawn to applied anthropology, in particular the emerging fields of environmental and conservation anthropology. When I originally applied for the program, I was considering going back to Africa for thesis fieldwork, however, when I returned from my field season in Baja, I couldn't think of anything but the sea turtle project. Apparently, I had become one of "them" -- the so-called "turtle people." During my first term, small papers on the topic of community-based conservation and the sea turtle project grew into my main focus of interest. By the end of my first term as a graduate student, I knew that this would become my thesis work.

In the following pages, I will describe my experiences working on sea turtle conservation initiatives within several small coastal communities in Baja California during the summers of 1999 and 2000. I will first describe background information relevant to this case study, including a brief outline on the geography and history of

Mexico's Baja peninsula. I will also provide information on the general ecology, status and distribution of sea turtles, with a focus on those species of the eastern Pacific that frequent the waters surrounding Baja California Sur. Next I will review some of the pertinent theory in the literature, including a discussion of community-based conservation and human dimensions in natural resources. I will describe some of the current issues surrounding sea turtle conservation initiatives in Baja and present a brief history of community-based conservation initiatives relevant to the case study. I will also present some background on current debates over the use of local knowledge in conservation, including a look at the different management paradigms and research approaches in question. I will explore how concepts of "science" and "knowledge" are shaped and how perceptions of these and other ambiguous terms -- like "ecosystem management," and community "participation" -- impact choices made in natural resource conservation management and planning.

The data I am presenting has been generated through surveys, informal and semi-structured interviews and participant observation. I will demonstrate how active involvement and participation of local communities are highly effective tools in sea turtle conservation initiatives in the region. In particular, the cooperation of the fishing communities has been integral to the research efforts and collaboration with the community has resulted in conservation success.



Figure 1. Preparing the nets, Punta Abreojos
(Photo: Terri Garland; courtesy of J. Nichols)

BACKGROUND

Mexico

Mexico is formally recognized as the United Mexican States. It covers an area of approximately 761,600 square miles (1,972,500 square km), making Mexico about three times larger than the U.S. State of Texas and the 13th largest country in the world. Mexico and the United States share a border of about 2080 miles (3,330 km) extending from the Atlantic to Pacific (U.S. Department of State, 2001).

Highly advanced Amerindian populations -- such as the Aztecs, Toltecs, and Mayas -- have existed for thousands of years in the area now known as Mexico. During the early 16th century, Spanish conquistadors led by Hernando Cortes, succeeded in founding a Spanish colony. This colonial rule was maintained for nearly 300 years, until Father Miguel Hidalgo declared independence on September 16, 1810. Several years of war followed, culminating in the formation of a republic in 1824 (U.S. Dept. of State, 2001). However, during this major time of transition and hardship, the new government remained unstable. After the war over Texas with the United States during 1846-1848 and attempts at a monarchy rule, a 10 year revolution finally erupted in 1910. It was not until 1917 that the Mexican Constitution was signed. Shortly thereafter, what is now known as the Institutional Revolutionary Party (PRI) was formed. Up until the most recent elections the PRI controlled the entire Mexican government. This changed on July 2, 2000 when a member of the opposition National Action Party (PAN) and the Alliance for Change coalition, Vicente Fox, won

the presidential election. His inauguration on December 1, 2000, ended 71 years of the PRI government domination. (U.S. Dept. of State, 2001).

Today, Mexico is the largest Spanish-speaking country in the world, and the majority of the population are *mestizos*, of Amerindian and Spanish descent. About 30% of the entire population is "Amerindian," and speak various Mayan dialects, while only 9% are "caucasian." Additionally Roman-Catholicism is the predominant religion in the country, with close to 90% of Mexicans of various descent followers of this faith (United States - Mexico Chamber of commerce, 2001).

The 2000 Census indicated that Mexico's population was close to 98 million. Of this 98 million, approximately 74% of the population is concentrated in urban areas (towns of over 2,500 inhabitants) and nearly 20 million people inhabit the capital Mexico City, making the Mexico City metropolitan area the most heavily populated in the world (U.S. Dept. of State, 2001). Many people migrate to this metropolis or to heavily populated border towns, such as Tijuana and Ciudad Juarez, from rural areas where jobs are often scarce. While the annual population growth rate (2000) was estimated to be approximately 1.6%, the net migration rate was listed as -2.8% (United States-Mexico Chamber of Commerce, 2001). In 1999 alone, nearly 340 million legal crossings from Mexico to the United States were recorded (U.S. Dept. of State, 2001). Countless others cross the border into the United States illegally every year.

The Baja California Peninsula

The Baja California peninsula, which extends into the Pacific Ocean south of U.S. California, is comprised of two *estados* (states): Baja California and Baja California Sur (figure 2). The entire length of Baja is just over 800 miles (1300 km), making this peninsula twice the length of the U.S. State of Florida and the fourth longest peninsula in the world, after the Kamchatka, Malay and Antarctic (Cummings, 1998). With the Pacific Ocean to the west and the Gulf of California – also called the Sea of Cortez -- to the east, the Baja peninsula is bordered by nearly 3,000 miles (4,800 km) of shoreline. The interior of the Baja peninsula's 55,000 square miles (144,000 square km) of land mass and 930 square miles (2,460 square km) of islands and islets is sparsely populated. The majority of Baja's population is concentrated in the few urban areas – the border towns in the north, and the Cabo region to the south.



Figure 2. Map of Northwestern Mexico, showing the Baja California Peninsula
(Source: www.maps.com)

Bahía Magdalena

Bahía Magdalena - a large mangrove estuarine complex on the Pacific side of the peninsula -- is one of the largest bays in all of Baja with an overall length of about 2236 km and a width that varies between 5 and 25 km (figure 3). Five major barrier islands border the bay: Isla las Animas, Isla Santo Domingo, Isla Magdalena, Isla Margarita and Isla Creciente. Due to its location between Pacific and California ocean currents -- which allows for a mixture of both warm and cold water species -- and the relative protection that the barrier islands provide, Bahía Magdalena is a highly productive ecosystem which boasts enormous biodiversity. The mangroves of this bay are thriving within the northernmost reaches of their range; their presence is a unique feature of the coastal ecology, which contributes to the high productivity of a bay that has been called "the Chesapeake of the Pacific" (Dedina, *pers. comm.*).

Numerous fish camps are scattered along the coastline of Magdalena bay, many of which are only occupied seasonally. There are also a few permanent settlements, most notably the towns of Puerto A. Lopez Mateos, Santo Domingo, Puerto Magdalena and Puerto San Carlos -- the largest settlement in Bahía Magdalena. Traveling west through the agricultural fields of the Santo Domingo valley you will arrive in Puerto San Carlos, approximately 60 km from Ciudad Constitucion, one of the larger cities along MEX highway 1, the only major highway that runs along the entire length of the Baja peninsula. The population of Puerto San Carlos varies

seasonally with the fisheries, and can range between 3000-5000 people. Bahía Magdalena and the town of Puerto San Carlos are about 800 miles south of the United States border.

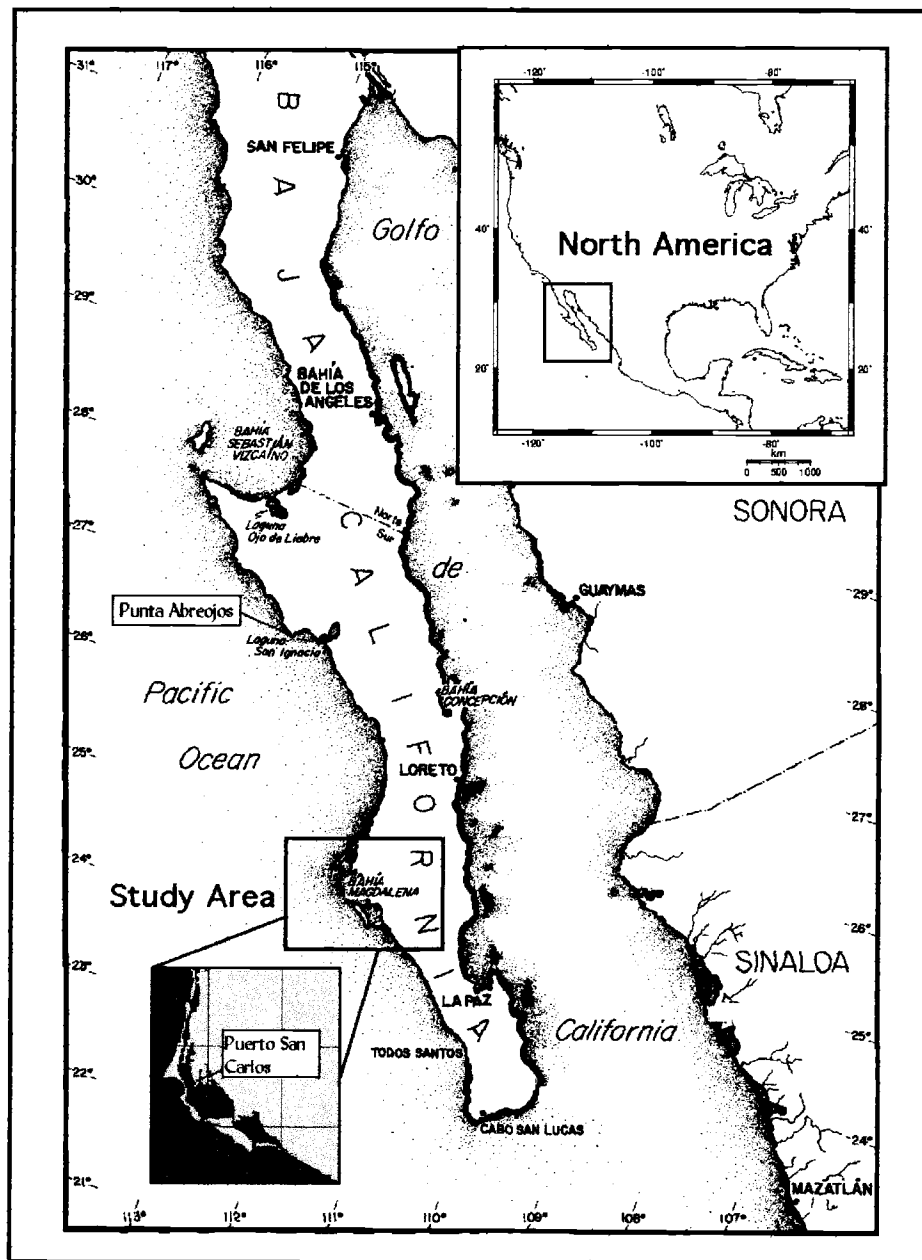


Figure 3. Main Study Areas: Bahía Magdalena, and Punta Abreojos
(Modification of map originally appearing in: Nichols et al., 2000)

Many of the towns on the shores of Bahía Magdalena were settled by *rancheros* (ranchers) from the Santo Domingo valley and surrounding area. While Magdalena Bay was first discovered by *conquistadores* (explorers) in the 14th Century, migration to this region did not get underway until the 1920's when inland agricultural projects began to fail and new means of subsistence - shell and finfish - were sought (Dedina, 2000). More permanent settlement began in the late 1950's when the cannery and deep-water port projects were initiated in Puerto San Carlos that more permanent settlement began. Since that time people have continually been migrating to the town. Though many who currently inhabit Puerto San Carlos have lived there for a number of years and consider themselves residents of the area, their roots may lie in other states in mainland Mexico - Sinaloa, Sonora, Chihuahua or Nayarit, for example (Bostrom *et al.*, 1999). Today, migrant *pescadores* continue to come from the mainland and other parts of the Baja peninsula in order to exploit the resources seasonally.

The people of Puerto San Carlos have been called "the people of the mangroves" - they form a resource-dependent community (Dedina, *pers. comm.*), relying on marine and coastal ecosystems for their livelihood and survival. While there is a cannery, port and large-scale commercial fisheries, as well as a thermoelectric plant in the area, the community and character of Puerto San Carlos rests on the shoulders of small scale artisanal *pescadores* and their families. Some *pescadores* are a part of a *cooperativa* (fishing cooperative), some are among the many *pescadores libres* (independent fishermen) in the region.

Communities are never completely homogeneous, and Magdalena Bay is no exception. Many factors contribute to variation in perspectives; factors such as age, gender, occupation, education, religion, and state of origin influence how people view their environment and how they prioritize their interests in specifics of that environment. Even within a locality the diversity of perspectives and values that arise from differences may make it difficult to reach consensus or unity within the community setting. When it comes to resource use and management, the task can become even more of a challenge, particularly when the specific resource in question is surrounded by controversy. Emily Young (1999) suggests that "a patchwork of individuals and families of various origins with a relatively short collective history must build a sense of community and a collective set of values that will govern interpersonal relationships and local resource use" (p.373). This type of situation exists within Puerto San Carlos and many of the other coastal communities of Magdalena Bay and all of Baja California.

The School for Field Studies

Since its foundation in 1980, The School for Field Studies (SFS) has been leading environmentally based field studies abroad for undergraduates and exceptional high school students. Currently, SFS administers six main field stations: the Center for Sustainable Development Studies in Costa Rica, the Center for Wildlife Management Studies in Kenya, the Center for Rainforest Studies in Australia, the Center for Marine Resource Studies in the British West Indies, the Center for Coastal

Rainforest and Fisheries Studies in Pacific Northwest Canada, and the Center for Coastal Studies in Mexico: each focusing on a different aspect of environmental problem solving.

The SFS approach to education encourages students to live and learn where they can make a difference. The SFS goal is to enable students to come away from an SFS study abroad experience “with an understanding of the complexity and inter-relatedness of environmental issues, as well as an increased commitment and new skills to help improve the environment and the lives of people dependent on that environment.” (School for Field Studies, 2000). They achieve these objectives through:

- 1) working on real problems, based in resource-dependent communities that have requested the assistance of SFS in addressing local resource issues.
- 2) using an interdisciplinary approach.
- 3) engaging students in hands-on learning.
- 4) promoting direct involvement in the local community, through educational and social activities and cross-cultural exchange.
- 5) requiring students to participate in a problem solving team.

Students participate as members of smaller groups that engage in various research projects. This type of experiential learning can lead to profound changes in worldviews and conservation ethics, and bring a greater awareness about the reality of resource conflicts, not only for students, but also for people within the local community, as well as the researchers involved there.

Puerto San Carlos is home to the SFS Center for Coastal Studies, *Centro para Estudios Costeros*. There they engage in a variety of ecological studies and social

research projects within the community and surrounding environment. Over time the school and its students have become a permanent part of the local community. Incoming students from abroad bring new ideas into the community – as well as a boost for the local economy – and are looked upon favorably by members of the local community. Because of several years of good relations and working in partnership with locals, the school has situated itself within a positive atmosphere for successful conservation research projects.

Recent research topics at the school have involved investigating issues related to sea turtle conservation within Bahía Magdalena and situating that research within a broader regional and global context. Additionally, the SFS center for Coastal Studies contributes directly towards community-based research in sea turtle conservation efforts via public outreach, education and cross-cultural exchange. During the summers of 1999 and 2000, students at the SFS Center for Coastal Studies engaged in several projects related to sea turtle conservation. The school continues to organize directed research projects related to sea turtle conservation efforts as a part of student curricula.

During my time in Magdalena Bay, my home was the SFS Center for Coastal Studies in Puerto San Carlos. They provide accommodations for visiting researchers and there is usually space for several research assistants. A cooperative agreement between SFS and the researchers allows researchers to pay a reduced rate for their accommodations in exchange for involving students in certain aspects of the research

and data collection. Visiting researchers are often asked to present special lectures as part of the student curricula as well.

As a research assistant with the sea turtle project in 1999, my accommodations were covered through research grants provided to J. as a part of his academic work in pursuit of his Ph.D., and later by the newly formed organization WiLDCOAST, a partnership-based international conservation team. When I returned as more of an independent researcher in order to collect data specifically for my thesis in the summer of 2000, I was responsible for covering my own expenses. Fortunately, as an alumnus of an SFS program (summer 1997, Kenya) acting as a research intern under an affiliate organization, WiLDCOAST, I was eligible for some assistance from the school. While I was still responsible for paying for my room and board at the academic researcher rate, SFS provided me with a stipend to help defray my costs, particularly the expense involved in driving from Oregon and back (for specifics of this internship agreement, see Appendix 1— Internship summary report).

Punta Abreojos

Punta Abreojos is also located on the Pacific side of the peninsula, though in the northwestern part of Baja California Sur close to the border with the state of Baja California (see figure 3 above). Punta Abreojos is a small, but relatively wealthy fishing community. Their wealth is due in part to the richness of the marine resources off shore, including abalone, lobster, shark, and tuna. However, the majority of their wealth lies in the solidarity of the community and one highly organized and successful

fishing cooperative of approximately 192 members. There are 20 board members in leadership positions for the cooperative, and these positions are changed through elections every 2 years. The community has a very strong “sense of place,” taking pride and ownership in their resource base. Their leadership has been honest and strong, and they enforce the fisheries regulations in order to protect their resources. Since no outsiders are legally allowed to fish in their concession, they know that they cannot blame anyone else for poor management or a decrease in their resources (Arce, *pers. comm.*).

Three families settled the town in the early part of the 20th century, when settlers came from San Ignacio by burro, looking for work on the coast. After the power plant was built in 1960 and the desalinization plant constructed in 1976, things became much easier for the residents of Punta Abreojos. Prior to this time, they lived on *machaca* – salted dried meat, and relied on shipment of drinking water from outside of the community. At one point in time water was shipped from San Diego; the boats were rowboats since there were no motorboats at that time (Arce, *pers. comm.*; Dedina, 2000).

Within the world of environmental activism, Punta Abreojos – and more specifically, San Ignacio Lagoon adjacent to this town – is well known for the battles fought over the proposed construction of a salt works by Mitsubishi. Numerous action alerts and calls for donations were sent out to environmentalists urging to fight for protection of the lagoon, a major calving ground for gray whales. For the people of Punta Abreojos, the salt works project would have created a giant pier in the middle

of their fishing grounds and they were extremely worried about the further development and pollution that would come of the project, including the resulting migration to the area.

When I asked one Punta Abreojos resident if he would want a better road into town, he stated "No. As an individual, I know that a better road would mean more development. As a [fishing] co-op member, I don't want a better road like in Puerto San Carlos. A paved highway brings thieves and people who want to exploit the resources." He goes on to say that poaching problems exist in Puerto San Carlos because of the easy access and lack of control and enforcement of the fisheries regulations. Because people come from all over Mexico to exploit the resources of the Magdalena Bay region, there is not the same sense of place and respect for their home as exists in closed communities like Punta Abreojos. Regarding the idea of improving the road into town, it has been said that "it is better to lose a muffler or two than to lose everything" (Arce, *pers. comm.* 2000).

In the end, the people of Punta Abreojos found success in their battle with Mitsubishi. This success was largely due to the solidarity of the town's fishing cooperative and their affiliation with several environmental organizations and advocates – like WILDCOAST and the Water Keepers Alliance. They feel very strong as a cooperative as a result of this success. One fisherman states that the conflict with Mitsubishi was like "a mouse against a lion," but now they feel like "the mouse can beat the lion." This has led to a renewed sense of pride within their community.

Sea Turtle Ecology and Management

Sea turtles are among the oldest lineages of extant reptiles. Prehistoric sea turtles swam the oceans during the time dinosaurs roamed the earth and evolution has changed sea turtles little since then. The earliest known fossils of ancient sea turtles date back to 150 million years ago and suggest that turtles evolved from ancestral marsh-dwelling lizard like reptiles. Fossil evidence suggests there were four families of prehistoric sea turtles -- Toxochelidae, Protostegidae, Cheloniidae, and Dermochelyidae -- existing approximately 65-70 million years ago, during the late Cretaceous Period. Presently, only two of these families are still in existence, Cheloniidae -- the hard-shelled turtles -- and Dermochelyidae, comprised of one extant species, the leatherback (Ripple, 1996).

Today, seven species of sea turtles exist worldwide: the loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*), Kemp's ridley (*Lepidochelys kempi*), hawksbill (*Eretmochelys imbricata*), the green turtle (*Chelonia mydas*) and East Pacific Green -- or Black turtle -- (*Chelonia mydas agassizii*), and the Australian flatback (*Natator depressus*). All sea turtles are currently listed as threatened or endangered.

All species of sea turtles share similar basic characteristics though are distinguishable by physical variations and behavior. Sea turtles have an external shell; the top portion is referred to as the carapace and is joined by cartilage to the bottom shell, or plastron. The carapace is covered by scutes, small bony plates, except the leatherbacks who get their name from their leathery carapace. While the different

species grow to various sizes, juveniles or adults of a species can always be identified by the number and arrangement of scutes on the carapace.

Due to their highly migratory nature, sea turtles have been referred to as "nomads of the sea" (Ripple, 1996). Once they hatch out from their eggs on nesting beaches and enter the sea, male turtles remain at sea for the rest of their lives. During the breeding season, a successfully mated female will crawl onto the beach to lay a clutch of eggs in the sand, bury them, and return to the sea – all before dawn. She may lay several clutches within a season, as the gestation period is only a few weeks. Copulation can last for as long as 12 hours, a pair remains locked together all day or all night. This gives the sea turtles legendary status with the *pescadores*, and leads to the notion of turtle eggs possessing aphrodisiac qualities.

The Sea Turtles of Baja California

Many of the nearshore waters of Baja California serve as critical habitat in the growth and development of many sea turtles. The protected bays and lagoons that surround the Baja peninsula are important in the life history of several species of sea turtles. Of the five threatened or endangered sea turtle species known to inhabit the coastal waters of Pacific Mexico, two species most commonly frequent the waters within and adjacent to Magdalena Bay: the East Pacific green turtle -- or black turtle -- (*Chelonia mydas*), and the loggerhead turtle (*Caretta caretta*) (Clifton *et al.*, 1995; Nichols, 2001). The coastal waters around the Baja California peninsula serve as critical feeding and developmental habitat for these and other sea turtles, after they migrate from

nesting beaches as far away as Michoacán, mainland Mexico (Nichols *et al.*, 1998) and Japan (Nichols *et al.*, 2000).

Current and Historic Harvesting of Sea Turtles

Sea turtles have often held a unique place in the creation mythology of many cultures. The Seri Indians of Sonora, northwest Mexico, believed the world to be born on the back of a giant leatherback turtle (Ripple, 1996). Accounts dating back to the 1800's indicate that the Seri were among the most skilled of turtle hunters and have been practicing their skill since ancient times (McGee, 1898; Smith, 1974; Clifton *et al.*, 1995). In the early days the Seri used harpoons, most often harvesting green sea turtles in the northern Gulf of California. However, when a leatherback was caught, the Seri would engage in a several day long ritual ceremony – elaborately decorating the leatherback and keeping it under a thatched-roof shelter while singing and dancing around it. After the ceremony, the leatherback would be returned to the sea (J. Nichols, *pers. comm.*). Today, the Seri continue to eat turtle meat and consider it an essential part of who they are.

While the sea turtle may figure prominently into the mythologies of some indigenous coastal people, these types of spiritual connections are not the only connections between turtles and coastal inhabitants. Sea turtles have been extensively hunted for subsistence and commerce. The meat, blood and oil are seen as excellent sources of protein and virility, while the eggs have long been considered an

aphrodisiac. The carapace, particularly of the hawksbill, has often been used for "tortoise shell" jewelry. Sea turtles have also been harvested for their leather.

Today, coastal communities worldwide continue to utilize sea turtles according to their traditions and culture despite evidence of decreasing turtle numbers and strict laws prohibiting turtle harvest and use (for some examples see: Frazier, 1995; King, 1995; Kowarsky, 1995; Nietschmann, 1995; Parsons, 1962; Tambiah 1989; Tambiah 1995). In northwestern Mexico, and specifically the Baja California peninsula, turtle use originated as subsistence harvest, but over time this use broadened into a directed fishery (Clifton *et al.* 1995; Caldwell, 1963). In addition to the food that turtle meat provided for an individual fisher's household there were increasing economic benefits associated with the sale of turtle meat in the market, regionally and internationally. Although it is hard to place an actual monetary value on sea turtles now, the estimates received from conversation with locals ranged between 15 and 400 pesos (US\$1.50-\$42) per kilogram.

Nichols describes the cultural significance of sea turtles in Baja California as having the food quality of filet mignon and the addictive quality of coffee while possessing the same traditional symbolism as a Thanksgiving turkey (*SFS Center for Coastal Studies lecture*, 2000). Whether you look at turtles from the perspective of cultural traditions, or as an economic or food resource, sea turtles are arguably among the most important species in northwest Mexican culture.

Legal Framework and Political Economy

For many years, the taking of turtles in Mexico was a legal industry -- largely unregulated -- and turtles seemed inexhaustibly abundant. As many as 375,000 turtles were harvested between 1966 and 1970 (Clifton *et al.* 1995). As turtle populations began to decline, size limits and closed seasons were enacted. However, by the end of the 1980's it was increasingly obvious that such large-scale harvest was not sustainable. The existing management schemes were glaringly ineffective and the international pressure to do something about it was growing. Broad legal protection of sea turtles in Mexico came with President Salinas' Executive Order (*Acuerdo*) on May 31st, 1990 issued by the Mexican Ministry of Fisheries and the Ministry of Urban Development and Ecology (now SEMARNAT). The *Acuerdo* established "a prohibition for the species and subspecies of sea turtles in waters of federal jurisdiction in the Gulf of Mexico and Caribbean Sea, as well as those in the Pacific Ocean, including the Gulf of California" (DOF 31 May 1990). Article two of the *Acuerdo* states that the Mexican Federal Government strictly prohibits the pursuit, capture, and extraction of any species of sea turtles on any beaches or in any federal waters. Article Three specifically states that "the specimen of any species of sea turtle incidentally captured... shall be returned to the sea, independent of its physical state, dead or alive..." (DOF 31 May 1990). This total and permanent ban on sea turtle harvest was considered an environmental victory to the outside world and the international pressure ceased.

It has been stated that "the surest way to drive a species [in Latin America] to extinction is to give it total protection... You must exploit something, even a token

quota to maintain control of the fishery" (Suarez, *as quoted in* Clifton, 1995). While a total ban sounds good in theory, the reality is that the legislation was simply passed and then unregulated. The only real outcome of the ban has been that turtle harvest has shifted from a legal to illegal activity, driving the prices up and rewarding those individuals in noncompliance with the legislation.

The taking of turtles within Magdalena Bay and other coastal communities in Baja continues presently despite evidence of decreasing turtle numbers and the passing of these strict laws prohibiting their use. Compliance is at a minimum within the community primarily due to the weakness of enforcement measures and the strong traditional use of turtles during holidays and special events. Additionally, capture of sea turtles continues to occur in gillnets of local *pescadores* in many coastal communities, whether it is through incidental bycatch, or intentional harvest.

However, not all *pescadores* who have been harvesting turtles since the ban should be considered intentional poachers. There has been much confusion over the legality of taking turtles for private household consumption, because the legislation makes specific reference to commercial fisheries. Additionally, Article 4 of the general Mexican Fisheries Law states that for the capture and harvest of marine resources, a permit or concession is required except for domestic consumption (DOF 25 June 1992). In the recent past, a common misperception has been that it is legal to take turtles that have been accidentally caught in their nets, especially if freshly dead. This has often been used as an excuse for taking turtles, though it would be difficult to determine whether or not a turtle was actually dead when first encountered in the nets.

However, Article 24 Fraction XIX of this same Mexican Fisheries Law states that it is an offense to pursue, capture, possess, transport, or trade a species that has been commercially banned because it is threatened or endangered (DOF 25 June 1992). It is apparent that discrepancies exist between Article 4 and Article 24 of the general Mexican Fisheries Law.

Article 420 of the Mexican Federal Criminal Code (DOF 13 December, 1996) states that the intentional capture, damage and privation of any species of sea turtle is a criminal offense. The penalties for sea turtle related offenses are stated in Article 24, Fractions VI, XX, and XIX of the Mexican Fisheries Law and Article 420 of the Federal District Criminal Code, and are as follows:

- Any fishery simulated for domestic consumption with commercial ends is considered an offense to the law, and may result in confiscation of the sea turtle and/or the vehicle as well as a fine that varies between 101 and 1,000 times the minimum wage (approximately US \$316.10 and US \$3,157.89) (Mexican Fisheries Law, Article 24, Fraction VI);
- For the capture, possession, transportation, or commerce of banned species there could be a revocation of the concession, permit, or authorization; confiscation of the sea turtle; decommission of the vehicle and/or a fine that varies between 1,001 and 2,000 times the minimum wage (approximately US \$3,161.05 and US \$6,315.79) (Mexican Fisheries Law, Article 24, Fraction XIX);
- For the capture of a sea turtle, there could be a revocation of a concession, permit, or authorization; confiscation of the sea turtle and vehicle and/or a fine that varies between 2,001 and 20,000 times the minimum wage (approximately US \$6,347.37 and US \$63,157.89) (Mexican Fisheries Law, Article 24, Fraction XX) and/or six months to six years in prison (Federal District Criminal Code, Article 420).

Although the legislation is in place to protect Baja California's sea turtles, enforcement is prohibitively expensive in such a vast area and *pescadores* have devised

elaborate methods of resisting enforcement. As such, laws and enforcement have not adequately abated harvest of and declines in turtle populations, especially in rural areas like Bahía Magdalena where the laws are misunderstood or disregarded and enforcement is infrequent. There remains a need for enforcement of such legislation, as well as a program to clearly explain the laws and their ecological purposes. As Reichart (1999) suggests, marginalizing the participation of local stakeholders nearly always ensures the failure of such legislation.

Local vigilance committees have proven successful in some areas, but this is not the norm. Community-based management solutions could be considered in concert with standard vigilance practices. Such an approach can lead to a sense of understanding, responsibility for the resource and feelings of empowerment through direct contribution to the conservation and management of the turtles that inhabit the coastal waters near fishing communities. Murphee (1994) states "conservationists now often prefer treating local people and their behaviors as a most effective vehicle for furthering their aims rather than unfortunate stumbling blocks" (p. 404). While the first step is at the local level, there ultimately needs to be cross-regional communication, collaboration and cooperation (Fallabrino, 2000). In addition to this communication, promoting public awareness through education and outreach programs needs to be further developed and implemented.

THEORETICAL BACKGROUND & LITERATURE REVIEW

Exploring Knowledge and Science

*"Science is not a revealed and unambiguous truth –
Today's science may be tomorrow's pseudoscience or vice versa."*

(L. Nader, 1996)

For centuries philosophers, mathematicians, scientists, theologians and the like have all been searching -- be it through trial-and-error observations or systematic research -- for answers to some of the most fundamental questions about our existence and our place in the universe. The realm of science has continuously been evolving in response to these curious investigations, yet how is "science" defined? An additional conundrum exists in our attempts to draw distinctions between "knowledge" and "science." What is clear, however, is that analysis is necessarily based in comparison and often the creation of highly oversimplified binary opposites such as modern/traditional, universal/particular, theoretical/practical or developed/underdeveloped are used to compartmentalize these constructs. Nader (1996) describes these dichotomous categories as part of a general tendency to organize things and create formal structures through which we attempt to understand the world. However, the construction of such categories also encompasses a general tendency towards ethnocentrism and positional superiority -- "the notion that one is superior by virtue of being in a position to create the categories or to draw the lines" (Nader, 1996:2).

Within the English language, the term "science" can be traced back to the 12th century where it was used simply as a general term for knowledge. It was not until the 18th century when a distinction was recognized between theoretical and practical knowledge and over time, the meaning behind the term "science" became increasingly associated with that body of theoretical knowledge and a particular method of hypothesizing and experimentation (Nader, 1996). Today, within this more restrictive concept of "science" there is at the same time an expansion of what science studies. While science is narrowing, becoming more particular, its scope of inquiry is also expanding and there has been a broadening of application beyond the biophysical realm towards social and humanistic domains.

Within what has been called the dominant western worldview, a system of knowing has been established based on the construction of hierarchies and systematics. Within this view, our western conception of scientific knowledge is seen as superior -- and therefore more valid -- than other "less sophisticated" forms of knowledge. This viewpoint has often been used to dominate these "subordinate" knowledge systems, and this has certainly been the case when dealing with indigenous knowledge. Systems of indigenous knowledge tend to be very holistic versus the more reductionist mentality of western science. Characteristics of western "expert" science, or "big" science, include: understanding isolated parts; categorization and construction of taxonomic and evolutionary hierarchies; and separation of the biophysical and human world. However, Agrawal (1995) argues that it is futile to attempt to demarcate the line between indigenous knowledge and western scientific knowledge considering

the difficulty of philosophers to find satisfactory demarcation criteria to distinguish “science” from “non-science.” I would also add to this our difficulty defining what constitutes valid “knowledge” of the world.

Due to the difficulty surrounding such debates, there has been a re-thinking of the relationship between western science and other forms of science. In recent years, it has been shown that indigenous knowledge systems are closer to western scientific knowledge than has been thought in the past. In some cases, indigenous knowledge systems may even be more “scientific” and “sophisticated” than western scientific systems. Many of the criteria used to describe western scientific investigations, such as hypothesis testing, experimental design and systematic observations, can also be used to describe systems of indigenous knowledge inquiry. In many cases, indigenous knowledge based on long-term observations – similar to the repetition used in western scientific approaches to hypothesis testing – has demonstrated a greater breadth and depth of knowledge of some aspects of the natural world. For example, several studies within the field of ethnoscience, have shown that indigenous knowledge systems, and particularly folk taxonomies, can provide more information about the plethora of species present within a locality than species counts conducted by outside western scientists (Hamilton & Walter, 1999; Poepoe *et al.*, in press).

Underlying Contributions of Anthropological Inquiries

Anthropology has historically influenced the myths about “the Other” which have been used in categorizations and comparisons within the science and knowledge

debates. Historical constructs of "the Other" as being backwards, primitive, uncivilized, and "scientifically illiterate" continue to endure be they overtly obvious or at a more subconscious level (Mascia-Lees *et al.*, 1989). Early ethnographic studies generated information that has since been used in political, social, or economic arenas, whether or not the anthropologist had any of these considerations in his/her agenda.

The postmodernist movement within anthropology arose primarily out of questioning the authority of the ethnographer, wondering where to place more weight, in "the other" or the outside expert interpreter? Much the same thing has happened within the field of conservation biology with questions over the authority of outside expert science. The questioning of ethnography lead to new perspectives about a holistic interpretation of "the other." Though we may try to be open to other systems of knowledge and ways of being, we can never truly escape an "us" versus "them" mentality -- often the only way to reach an understanding is through comparison. Even though many anthropologists are currently espousing the idea of cultural relativism, wherein such hierarchical categorizations are supposedly unnecessary, such constructs remain embedded in our culture and manifest themselves in various ways.

Within the fields of environmental anthropology and conservation science, these myths have lead to the potential discrediting of indigenous knowledge by western "expert scientists" in a position to make management and policy decisions. Narayan (1993) describes the conflict over "the Other" as an issue of power imbalance. In the case of anthropological "expert science" versus indigenous

knowledge, or "the Other," the question remains: "who is authorized to represent whom?" in the decision making process over natural resources within a certain location. It is a question of who is the insider, who the outsider, and who has the right or authority to speak for the needs of the community? Western scientists have often believed that they have superior knowledge. Likewise, anthropologists have also viewed themselves as advocates for communities that they believe would otherwise have had no voice in the decision-making process. For example, Hamilton and Walter (1999) suggest that because indigenous knowledge systems are a component of more complex cultural systems, the use of anthropological methods are needed in order to "describe and interpret...information in a meaningful manner" (p.13).

The traditional dichotomy between the emic and etic has often lead anthropologists into error. The newly emerging field of environmental anthropology, and similar subsets of applied anthropology, need to break down these dichotomies. Although the lines between the emic and etic can never be completely broken down, the incorporation of both are necessary in conservation planning. In the example of western science versus indigenous knowledge, both forms of knowledge provide a different perspective and level of detail, which are useful in management. A greater appreciation of the validity and importance of indigenous knowledge in real world situations is necessary. Taking this sentiment and applying it to environmental anthropology, supports the notion of cooperative management in which both "insider" and "other" are incorporated in the management of resources. When dealing with practical environmental concerns in need of immediate attention, it

becomes increasingly important to consider multiple perspectives and knowledge systems as a part of conservation programs.

Conservation Biology and Ethics Defined

Ethics are often determined by convention, established through personal and collective cultures, existing as ideals in human behavior. Although "ideals" are not fully attainable, ethics -- through a personal or collective consciousness -- often motivate behavior. Conservation ethics refer to those ethics relating to how individuals and/or groups should interact with the natural world (Attfield, 1998). The existence of an environmental ethic is not a new phenomenon, the roots of which can be traced back to Biblical times, as well as the early philosophies of Locke (1689) and Marsh (1885). Today, environmental ethics are not reserved solely for the educated, the ecologist, or the philosopher; ecophilosophies exist within the general population: all individuals hold beliefs or opinions about their ethical obligations to nature, even if they choose to "have no opinion."

Within the past decades, the field of conservation biology has begun to take on a whole new meaning. With the emergence of terms like "deep ecology," "sustainability" and "biophilia," we see a paradigm shift at hand (Wilson, 1988). Although these terms are often vague and surrounded by ambiguity as to their interpretations, they all exist as "ways in which people concerned with environmental ethics have searched for the personal and spiritual element of ecology that has been

missing in scientific ecology" (Berkes, 4). People are beginning to recognize their ties to the Earth as they witness its further degradation.

As one of my classmates suggested, some scientists who have spent their lives studying ecology, or specific organisms, are now taking on the role of "mystics" perhaps, as they delve into the realm of spiritual connections to the Earth, and advocating sustainability. And why not? For it is becoming all too clear that science and technology alone will not bring solutions to the crisis at hand. As Kellert (1996) states:

The task of conserving biological diversity may constitute one of the most critical challenges the human species has ever faced... Winning the hearts and minds of the general public and its leadership will be a necessity... Education and ethics, therefore, will be as important as science, policy, and management in attaining this goal. A knowledgeable and ethically responsible citizenry -- environmentally literate and morally concerned -- will be an indispensable ingredient in securing and restoring the integrity and health of the biosphere. (209-210)

Why Conserve Species?

A concern for the disappearance of species may be based on several value rationales. From a utilitarian standpoint, the loss of a particular species, group of species, or habitat may be directly linked to an individual or groups' ability to survive. While this survival mentality may encompass an immediate dependence on a food source, it may also become an issue of economic or political survivorship. Additionally, there are intrinsic values associated with the natural world. From this viewpoint, beyond any utilitarian values, the protection of species is inherently

necessary. There is a large body of literature discussing the issue of species preservation from both moral and political platforms (*for some examples see* Callicott, 1994 and Norton, 1987), however a lengthy discussion of this issue is not necessary given the context of this research. Suffice it to say that, from any standpoint, the loss of a species or species diversity is a cultural issue and raises serious ethical issues. For this reason, the sea turtle project case study in review, and similar conservation initiatives, need to be addressed within a cultural context.

Indigenous Knowledge and Ethnoscience

Several different terms have been used to describe just what it is that local people know, whether it is called indigenous knowledge, local knowledge, folk knowledge or traditional knowledge. The term used often varies by the discipline from which you speak. Certainly if you were the person who possesses such knowledge, it would just be something you know... just plain and simple knowledge of things around you. It would be something you possessed, something that existed without having to be defined. However, speaking from the outside, we need to call it something, and once we decide what to call "it," we need to decide on how to define "it," a task that leads to even greater confusion and ambiguity.

There are many definitions of indigenous knowledge (IK) circulating throughout the literature. Perhaps one of the most comprehensive definitions is offered by Grenier (1998). According to her, indigenous knowledge (IK) is:

The unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area... The development of IK systems, covering all aspects of life, including management of the natural environment, has been a matter of survival to the peoples who generated these systems. Such knowledge systems are cumulative, representing generations of experiences, careful observations, and trial-and error. (p.1)

A key characteristic of IK is that it is dynamic and adaptive. It is expressed through such things as song, dance, folklore, and myths. It is also deeply embedded within cultural beliefs, values, and community "laws." It can be witnessed through public health and healing practices, through agricultural/ horticultural practices, and local taxonomic classifications (Hamilton & Walter, 1999; Lagrotteria & Affolter, 1999; Soleri & Smith, 1999).

As globalization occurs, an ongoing battle is waged between indigenous knowledge systems and outside systems. Introduction of market-oriented practices, such as cash-monocropping and large-scale extraction of natural resources for commercial purposes often dissolve traditional ecological knowledge systems. Introduction of western values and an increase in development often lead to devaluation of indigenous knowledge systems and indigenous rights in relation to land tenure, intellectual property rights, and self-determination.

Local ecological knowledge is more than science; it is embedded in culture. For this reason, it can be argued that the removal of local knowledge systems is a removal of a local culture. Local knowledge is necessarily very adaptive and dynamic. The very definition of it is based on the passing of information from generation to generation, with modifications that reflect changes within the local environment.

However, currently indigenous knowledge has become very susceptible to erosion. The basic underlying factor lies in the way in which this knowledge is stored and transmitted. Since many knowledge systems are not recorded formally, there is no written account to check back on when a community is faced with changes in the local environment that are not gradual. Rapid changes within the environment may occur through development projects that fail to incorporate the needs and lifestyles of the indigenous people.

Indigenous knowledge is most often transmitted through oral communication and folklore, which encourages further subordination of “inadequate” and “unscientific” traditional systems that cannot necessarily be quantified or verified. The critical difference between local knowledge and big science really lies in their relationship to power, and it is not the holders of local knowledge who exercise power to marginalize. Local knowledge typically gains credibility only when it can be conformed to the dominant theories and practices of western knowledge (i.e. systematics and classifications, formal training, methodologies, verifiability, etc.)

Even within the strictest view of western objective “science” the decision-makers and managers can never fully leave behind their baggage of personal perceptions and values. As a result, there is great variance in the definitions that are provided to already ambiguous terms within the field of conservation biology. For example, Wallace *et al.* (1996) state that:

The philosophy of ecosystem management requires asking ourselves what kind of a society, and correspondingly, what kind of a relationship with nature we want. Patterns of politics suggested by ecosystem management include public deliberation of values toward

the environment, cooperative solutions, and dispersion of power and authority. These are all avenues to lessen social hierarchy and domination. Through opening the value debate, fostering a sense of interdependence among humans, and renewing a sense of reason, the chains of social domination may be lessened.
(as quoted in Lackey, 3).

And besides the ambiguity in terms, I wonder where all these “nonscientific” ideas came from in this definition of a stereotypical “scientific” concept: ecosystem management. In definitions such as these, it shows the conflicts within the discipline, and that there is a lot more at play than just “pure” science. It also indicates how important individual values and ethics are in shaping what we might consider to be the “best” management strategies. In our consideration of indigenous knowledge, Stevens (1997) suggests that:

Management plans should be developed in consultation with indigenous communities or their representatives rather than being written by protected area administrators or outside consultants and then presented to local communities as a *fait accompli*. Indigenous peoples should participate on commissions that draw up management plans, and the plans should be discussed and revised in public workshops and meetings. Ideally, community approval should be required for the implementation of the plan (271).

In the above suggestion, “participate” and “approval” are ambiguous terms, the meanings of which remain vague, and can exist in a form in which the authorities in power simply “allow” the local people to be involved, but this does not ensure their substantial involvement in management design and implementation.

Indigenous Knowledge and Conservation

There is a growing body of literature documenting specific case examples where areas of high biodiversity coincide with areas of high cultural diversity. It has been suggested that helping to ensure cultural survival and cultural diversity through community-based efforts could itself be a technique for conserving biodiversity (*for some examples see*: Berkes, 1999; Callicott, 1994; Nazarea, 1999; Stevens, 1997; Western *et al.*, 1994). Many indigenous groups are associated within areas of high biodiversity, and have a long-standing, intimate relationship with their environment and its resources; their knowledge can be encyclopedic. Is this a coincidence? It illustrates the interdependence of the people and their resources, and encompasses the issue of cultural rights. Often the people view themselves as “guardians” of these areas, and represent stakeholders in conservation decisions. Indigenous groups may feel that they have proprietary rights over their knowledge of their local environment. A good example of this can be seen in the relationship between ethnobotany and biotechnology extraction (Moran, 1999; Strum, 1994).

The inclusion of indigenous peoples in resource management can provide several benefits including a stronger conservation alliance through the sharing of local knowledge and resource use practices that are traditionally more environmentally sensitive (Callicott, 1994; Stevens, 1997). Additionally, indigenous knowledge is often strongly grounded in beliefs, values, and conservation ethics that are enforced through individual conscience, social pressure and community-based commitments to the defense of local territories and resources (Callicott, 1994; Nader, 1996; Stevens, 1997).

Aside from an inherent human value associated with distinctive cultures, Stevens (1997) describes the following as some of the practical contributions that indigenous groups can provide:

- Intimate knowledge of local geography and ecology
- Land and resource use practices that are adapted to the local ecosystem, and which may serve to maintain both the ecosystem and the regional landscape
- Indigenous conservation values and traditions such as the protection of sacred places, restrictions on harvest of resources and limitations on land use
- A populace often deeply committed to defending land and resources against outside encroachment
- Historical, cultural, and ecological knowledge that is of great value to things like protected area management, scientific research, and, in some instances, the enhancement of tourist experience and education
- Ways of life that may provide insights into values, institutions, and practices that may be of great importance for promoting ways of life that are satisfying spiritually, culturally, and materially, as well as environmentally sustainable land use in other regions and societies.

That is not to say that all of the above necessarily occur in any given location, nor that the consideration of all of the above always yields positive results in conservation efforts. Redford (1991), describes how the idea of the “ecologically noble savage” comes into play in western perceptions of “the other” as being more “in tune with nature” or living “in harmony with nature.” Redford believes that such ideas are simply romantic notions, and that these people are often no different than westerners in their desire for commodities. He suggests that it is just a matter of time and access to new technologies before they eventually become assimilated into western society. Stevens (1997) reminds us that:

Many conservationists have been uneasy with such a broad endorsement of local resource use and management. They express

concern about changing patterns of indigenous settlement and land use, and especially about the possible environmental repercussions of population growth, changing ways of life, cultural change that leads to decline in conservation values, and increased local commercial exploitation of natural resources (270).

Ideas such as these, sometimes lead to what can be called “conditional” rights, which allow for “traditional” use of the resources. However, “traditional” does not mean static and unchanging, though within the framework of resource conservation and use this may lead to the discouraging of any development and change within the local population. Stevens (1997) further describes the potential risk involved with such conditional rights by stating that “traditional use policies that have been imposed by outside authorities can be coercive and paternalistic, creating ‘cultural zoos’ [and] restricting land use to long standing traditional practices undoubtedly raises significant human rights issues by sharply limiting self-determination and avenues of development” (p.270).

Community-Based Conservation

New concepts like ecosystem management, adaptive management and participatory management are becoming more commonplace in natural resource conservation strategies. Emphasis has been shifting away from the more traditional species-by-species management approaches and moving towards a systems approach: a more global, synergistic and interdisciplinary approach to the conservation of our resources. With more people on the earth, and increased competition for resources,

management strategies become harder to implement from the top down. What may be the best ecological management strategy may not be the best social or economic strategy. There is always an ongoing conflict of interest between the environment and the economy, and the only way to achieve any sort of sustainability is to attempt to understand both and how they interact. What is equally as important is that the interactions will vary from one location to the next.

Community-based conservation (CBC) refers to natural resource conservation efforts that involve local people as an integral part of the conservation strategy, with local communities actively participating in the planning and management of resources and also gaining economically from the utilization of the resources (Hackel, 1999). Community-based programs provide the opportunity for people living on or near important ecosystems, or adjacent to protected lands, to participate in the land-use planning activities, the policy implementation and the management practices used. One of the fundamental assumptions of CBC is that individuals will necessarily choose to care for the things that they have a vested interest in. Bromley (1994) states that "community-based conservation seeks to locate areas of mutuality between those who want biological resources to be managed on a sustained basis and those who must rely on these same biological resources for the bulk of their livelihood" (p. 428). In most cases, this represents a difficult process of consensus building (Rijsberman, 2000).

This begs the question of who has more "say" in the matter? Such questions are often based in a conflict between indigenous knowledge and expert science. In

many traditional cultures, especially in poor, rural areas, people tend to get upset if they feel that the needs of wildlife are being placed above the needs of the people (Bird *et al.*, 1997). In many of these cultures, it is natural and expected to care for your own kind before you care for others. Strong ties of kinship and community, and very interdependent lifestyles cannot be completely overlooked in the management plans. Therefore, advocacy of management techniques that will address the issues in a holistic framework may be the best strategy.

The use of current and historic knowledge of the cultural framework is crucial to address within community-based management efforts. Even if the managers devise strategies to protect resources, Feldmann (1994) states that "such strategies may be ineffective if they are incompatible with customary or traditional rights recognized at the community level" (p.397). This dilemma is obvious in cases such as the sea turtle conservation efforts in Baja California. However, through prolonged direct personal contact, trust can be built, communication can be fostered and information sharing can occur. This does, of course, require a greater investment of time on the part of outside managers, but it can lead to the greater success of long-term management objectives (Nichols *et al.* 2000, Bird & Nichols, *in press*).

In addition to communication, promoting public awareness programs is a critical part of any conservation strategy. However, this "education" cannot be seen as a one-way transfer of knowledge. Train (1994) states that "we often are so busy developing our own solutions to other peoples' problems as we see them that we sometimes become a bit deaf and a bit insensitive to the ideas of those very people

whose problems we are trying to solve” (*as quoted in* Ramos, 1998, p.435). This is something that we need to be aware of. For example, with the sea turtle conservation efforts in Baja, we are educating people about the ecological importance of the turtles in the bay and the crisis that the turtles are facing in their population decline. We are also learning from the local people about the cultural and socioeconomic importance of the turtles, as well as local ecological knowledge that enhances ongoing biological research. By having open discussions, we generate a greater incidence of participation in the conservation efforts (Bird & Nichols, *in press*).

A feeling of resource ownership can also be a powerful source of conservation motivation. Research conducted in Haiti in the mid-1980’s suggested that the analysis of natural resource issues from a “conservationist or ecological framework... is short-sighted for anthropologists ” (Murray, 1987, p.237). From the standpoint of cultural-evolutionary theory, natural resource use and/or conservation is based more in an utilitarian value. While an environmental awareness may exist, the value ascribed to a specific resource is most often determined by ownership: what you own is of greater value to you than what your neighbor owns. This may be an over-simplification, but some discussion of ownership – at the very least, an awareness of its importance – needs to be a part of conservation planning. In the Haitian case, where reforestation projects became successful through the domestication of wood, Murray (1987) suggested that conservation would be successful when resources have immediate value and stakeholders possess some notion of ownership over those resources, “not when human consciousness is raised regarding the inherent ecological importance of those

resources” (p.237). While raising environmental consciousness through direct personal experience and educational projects can often serve as a powerful conservation tool, it is important to be aware that impoverished individuals and/or communities will necessarily satisfy their economic and food subsistence needs before considering any intrinsic values associated with the natural resources they depend on.

Community-Based Efforts in Sea Turtle Conservation

Throughout the world, fishers have been blamed for declining sea turtle populations, even with inadequate population estimates and utilization assessments (Caldwell, 1963; Clifton *et al.*, 1995; King, 1995; Parson, 1962; Tambiah, 1995). As a result, local “science” has historically been excluded from the conservation process and the active participation by fishers in sea turtle conservation initiatives has rarely been considered (Nader, 1996). However, as evidenced by the growing literature on the topic over the past decade, local involvement in turtle conservation has been increasing, though generally as directed by an outside “expert” organizing and/or overseeing community work by providing guidance regarding appropriate conservation techniques.

Community-based strategies are not new to sea turtle conservation: such approaches take a variety of forms including community monitoring of lighting practices on nesting beaches, community-based stranding networks and beach patrols, self-enforcement by fishing communities, formal sharing of traditional knowledge (Nabhan *et al.*, 1999) and the systematic consideration of interviews with fishers

(Tambiah, 1999). Additionally, sea turtle conservation has become a main attraction in some ecotourism initiatives and other forms of sustainable development (Campbell 1998; Govan 1998; Vieitas 1999). While such practices are increasing, community-based efforts are still not widely accepted as valid conservation tools (Frazier, 1999; Tambiah, 2000).

A major goal of community-based efforts in sea turtle conservation is to develop practices that will protect sea turtle populations and habitats that are also compatible with the socioeconomics and cultural ecology of local resource-dependent communities (Bird & Nichols, *in press*; Tambiah, 2000). In general, however, many of the "community-based conservation" cases documented in the literature have been those in which external researchers have initiated conservation projects and in the process have integrated local community *participation* (Govan, 1998; Hackel, 1999; Tambiah, 1995). Few of these case studies have actually integrated local *science* into the project.

RESEARCH APPROACH AND METHODS

Cultural Sensitivity and Ethics in Sea Turtle Research

Because of the illegality of harvesting turtles, all research for this thesis needed to be unobtrusive and conducted with the utmost sensitivity. Special attention was given to the tone and wording of all questions so as not to create offense. It was important to represent myself as an academic researcher without any affiliation with the Mexican or U.S. government. Collaboration and team work with members of the local community provided easier access to the community and made my questions and observations less threatening. Recognizing that my interests were related to a controversial issue, I had to practice some restraint in dealing with individuals whose activities or contributed information was bothersome to me personally. Seeing turtles harvested and butchered was a normal part of working on this project. As a member of a research team, I needed to conduct myself accordingly, showing respect when with individuals who trusted me enough to continue their daily activities in my presence. My colleague J. Nichols stated that the day we react to these things with our gut instincts would be our last day in the field: trust would be broken and any community participation would cease. During every day in the field, I was aware of my role as a privileged guest within the host community. It was also important not to abuse the trust and privilege I was given. For this reason most informants remained anonymous and individual responses were kept confidential.

A Stepwise Approach

The research approach of this sea turtle conservation project sought to utilize local knowledge and foster partnerships, which facilitates the exchange of information and active community participation. The following stepwise approach outlining general research considerations for the integration of local science into conservation initiatives was used in the project:

1. The first step involved getting to know who we were working with while allowing them to know us as more than just outside researchers: We built trust through friendships and partnerships within the local community and showed respect in our interactions with all individuals.
2. After we made our introductions in the community, we learned about community issues, cultural norms and beliefs. Showing consideration towards personal, local, and regional politics, we worked within the existing socioeconomic framework.
3. While it was acceptable to share the knowledge we possessed with local *pescadores*, (particularly when it was specifically requested), we didn't do all the talking: We spent an equal amount of time asking questions and engaging in participant observation. Both "outsiders" and "insiders" had something to share with and learn from each other.
4. We integrated contributed local knowledge and information, alongside the outside science, into an action plan and implemented the plan with the support, knowledge and active participation of the local population.
5. Lastly, we monitored progress and maintained flexibility, following adaptive management strategies.

Surveys and Interviews

During the summer of 1999, several groups of students from the SFS Center for Coastal Studies conducted surveys and interviews as a part of their directed research projects. Two separate sets of surveys and interviews were designed and administered in order to construct both a "supply" and "demand" function for sea turtle use within the Magdalena Bay area, particularly Puerto San Carlos. As a member of the sea turtle research team and someone with experience conducting qualitative research, I was consulted on survey design and approach and acted as a sort of co-advisor with SFS professor Salvador Garcia-Martinez for the "demand" study. During the "supply" study carried out a little later in the 1999 season, I had less direct supervisory and advising duties as I was assisting with other aspects of the sea turtle project and spending more time out on the water with researchers and *pescadores*. However, I was present on each of the survey days and assisted with administering the surveys and interviews. During this part of the data collection process, I allowed the SFS students to do the majority of the work, as it was a part of their learning experience and their own directed research projects. Besides, some of the students spoke far better Spanish than I did.

The first set of surveys and interviews were designed to assess the "demand" for sea turtles within the community. There were 14 survey questions and 10 follow-up interview questions (see Appendices 2 and 3). The second set of surveys and interviews provided information for the "supply" function and were comprised of 15 survey questions and 8 follow-up interview questions (see Appendices 4 and 5). While

the student research groups conducted their own analyses of the data collected, I was given permission to use the raw data generated from these survey and have used the information as part of my baseline data. During the 2000 field season, I conducted follow-up surveys and interviews in order to verify the accuracy of past results and expand upon them with a more in-depth look at some of the issues raised during the previous studies in the area.

Research conducted during the summer of 2000 was primarily qualitative in nature. My main objective was to gather information which allowed for a deeper understanding of how the Baja California sea turtle conservation project was perceived within the local community, as well as to gain insights into what community-based conservation looks like on the ground. In the continuation of this study, I utilized a variety of research techniques. Because the primary aim of my project has been to investigate and incorporate community-based research into sea turtle conservation initiatives, it was important to me that my data be generated through direct involvement within the community. Two of the most important techniques used were informal interviews and participant observation – participating in daily activities within the community – as well as the use of local researchers to help in the data-collection process.

In August 2000, I also administered a questionnaire to the 18 students participating in the one summer session at the SFS Center for Coastal Studies (see Appendix 6). Surveys were handed out after breakfast one day; I asked that they be

returned at lunch that afternoon. After a reminder, the survey response rate was 100% by the evening meal!

Demand Surveys

In the "demand" study, a total of 122 surveys were collected and 56 survey respondents also agreed to participate in an immediate follow-up interview (see Appendices 2 and 3 for survey/interview questions used). The data were collected on 3 separate survey days. On Saturday, June 19, 1999 all 21 of the SFS students participated in the surveying efforts within Puerto San Carlos, collecting 52 surveys and some interviews. The students were divided into 5 groups and surveys were conducted at random among homes and local businesses. The groups spread out across town, going door-to-door, speaking to whoever was available. Each student group had at least one member of the sea turtle project and SFS local staff working with them to make the introductions easier. Thirty-five surveys were collected on Tuesday, June 22, 1999 by a smaller group of students working in Puerto Magdalena on Magdalena Island, just across the bay from Puerto San Carlos. A lemonade stand was set up on the plaza in Puerto San Carlos on Thursday, June 24, 1999 and resulted in 35 more individuals filling out surveys.

For all survey days, the survey response rate was nearly 100%. Because each of the surveys collected represented a different household, the overall sample size encompassed roughly 60% of the local population. The data from all three survey days and both locations were lumped together. For this reason, I was unable to do

any comparative analysis of the results from Puerto San Carlos and Puerto Magdalena. However, there is a lot of overlap between the two locations, as community members move back and forth across the bay frequently and often have family living in both towns.

Supply Surveys

In the second summer session of 1999, a new set of students picked up where the “demand” students left off. A new survey was written for a specific target group: the *pescadores* (see Appendices 4 for survey questions administered). The first few questions were the same as prior surveys in order to have a basis for demographic comparisons between the *pescadores* and the general population of the community, though we knew that many of the “demand” respondents fell under the occupation of fishing. In this study, however, surveys were administered in the sections of Puerto San Carlos where the majority of *pescadores* were known to reside, as well as at several fish camps. The SFS Center for Coastal Studies *pangueros* (small boat drivers) acted as liaisons between the student groups and the fishing community. This helped to limit the reservations of many of the locals to answer questions pertaining to an illegal activity: the harvest of sea turtles.

On the first survey day, July 24, 1999, we pulled our boats up on the beaches of Puerto Magdalena. Immediately, we found some *pescadores* to talk to, while some other students began to disperse throughout the homes and business of the small shantytown. By the end of our few hours there, 45 surveys and 33 follow-up

interviews had been collected. A few days later, on July 27, the *pangueros* – *pescadores* now employed as boat drivers for the CCS – lead student groups through areas of Puerto San Carlos where they knew most *pescadores* resided. That day resulted in 23 surveys and 20 follow-up interviews.

The following day, July 28, we decided to attempt to survey one of the more remote fish camps at Punta Arena. The Punta Arena fishcamp was a tiny shantytown on the southeast side of Isla Magdalena. This location, at the mouth of Magdalena Bay, made it an ideal, sheltered base camp for fishing on the open waters of the Pacific on the west side of the island. Although student groups had stopped here on occasion and most of the *pescadores* were aware of the SFS Center for Coastal Studies in Puerto San Carlos, no formal surveys had ever been attempted at Punta Arena. The *pescadores* were initially very defensive and reluctant to speak to anyone directly. They would often fly a finger off in some direction and state that a better person to talk to about this subject would be “that guy over there.” Once we found the “gatekeeper,” a big man with a scruffy beard, and he agreed to a survey, some of the other *pescadores* we had already approached came up to us and said that they would be happy to participate in our survey. In the end, we collected 13 surveys and 7 interviews at Punta Arena, which covered about 50% of the population there at that time. The other *pescadores* had remained busy in their business of sorting through and weighing the day’s catch.

Student Surveys

While my main interest was the perceptions and values of the local community, I was also interested in how the study abroad students perceived the sea turtle conservation project that they were involved in during their studies in Magdalena Bay. During my second field season, in the summer of 2000, I came equipped with a short questionnaire to be administered within the student population that summer (see Appendix 6). There are typically two summer sessions of about 20 to 25 students, and I anticipated a sample size of 40 to 50. However, due to unusually low enrollment, only one session was offered and 18 students attended. This is a rather small sample size, but I decided to administer the questionnaires anyway.

I collected basic demographic information in order to make some generalizations about the types of students who participate in such field programs, while asking open-ended questions specific to the sea turtle project. I was primarily interested in how the student group perceived the existing values related to sea turtle conservation within the local community and how the students themselves viewed sea turtle conservation. I was also interested in the students' thoughts on the Mexican government's 1990 ban on sea turtle harvesting.

Interviews and Ethnographic Profiles

For those survey respondents within the community who agreed to an immediate follow-up interview, the use of open-ended questions during the

interviewing process seemed to provide greater comfort for the anonymous respondents. In this way, respondents were free to provide as much information as they felt comfortable sharing. In some instances, we were able to probe for more details. Certain general questions would be asked first, and then funneled into more specific questions pertaining to sea turtles (refer to Appendices 3 and 5).

During the summer 2000 field season, I conducted follow-up in-depth interviews with seven key informants in order to help verify the accuracy of the past surveys and interviews and expand upon them with a more in-depth look at some of the issues raised previously. I was interested in composing ethnographic profiles of the key people involved in sea turtle recovery efforts in the region. Among those interviewed were members of the "turtle crew" including outside researchers and local community members. I was interested in gathering information about their background, livelihood and why they became involved in the sea turtle project. I was particularly interested in how some turtle crewmembers had made the conscious choice to shift from turtle consumer to turtle advocate. I also profiled some of the key staff at the SFS Center for Coastal Studies in order to gather information about the general SFS mission philosophy, as well as their personal goals and expectations surrounding the sea turtle-related conservation projects.

My interview style was semi-structured; I tailored the questions according to what I previously knew about the personal history of a particular informant. Because of this, interview questions were not necessarily identical. However, consistency was maintained through all of the questions relating to several main themes that I was

interested in, including: the informants' views on sea turtle conservation and on the study abroad program; the informants' concerns for marine resources in the community; the informants' personal connections to sea turtles; and local fisheries resource problems as identified by informants.

Participant Observation

During my research, I engaged in participant observation in three ways: 1) among the SFS Center for Coastal Studies students, 2) within the local community, and 3) as a member of the sea turtle conservation project. This included attendance at four major influential community meetings and more than 100 other informal meetings and discussions (see appendix 7). Participant observation is a critical component of the anthropological method within field research, providing many benefits. By participating in daily activities within a community of interest, trust is built and better communication is facilitated. Additionally, rich detail can be gathered by observing the individual behaviors that survey and interview data may not be able to detect. One criticism of using interviews as primary data is that the results may not be valid due to respondents only providing the answers they believe researchers want to hear and not the answers that reflect how respondents actually think or behave. Participant observation allows the researcher to learn by watching what people do separate from what they say, and may help to verify or refute other research findings. Additionally, participant observation allowed me to gather information about subjects and activities which people may have otherwise been reluctant to discuss in an

interview. In the case of the sea turtle project, this was of particular importance in dealing with known turtle poachers.

The "Conservation Mosaic:" An Integrative Approach

The research objectives of the Baja California sea turtle conservation project have been twofold: including both conservation research and active community involvement. The research consists of socioeconomic studies of current and historic sea turtle utilization within Baja California Sur, particularly in the Magdalena Bay region, as well as ongoing biological monitoring and ecological studies (Brooks, *et al.*, *in press*; Garcia-Martinez & Nichols, 2000; Nichols *et al.* 2001).

Biological Components

The sea turtle projects began as an assortment of biological investigations. A variety of data have been collected about various species of sea turtle, including basic morphometric data, mortality information, diet analyses (Gardner & Nichols, 2001; Hilbert *et al.*, *in press*) and tissue samples for genetic analysis. The majority of the biological data is gathered by setting nets, capturing turtles, taking measurements and tagging. There are several measurements to record, including the straight and curved carapace length and width, as well as the width/length of other body parts like the plastron, head and tail. These measurements allow us to determine the relative age of individual turtles as juvenile or adult. All capture locations are recorded with a GPS

unit, and later mapped. Captured turtles receive flipper tags distinguishing their relative location of capture as well as providing contact information for any individual who may capture the turtle and wish to report its location. The goal of tagging is to be able to track the movements of turtles based on tag returns. Radio and satellite transmitters have also been deployed in order to monitor the distribution, movements and long-distance migratory patterns of sea turtles (Brooks, *et al.*, *in press*; Nichols *et al.*, 1998; Nichols *et al.*, 2000b). These biological data provide important information when analyzed together as a whole, more so than simply looking at individual components. The variety of data collected allow for the development of stronger conservation efforts as well as providing insight into whether current conservation measures are successful or not. This is crucial when dealing with the continual decline of threatened and endangered populations.

Socio-Cultural Components

Because of the inherent difficulties associated with in-water investigations, the biological studies continue to be a major focus of the research projects. However, due to our interests in conservation and actually applying the information gathered, working with the local community was just as important as having accurate biological data. Local *pescadores* from the community have been involved in all aspects of the data collection, identifying optimal locations and times to set nets, assisting in captures, measurements and marking, as well as informally monitoring turtle movements while fishing on the bay (Nichols *et al.* 2000a). Through their participation, the *pescadores*

have learned about the techniques used and the motivation behind our biological investigations. Their sharing of detailed knowledge about the ecology of the bay, including the seasonal movements of marine species and the daily movement of the currents, have contributed immensely to our work by improving the accuracy of the information collected and providing a more complete picture of the sea turtle's natural history.

The partnerships formed with individual *pescadores* have been integral to other aspects of research in the area as well. Several *pescadores* have helped in the collection of surveys and interviews within their communities. Furthermore, much has been learned about the community's needs and interests related to sea turtle exploitation and conservation in the region. The data collected during the 1999 field season yielded important primary data related to the cultural and socioeconomic factors that affect a fisher's decision to capture a turtle, or impact the choice of keeping or throwing back a turtle captured incidentally. From this baseline information and understanding, I was able to delve deeper into the realm of sea turtle conservation motivation in my studies during the summer of 2000.

Research Limitations

My affiliation with SFS and with J. Nichols – the “turtle man” – provided me with much easier access into the community. Without wearing my affiliation on my sleeve, I would most likely not have been able to make the contacts, have the conversations, or participate in any of the activities of the community. Despite the

ease of entry into the community, I still faced some major challenges and limitations while conducting my research. Although I would automatically be linked to SFS and viewed as one of the students there if I were just walking around the town of Puerto San Carlos on my own, I was dependent on others to make the introductions for me in more remote communities. As most people who lived in the area did not speak English, and my Spanish was mediocre at best, I was largely dependent on bilingual interpreters during the interviewing process as well as in the accurate translation of survey questions.

Most researchers, regardless of the type of project, usually end up wishing they had more time to collect their data. I was fortunate in that I was able to re-enter the field for another summer, having spent the interim 9 months doing research and preparing for the second season. Having a familiarity with the location greatly helped me in my second field season. However advantageous this may have been, I still went away feeling like there was so much more I could have or should have learned. It seemed that things were just beginning to really happen in those few weeks prior to my scheduled departure.

I faced several limitations in how I could analyze the survey and interview data from the first season. During my first field season, I was not working under the knowledge that the research I was helping to conduct would become a part of my Master's thesis work. As a result, my attention to detail during the 1999 season was not as accurate as it could have been. As part of their research projects, the SFS students designed the survey and interview questions to be administered. Although I

was assisting as a student advisor during the survey design and implementation, these questionnaires were not structured to most effectively meet my later analytical needs. Additionally, not having access to the original interview transcripts from the 1999 field season prevented me from being able to accurately compare and analyze the interview data. I was also limited in my scope of analysis and comparison due to the fact that the raw survey data I had access to from the 1999 season was not broken down by survey location. The collected surveys generated some important background information; however I was not able to provide the overall level of analysis that I would have liked.

RESULTS AND ANALYSIS

Survey Results

Due to the fact that the population of many of the communities in the Bahía Magdalena area fluctuates in response to the seasonal availability of fisheries resources, it is difficult to accurately determine how representative a sample was collected through the surveys administered. While the total number of surveys collected likely represents a small percentage of the actual population (~ 5%) within the Bahía Magdalena area, it may still be possible to make some generalizations from the survey results by combining them with the results of other research techniques.

Demographics

Of 122 respondents in the demand survey, 88 (73%) were male and 32 (27%) female. More than half (57%) of the respondents had been born in Baja California Sur, though not necessarily in the Magdalena Bay region. Those who migrated to the area from other states came primarily from Sinaloa (10%), Sonora (6%), and Michoacán (5%). Forty-four people (36%) listed their occupation as "fisher," while the other 75 respondents listed various occupations, ranging from local business owners, housewives, and schoolteachers. The *pescadores* who participated in the demand survey ranged from the average fisherman in the community -- who may incidentally catch sea turtles while fishing for another main target species -- as well as

the poachers that are intentionally harvesting turtles for sale on the black market at the local level. Ninety-six of respondents (77%) stated that they made less than \$5,000 pesos (~US \$500) per month (Figure 4), and 50% of the males surveyed were *pescadores* who fell under this income category. The average household had between 4 and 6 dependents (Figure 5).

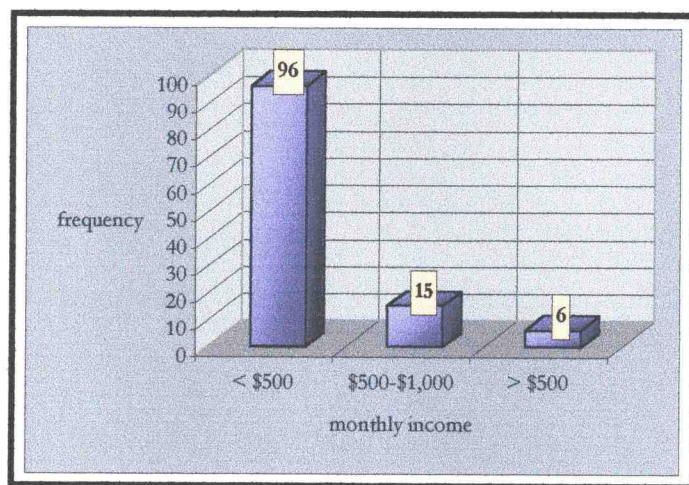


Figure 4. Demand survey question, average monthly income?

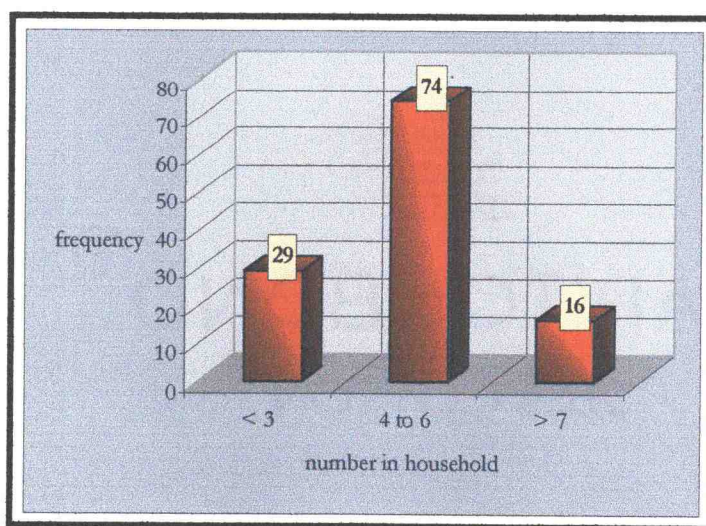


Figure 5. Demand survey question, number of dependents in household?

Demographic information gathered through the 94 supply surveys was slightly different. Whereas the demand surveys were given to any member of the community, there was a specific target group to survey for the supply surveys: the *pescadores*. The supply surveys were completed by *pescadores* or on the behalf of *pescadores* by their spouses. Nearly 90% of the survey respondents were male. A majority of the respondents (58%) were between the ages of 31 and 50. There was also a difference in the highest level of education achieved between both survey groups (Figure 6). While there were several *pescadores* who continued their education beyond primary school, including 2 *pescadores* who were college educated, the majority of the *pescadores* (55%) surveyed in the supply study did not progress beyond a primary education.

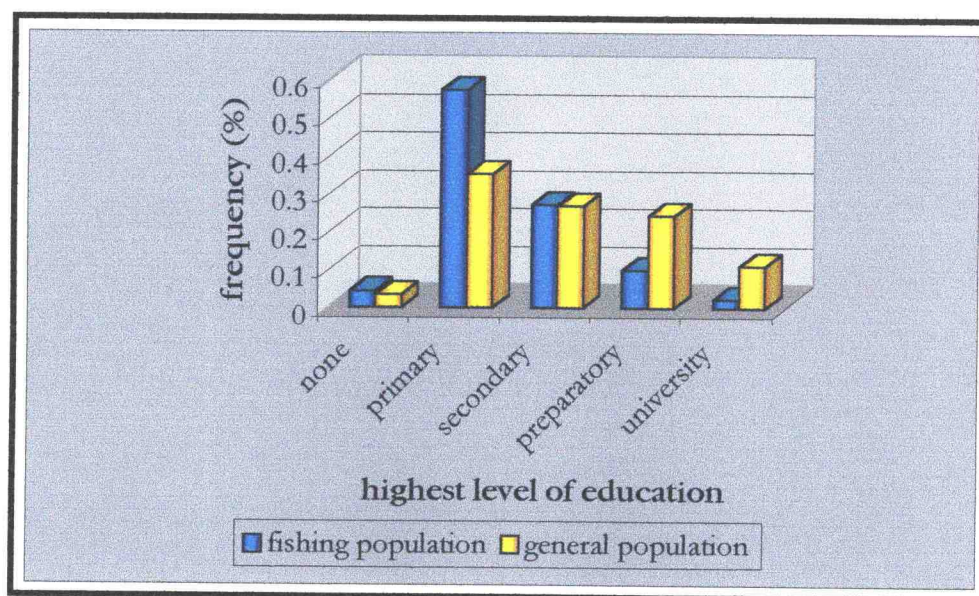


Figure 6. Comparison of highest level of education achieved, from demand and supply survey responses

Perspectives on Sea Turtle Use and Conservation

In Bahía Magdalena, turtle meat is at times a tasty delicacy and, at others, a necessary means of feeding a large family. There are a variety of occasions during which sea turtles are consumed, including Mother's or Father's day gatherings, weddings, Christmas and *Semana Santa* (Easter week), (Figure 7).

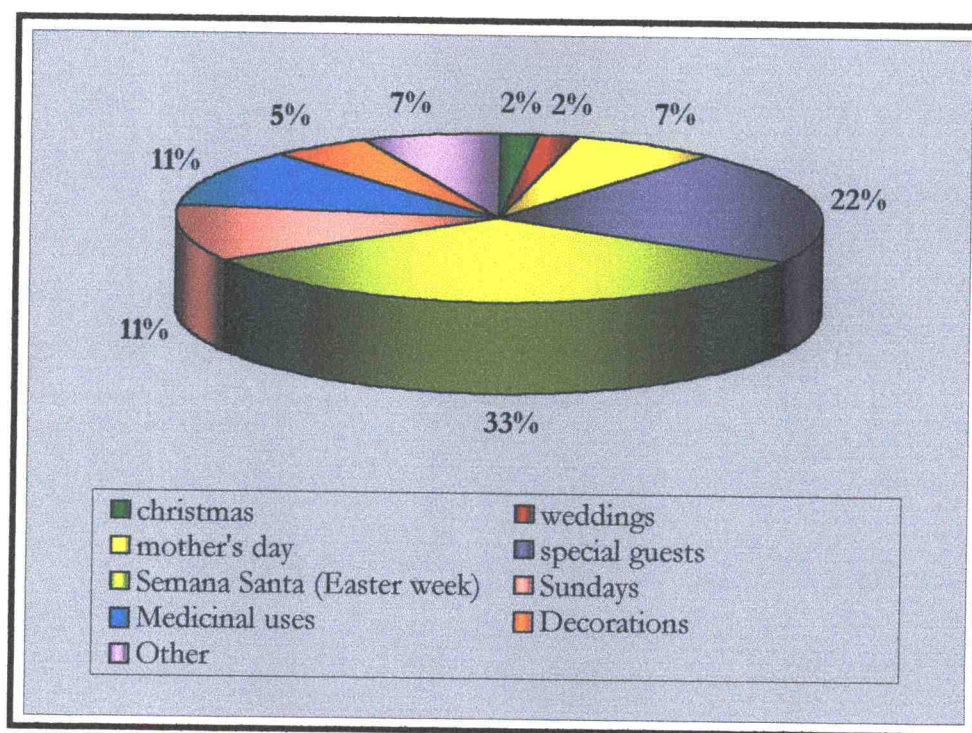


Figure 7. Occasions for Turtle Consumption

Besides the meat that turtles provide, other parts of the turtle may also be used. The carapace is sometimes used as a serving platter or a decorative ornament around the home. In several of the restaurants in the region -- many of which regularly served turtle before it became illegal -- turtle carapaces are still displayed on dining room

walls. Turtle blood and oil have often been taken medicinally, most commonly used to treat respiratory ailments like asthma. Based on the demand survey results, SFS students Bostrom *et al.* (1999) described three main reasons why sea turtles are being consumed: 1) large family size and low per capita income, 2) lack of enforcement of the 1990 ban and 3) an unawareness of the long term effects of declining sea turtle populations.

Of the 122 surveyed in the demand study, 70% agreed that turtles were in high demand, although 70% also believed that the 1990 ban had caused a decrease in the overall demand. Most of the people interviewed believed that the ban was appropriate, though many were unaware of the actual details of the legislation. Ninety-four percent of those individuals surveyed believed that sea turtles should be conserved, and 98% of those interviewed were also interested in sea turtle conservation stating various reasons such as a concern for their grandchildren to be able to know turtles, concern over the potential loss of family traditions, or concern over the possibility that there would be no more sea turtles left to harvest. In addition, 66% of the people surveyed believed that the sea turtle population in the bay was decreasing, stating that they were seeing turtles less than they used to.

The importance of religious affiliation also proved to play a role in the use of sea turtles within the community. Although there was no specific question asking for respondents to state their religion, in interviews and informal conversations, respondents often explained that, because their family was Catholic, they consumed sea turtles as a traditional dish during *Semana Santa* (Easter week) as a substitute for red

meat, which is prohibited by the Church during Easter. As the survey data suggest, *Semana Santa* is the most popular time to use sea turtles (Figure 7 above). A minority of the population, approximately 10%, of Puerto San Carlos are Jehovah's Witnesses. One of the major guiding principles within this faith, as described by one informant, is to always abide by the law. Some of the local members of our research team were Jehovah's Witnesses, and stated that because there was a law against the harvesting of sea turtles, their family did not participate in consumption of sea turtles, even if the turtles were harvested and prepared by another household. Before the passage of the law, they would participate in consumption of sea turtles on some of the special occasions listed above.

Some of the responses given by the *pescadores* interviewed in the supply survey investigations provide an interesting look at the complexity of the issue of sea turtle use. While the majority (59%) of the *pescadores* interviewed stated that they made less than \$3,000 pesos (~US\$300) per month, when asked whether there was a need to harvest sea turtles specifically in order to support themselves and their families, only 15 *pescadores* (16%) said "yes." However, if we contrast this with the responses given to the question of whether sea turtles were important within their culture 92% of the respondents indicated that turtles were important (Figure 8). This suggests that although there may not necessarily be a need to harvest turtles, there is still a strong demand for them as indicated by responses given about the occasions for turtle use and consumption (Figure 7 above).

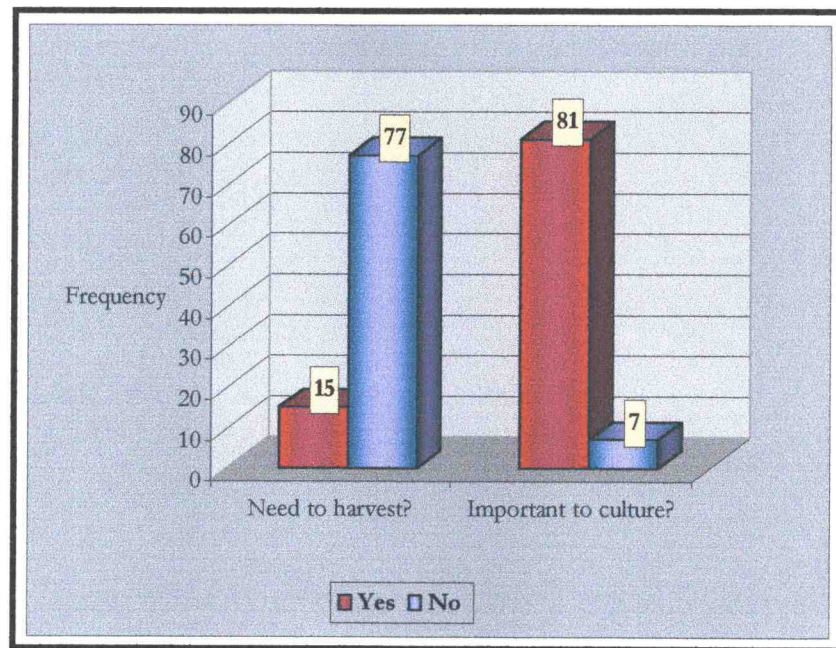


Figure 8. Comparison of responses to two questions: “need to harvest?” and “important to culture?”

While many *pescadores* recognize the importance of sea turtles in their local culture and 97% of the *pescadores* stated that they were interested in the conservation of sea turtles, an interest in conservation is not necessarily equivalent with a willingness to stop harvesting. When asked about the average number of turtles caught per week, 85% of the *pescadores* stated that they caught 1-5 turtles, 6% catch 6-10, and another 9% catch an average of 10 or more turtles a week. Within the survey set, there was not a question addressing what percentage of these captures were incidental and what percentage represented sea turtles as a target species for harvest, so it is difficult to speculate about *pescadores* motivation. However, one survey question asked what is done with a captured turtle, and the *pescadores* were given three choices and could choose all that applied: eat it, sell it, or throw it back. The data collected indicated that

the majority of the time, a captured turtle was consumed within the family or community, however 3 people stated that the turtle was sold. Thirty-nine individuals also chose "throw it back" as the fate of a captured turtle. However, since the *pescadores* could choose any or all of these answers, there was no way to accurately analyze the probable fate of an individual sea turtle, nor any way to assess how many of the reported captures were intentional. Of those turtles intentionally harvested, it is not known how many were targeted specifically for sale and what percentage was intended for private household consumption.

Biological Studies

We catalogued several hundred turtle mortalities in Magdalena Bay during the 1999 summer field season and again in 2000. The mortalities were counted through a combination of strandings and collecting the discarded carapaces of turtles intentionally harvested for food or sale on the black market, as well as information generated through interviews. From these data, as well as other studies in the region, Nichols (2001) estimates approximately 10,000 turtles are consumed a year in the Baja peninsula alone, however a biologist from the university in La Paz thinks the estimate should be closer to 30,000 year (*pers. comm.*). Nichols states that these are conservative estimates because it is difficult to extrapolate the information for the entire region. However, we know of one poacher who harvested 60-80 turtles before the last Semana Santa, and there are other individuals who do the same in other coastal communities. In Bahía Magdalena, the majority of the *pescadores* only harvest a turtle

occasionally, usually by accident. It gets caught in their net while they are fishing for another target species, but they decide to keep it and bring it home as a special treat for their family. They may catch a turtle once a week, or perhaps once a month, maybe even less than that. They are not aware that the one turtle they are taking makes a difference; they see it as only one turtle in a bay that must have many turtles since they often are caught.

While the numbers are quite grim, it is important for us to feel confident in it being an accurate number. Without the participation of the local *pescadores*, there would have been many turtles that went unaccounted for in our data. The number of documented mortalities represents what is actually happening in the bay and becomes a valuable educational tool. As a part of our ongoing monitoring, all discarded carapaces are collected and placed in a pile in the back part of the SFS school property at the end of the point where many *pescadores* put their boats in the water. This “turtle cemetery” serves as a constant reminder of the numbers of turtles being taken within the community. In conversation, many people seemed unaware of the magnitude of the decline and how many turtles were being taken in their community. If a household consumes one turtle on occasion, there is another household doing the same. Collecting the discarded carapaces from dumps and creating a visual representation of turtle mortality may help increase awareness of the compounding effects of one household taking one turtle on occasion.

We had to be careful, however, to keep the local mortality information quiet at the time being. Although not on the scene currently, if the more radical international

environmental activist groups got hold of the numbers, there would be the risk of losing all trust. In many cases, these radical environmentalists are deaf and blind to any alternatives that would involve the rights of humans as well as the rights of the animals in question. Many of these people value animal rights over human rights, loosely defined here in terms of their cultural and traditional rights. We have seen heated debates and confrontations occur over such things, such as the traditional rights of Native Americans like the Eskimos to hunt whales (Freeman, 1989), or more recently the Makah in the Pacific Northwest. The establishment of trust is one of the key components to success, and it is a very sensitive thing. Train (1994) states that "we often are so busy developing our own solutions to other peoples' problems as we see them that we sometimes become a bit deaf and a bit insensitive to the ideas of those very people whose problems we are trying to solve" (*as quoted in Ramos, 435*).

SFS Student Perspectives on the Sea Turtle Conservation Initiatives

A total of 18 questionnaires were collected representing the perspectives of the students participating in the study abroad program at the SFS Baja field site during the summer of 2000. The student sex ratio was highly skewed during the session: 88% of the students were female, and only 11% were male. Student age varied between 17 and 24. Three of the students were Mexicans from the Mexico City area; the remaining 15 students were from various locations in the United States. There were three high school students, as well as two college graduates participating in the program; the majority of students had just completed their junior year in college. The

majority (56%) of student participants described their degree program or main area of interest as biology.

When asked what the students thought about the conservation of sea turtles, individual responses varied but overall the students felt that sea turtle conservation was important and necessary. However, the reasons given for this importance were mainly of two persuasions: 1) conserve the turtles because they are an integral part of the marine ecosystem, and 2) conserve the turtles because they are essential in defining the character and livelihood of the coastal fishing communities of the region. However, the most interesting results were those generated through questioning how the students viewed the 1990 ban on sea turtle harvesting. While all of the students expressed an interest in the conservation of sea turtles, few of the students agreed with the 1990 ban. Several students (39%) expressed concern for the danger of the "black market" that the ban created. A few students stated that the 1990 ban was a good idea, formulated with "the best of intentions," but had not been administered or enforced effectively. Many of the students (44%) demonstrated a concern for the cultural traditions associated with sea turtle harvest and use, and believed that the 1990 ban failed to consider the needs of the people. One student even suggested that "people are more important than animals... and any law that shows such utter disregard for a peoples lifestyles can not bring about anything productive." Some students suggested the possibility of utilizing the growing interest in ecotourism as an alternative non-consumptive source of income for turtles. Since gray whale ecotourism and adventure-based surfing trips have already been established in some

areas of the bay, it may be possible to “advertise” the turtles as another source of interest.

From the *Pescadores*’ Mouth: Semi-Structured Interview Results

To add further detail to survey results several interviews and discussions were held, including seven interviews with key informants that were tape-recorded. Due to the large volume of field notes and transcripts from all of these interactions and conversations, only a few representative interviews will be discussed here. The following personal story is included for the purpose of describing how many locals grow up with a close connection to sea turtles. The other perspectives and examples that are shared also represent some of the typical opinions that I encountered related to sea turtles and resource management.

Adan’s Story

Adan is in his early twenties and a native of Puerto San Carlos, now living in San Diego with his girlfriend and taking classes at community college. As a young child, he had medical problems and would not eat. His father went to the *pescadores* elders for a remedy (like a Shaman, he said). They suggested giving Adan the blood and oil from sea turtles. He remembers the first time he drank the blood. It was heated up with clamata juice and lime and pepper. He drank it and fell asleep.

After this, Adan's father kept looking for *pescadores* with turtles; he never captured turtles himself. From the age of 5 or 6 to 10 or 11, Adan had turtle blood and/or oil every morning before school. The oil, especially, is used for respiratory problems and colds. It is part of the medicinal traditions in the area as well as food traditions. "It's a fact that we eat the turtle," says Adan, "you have to go back to the history and understand the culture and why people do it. You ask people why they do it, and it's just a part of their culture."

He remembers a lot of turtles in town during his childhood. When he was about 7 years old, there was a photo taken of him and 3 other children on a leatherback. It was so heavy, that the men couldn't lift it, and had to drag it behind a truck to get it into town. Adan also remembers catching crabs as a child and seeing turtles resting in the shallows. He thought they were rocks, but then one day a "rock" moved. He tried to grab it, and a friend grabbed a flipper, but the turtle still pulled them away from the shallows and they had to let go.

"Culture to me," says Adan, "is something they do that becomes part of the roots" they do it so often that the behavior becomes a part of the tradition... stating that whether it is "right" or "wrong" (to take turtles) the culture has its own set of beliefs. In the day-to-day existence of the *pescadores*, sometimes they have too much, sometimes they have nothing. It's hard for *pescadores* to understand that the turtles are really in decline because they are still catching them, and besides that Adan says that there is a certain machismo aspect of the culture to say "I ate turtle today." But, J's involvement has changed his perspective from seeing the turtle as a "fish" to seeing it

as a "beautiful animal"... and now, to Adan, "a turtle looks like a butterfly swimming in the water." Since he has known J, Adan hasn't eaten turtle in the last several years. His family still eats turtle, except his mother and one sister who do not like it, and another sister who is allergic.

When Adan is questioned by local friends about why he has stopped eating turtles, he says that "I took too much from them - I don't know how many turtles I've drank blood from, or how many turtles' oil - I think it is time to give something back to them (the turtles)" He says that sometimes he "dreams awake" and states that "I'd like to have the satisfaction of looking back and saying that I was a part of a project that was good." He wants to be able to look out on the bay and see turtles.

Perspectives on Existing Regulations and Enforcement

I asked Juan "if in the future you have children, will you want them to be *pescadores* too?" Juan replied, "No, because I don't think there will be any more fish." The life of a *pescador* is a difficult one, particularly for the many small-scale artisanal *pescadores* who reside in the Bahía Magdalena area. Several *pescadores* are known to poach, fishing out of season or in another cooperative's concession, in order to make ends meet. For this reason, it is difficult to expect that all *pescadores* will stop their illegal harvest of turtles. "Giving the fishermen more information about turtles won't make a difference," states one *pescador* from Puerto San Carlos, "because they still see the turtles and catch them regularly. They believe what they see, and they have to see the decline personally to believe that there is a decline. That is the only way that

people may change their behaviors.” Another *pescador* states that many people in town think that there are lots of turtles in the Bay so there must be lots of turtles everywhere, but he has learned that his bay is a unique and special habitat which attracts turtles in larger numbers than elsewhere along Baja’s coast.

Juan, a fisher of 24 born in Sinaloa, who has been living in Puerto San Carlos the last 11 years, supports the idea of enforcing stronger laws and fisheries regulations in general. In his opinion, turtles are not the only species suffering. He states, for example, that “the legal season for shrimp is five months of the year, but many boats harvested shrimp all of last year,” this due to the fact that there are, on average, only three army vigilance boats sporadically patrolling the entire Bay. Juan believes that “if there was a permanent inspector in the region, the people would have fear. They are aware of the laws and regulations and they are not following them - it is too easy to take turtles now.” Although the presence of an inspector would not ensure compliance with existing laws and regulations, it would make illegal harvesting more difficult, because “people would fear loss of the turtle, their fish, their boats... everything.”

When asked, “how would you feel if there were no more turtles in the Bay in 10 years?” all the respondents expressed some degree of sadness over this idea. One *pescador* suggested that the people would feel badly, not only because of the loss of a food resource, but also because of its significance within the culture. The most important thing that this *pescador* feels is that he has a daughter who is almost 2 years

old, and he wants her to have the opportunity to be near turtles when she is older. He states that he would be very sad if she didn't have that opportunity.

Views on the School for Field Studies Involvement

When I asked questions about how the community viewed the school and the research being conducted there, there were differences of opinion. One fisher suggested that people in town don't really have a lot of knowledge of what is going on at the school, that they don't understand the product or end goal of the projects, and that they don't have a good sense of what the school is about. Another fisher states that "it is nice to see Americans coming to Puerto San Carlos, of all places -- it makes many of the people feel like this place is important." He believes that the presence of the school and the ongoing projects are good for the community, and the community enjoys seeing the students from other countries. He thinks that some people in the community are beginning to "open their eyes a little bit" as a result of the turtle project. He said that before the project he saw turtles but knew nothing of them -- nothing of the biology, or where they migrate -- and now he knows more, and because of that he takes less. He doesn't want to kill any more. Rodrigo, one of the *pangueros* for the school and a newly dedicated sea turtle conservationist, says "If I can save as many turtles as I have eaten, then I will be really happy about it." I asked him if he could give me a rough estimate of how many turtles he had consumed in his lifetime. He just laughed and said he was sorry, but that was confidential information.

Participant Observation

During the summer field seasons, several important meetings were held, and I was very fortunate to be able to sit in and observe many of them (see Appendix 7 for a list of major meetings attended during 2000 field season). I must first make note of the fact that when referring to a "meeting" such events ranged from impromptu conversations with influential members of the community in the back of a pick-up truck to more formally planned meetings.

Community Meetings and Cross-Regional Communications

In my experience, meetings seem to be conducted in a very different manner in Mexico -- people tend to talk a lot more, and are more willing to sit for an extended period of time. In the United States, meetings typically would not start late in the evening and continue for several hours -- nor would so much time pass without people getting fidgety and anxious to leave. One obvious reason for evening meetings in Baja is the fact that most people are out on the water fishing all day. The fact that people were willing to sit down at the end of a long day and engage in in-depth conversation for an indefinite amount of time was encouraging. Additionally, there seemed to be more of an element of respect for community members and their opinions, as well as an element of selflessness wherein people made the time to be present at such meetings. At the same time, there was also a tendency to talk and talk and not have any concrete conclusions or actions taken. In that regard, it was nice

that there was usually someone facilitating the discussions and, when needed, prompting with concrete plans and dates in regards to the formation of conservation strategies and next meeting dates and locations.

Pick-up Trucks and *Pangas*: The Importance of Impromptu Meetings

Ervin (2000:194) states that “ in many cases, informal conversations are used along with observations of behavior although focus groups, village meetings, and key-informant interviews are also frequently used.” These were standard research techniques while in Baja. It’s amazing how much information could be gathered through impromptu meetings in the back of a pick-up truck or over a beer at one of the local hangouts. I found that people were very willing to talk when there was no pen or paper around. People have turtle stories, especially the *pescadores*, and they love to share them. They love to boast about the biggest one they caught, or about how their wife prepares the best turtle soup in the town. Some of the older *pescadores* enjoy sitting back and reminiscing about the days when turtles were so abundant that several turtles could be caught in a single net– “those were the days when the fishing was good everywhere.”

Punta Abreojos Meeting

Perhaps one of the most important events of the 2000 season was a weekend visit to Punta Abreojos. The main goal of this visit was to have a meeting about how

to better protect and manage the coastal resources important to the *pescadores*, with a large focus on sea turtle protection. My trusty jeep took J, myself, and an NPR reporter while Adan drove four other men from a cooperative in Puerto San Carlos along some of the worst "unimproved" roads you can imagine. The men from Puerto San Carlos who came with us were interested in learning how to better protect their resources from the successful Punta Abreojos cooperative, while the Punta Abreojos cooperative was interested in learning about Puerto San Carlos' aquaculture projects.

The formal meeting took place on a Saturday night and lasted more than 3 hours. Over 20 people from Punta Abreojos attended, mostly members of their fishing cooperative, though there were a few non-fishermen and two women schoolteachers who were interested in conservation education. After formal introductions, people were allowed to make statements, followed by general questions and discussion. Representatives of the Punta Abreojos cooperative were very inquisitive about the sea turtle project in Bahía Magdalena and demonstrated great pride in the sea turtles that inhabited the waters near Punta Abreojos. However, the planned meeting at the community center may have had less of a lasting impact than the more informal activities of the weekend – sharing meals, going out on the boats together, taking a tour of the fish processing plant and desalinization plant and engaging in conversation. The men from Puerto San Carlos were very impressed with the solidarity of a single cooperative representing the entire town of Punta Abreojos and realized that was the source of the community's wealth and success.

There are numerous cooperatives within the Bahía Magdalena region, all holding concessions of various sizes. In Punta Abreojos, the small cooperatives had joined together to form one cooperative with one large concession. Their concession extends 200 miles out to the EEZ (exclusive economic zone) and covers over 22 miles of coastline. Because of the size of the concession and the collective pooling of resources as well as the high degree of trust and cooperation, the community of Punta Abreojos displays great strength and wealth and has had huge success in peer-monitoring and enforcement of fisheries regulations including turtle harvesting. Walking around town I was aware of the sense of pride that people took in their community. Unlike most rural communities in Baja, Punta Abreojos had streets and yards that were exceptionally clean and tidy.

After the weekend, my jeep came home with many battle wounds from the drive, but I came home with a better appreciation for the vast expanse of wilderness that separates many of the coastal communities. For this reason alone our visit, which also fostered friendships and enabled cross-regional communication and collaboration, was a huge success.

Formation of the COMITE

After the meetings in Punta Abreojos, the men from Puerto San Carlos who attended were energized and highly motivated to make changes. They were excited to work further on the creation of a protected area for sea turtles as an example of their interests and in hopes that it would bring people together. After a few weeks of

spreading the word, men from different fishing cooperatives came to the SFS site to talk to J about organizing a community meeting in Puerto San Carlos. Later, representatives from eight of the cooperatives held a meeting to organize a public meeting and each cooperative in attendance voted in a member to represent them at the table – thus forming the *Comité para la Protección de las Tortugas Marinas* (committee for the protection of sea turtles, hereafter called the COMITE) in Bahía Magdalena.

The major outcome of the initial meeting was the election of officers and a draft resolution/ mission statement for the committee that all members would be asked to sign at an upcoming community meeting. They created an enforcement commission and a commission for education and information, and elected officials for these subgroups as well as for the COMITE in general. They planned to have the community meeting during the weekend to encourage the participation of more individuals. This was a positive first step in the needed unification process, which has lead to greater support and involvement within the community.

The attendance at the community meeting to introduce the COMITE was phenomenal: more than 100 people! No one was expecting so many people, but it was fortunate that we had reserved a larger room at CETMAR, a fisheries-related technical school in town. The SFS students had painted a bright poster bearing the name of the COMITE, which hung on the wall behind the head table. Several color copies of the turtle-related artwork of local children were also hung around the room, near the front door, and on the podium. Among those invited to sit at the head table were officials from SEMARNAP and PROFEPA (the federal agencies responsible for

enforcement of regulations), a representative of the mayor, the *ejido* president, and the center director from the SFS school, as well as the elected officials of the COMITE.

The COMITE invited J to give his slide presentation to start things off, and J thanked them for the opportunity to share his information. He began his talk as he begins many of his talks, with a slide showing North America, stating that the Baja peninsula is two times longer than the U.S. state of Florida, but in Florida there are so many turtle biologists that each turtle could have its own personal biologist. The audience laughed. He continued to say that there are not many turtle biologists in Baja, going on to describe how important Bahía Magdalena was to the turtles. During J's talk, I looked around the room and saw many people nodding in agreement. For me personally, the whole event was very emotional, and I felt fortunate to be present and able to observe this historic event. It was J's last day in the field for the summer, and I had only a week left myself and it was definitely the culmination of J's years of dedication to the project.

Community-Level Education: *Noche de Caguama* Projectos

"*Noche de Caguama*" flyers were posted around town inviting everyone to "turtle night" at *El Galeon*, a local bar in need of some extra business. For a small fee, the town police drove their vehicle up and down the streets of Puerto San Carlos, spreading the word with their loudspeaker. Informal community meetings have evolved into annual educational programs. Initially, head researcher J. Nichols organized a meeting at a local community hangout, advertising a slide show

presentation on turtles, informal conversation and free beer and snacks. Although we were aware that most of the attendees were there for the beer, J. did not care what brought them there initially, as long as they went away with something to think about.

The highest attendance for a turtle talk was the children's program "*Noche de Caguama Para Niños*," on July 11, 2000, held at the SFS School. The children ranged in age from 5 to 14. The SFS School provided transportation for interested students who met at the town plaza. Other children were dropped off by parents at the school directly, and still others walked down to the school on their own and of their own interest. In addition to the usual slideshow presentation, drinks and snacks, we held a drawing contest about the turtles in Bahía Magdalena and children were asked to write a message about the turtles on their artwork. Outside under the palapa, J. demonstrated how we took carapace measurements – the children could pose as a turtle with a carapace on their back, and be measured with calipers and given a satellite transmitter. The children seemed attentive and inquisitive. They enjoyed the drawing, and the prizes, and all the photographs we took.

The following night, July 12, in an attempt to bring the community to the school, the traditional *Noche de Caguama* was held again, this time at the SFS site and not the bar. Without the advertisement of free beer, attendance was low. However, three men from the regional newspaper 'La Extra' who had just run an article in that day's paper on the sea turtles and J's work were in attendance. After the slide show, the atmosphere was relaxed and intimate, and the few participants engaged in informal conversation about turtles and the newspaper article while enjoying coffee and

cookies. While the turnout was low, it was reassuring to see that there were a few extremely dedicated and enthusiastic community members, previously unaffiliated with the turtle research or the school, who made an effort to attend and contribute.

Community Contributions

These local education programs and communications have led to the participation of *pescadores* in providing valuable data such as flipper tag returns and mortality information. Of most important note was a tag return from Japan. A local fisher had been holding onto this tag from a loggerhead he had caught five years previously; the tag had been attached to his key chain. After some dialogue was started in the community about the conservation of turtles in the bay, he gave it to a member of our team in hopes that it would help in our research efforts. It is encouraging to see that he valued this tag enough to hold onto it for so long; that he viewed it as something unique and worth holding onto is encouraging.

Perhaps of even greater significance is the demonstration of trust that Javier had in us through his turning over the tag. It indicates that people may be willing to help further with returning tags that they find. Many *pescadores* indicated that they typically discarded tags for fear of legal repercussions. Positive response to those *pescadores* who do turn over flipper tags will hopefully foster that trust and lead to further information exchange. J. Nichols (*pers. comm.*) has heard from increasing numbers of *pescadores* who return turtles to the water unharmed, after recording tag

numbers and capture locations. The most skilled research team members have been former turtle hunters.

In addition to this, some of the *pescadores* in the community who regularly catch turtles knew that we wished to obtain tissue samples and measurements from the turtles. In a few cases, members of our research team were invited to the homes of the people who consumed a turtle for their afternoon meal. The *pescadores* and their families often allowed us to take measurements and tissue samples, usually after the turtle had been slaughtered. In other cases, a few members of the fishing community would regularly come by the SFS research site and bring us stomach samples for use in our diet analysis studies. While we did collect a large portion of our biological data from strandings and capture by our research team, approximately half of our data came from direct participation within the community of Puerto San Carlos. Additionally, the locals also provided the necessary transportation of our team to and from beach areas where there were stranded turtles to record.

These examples of community participation have been very important. However, there are other, perhaps less tangible, ways in which the community has contributed towards the sea turtle conservation project. Local knowledge in the form of intimate geographic familiarity, technical fishing expertise and support with research logistics can also greatly impact the success of conservation work. By utilizing the local knowledge contributed by community members the effectiveness of biological studies was greatly enhanced. This information often provided the baseline data to work with, such as the identification of productive areas to set nets and

locating beaches where strandings are common, as well as valuable details of the workings of the bay like the movement of daily currents. During our time in the field, several *pescadores* assisted us in mapping out the locations in the bay where they observed and/or captured turtles most frequently, which species, during which season and at what time of the day. In addition to knowing where and when to set the nets in the bay, we also learned that certain types of nets and netting techniques were more likely to capture turtles. Such information was crucial in the biological portions of the study.

There are several other factors that contributed to the overall success of both the biological and social aspects of the research project. When entering the host community, the outside researchers were not familiar with how the community was organized or where many of the small fish-camps were located. The local *pescadores* who collaborated with us provided the information necessary to locate the fish-camps where turtles were most often brought. They also assisted us in our introductions into these remote communities, where our presence and interests might not have been tolerated otherwise. Additionally, Magdalena Bay is a very large region with several fishing cooperatives working in its waters. There are no visible boundary markers designating fishing concessions for the outside researchers, however all the *pescadores* seemed to understand clearly where these boundaries occurred. We would never have been able to tell whose waters we were on without the information provided by the fishing community. In this way, we were able to learn where the concessions were held and who the main contact people were for each concession.

DISCUSSION AND CONCLUSIONS

The Turtle Connection: Cultural Ties and Physical Embodiment of Sea Turtles

I'd look at them and think, you are made of turtle - eating so many turtles over the years, drinking blood - part of the person is turtle protein. And instead of reacting to that in a disgusted way, negative way, or saying 'you shouldn't eat turtles,' or 'that's terrible,' I just kind of listened and realized that that connection to the animal is one of the reasons why it's endangered, but it's also a tool and it's the reason why they will be protected, and why people will be enthusiastic about working for their recovery. It's a hell of a lot better than indifference, or ignorance, which are much more dangerous than that passion and connection with the animal. (Nichols, *from an interview with C. Graber*, 2000)

It may be an unconventional approach to take, but embracing that connection between the people and animals: their use, and the richness of their cultural traditions, as a conservation tool seems to be working. Many mainstream conservationists and environmentalists may find it hard to be tolerant of such practices. There is often a strong polarization between *pescadores* and users of the resource and those who wish to see the resource protected and untouched. In a way, the fishers are seen as the enemy, whereas the conservationists are heralded as champions of the animals. Nichols believes that it is "much more interesting to just all work together and come up with a solution that is not based on animosity and polarization."

Another facet of this connection with turtles, besides the actual embodiment of the turtles, are the epic stories. People love to talk about turtles, especially the *pescadores*. They seem quick to talk about the "biggest and the best" turtles. Old

pescadores' tales. Sea turtles are a part of the cultural geography of the Baja California peninsula, going far beyond their role as a source of food, and are arguably the most important animal in the lives of these coastal peoples. In the past, a general lack of understanding could serve as a rather difficult stumbling block in the way of successful conservation programs. However, within the research approach utilized in Baja, an intimate understanding of the cultural context has been critical.

Historical Preservation: Why Conserve Sea Turtles?

How can understanding the cultural significance of sea turtles help sea turtle recovery efforts? Nichols (*SFS center lecture*, 2000) makes an interesting analogy between the historic preservation of archaeological sites and the preservation of biological resources. He asks us to consider why we protect archaeological sites, and suggests that it is our desire to preserve our history, in part, to remember and learn from our past. Nichols suggests that most people would not argue for the bulldozing of such places as Mayan ruins or Jesuit Missions, and that within the context of sea turtle conservation there is an aspect of protection that mirrors these sentiments. Everywhere that people and sea turtles have lived together, there are very obvious cultural ties to the turtles that are separate from turtles solely as a food resource. Turtles have served as a source of inspiration for many aspects of local culture such as art, song, dance and folklore, particularly for indigenous coastal peoples. Turtles possess a symbolic quality, though the symbolism may change between various cultures. In some traditions, the turtle is seen as a symbol for longevity, in others it is

considered the bearer of the earth. While such turtle-related folk traditions do not exist within the communities of Bahía Magdalena, sea turtles are still viewed as a symbol of virility and strength. This, coupled with the strong cultural traditions of serving turtles for important guests, may be the deeper underlying motivation for sea turtle consumption.

Of Whales and Turtles: A Potential Conservation Strategy

It may be possible to construct some linkages between the status of whales and turtles, if we consider the history of whaling and how cultures have changed over time as the use and value of whales has shifted from an industrial fishery to a nonconsumptive whale-watching industry. The story of the gray whale is a success story and a particularly good example pertinent to this location, as Bahía Magdalena is not only an important foraging ground for sea turtles of the eastern Pacific, but it is also a calving ground for the gray whales. Both species migrate over great distance to utilize the abundant resource of this area.

An evolution might be possible in the way that turtles are used similar to the way that the use and value of gray whales has changed. With the recent interest in establishing a protected areas for sea turtles in Estero Banderitas, part of the Bahía Magdalena complex, some of the *pescadores* are hoping that tourists will come to see the turtles. Bahía Magdalena has seen many ecotourists in the past decade or so. The majority of the visitors to the area are there during the calving season, when they can approach and observe a large congregation of gray whales. There are also adventure

tours and surf camps in remote areas of the barrier islands. While turtle tourism will likely not be an attractant of its own, the *pescadores* interested in bringing visitors into their protected turtle area hope that those tourists already in the area out of other interests will spend a day on a sea turtle tour before they leave. However, sea turtles are much more difficult to observe than the gray whales. While whales are often curiously attracted towards the small boats, turtles are quick to try and escape out of sight. It will be a few years before we are able to gauge what success turtle tourism might have in Bahía Magdalena. The potential exists, if the locals find the right approach and keep the tourist level low, so as not to harass the turtles and force them to leave their sanctuary. However, larger scale ecotourism is not likely to be an issue due to the fact that there is a cannery situated in Puerto San Carlos, which produces a noticeable stench, particularly during the hot summer months.

Lessons Learned

As a conservation biologist and environmental anthropologist, I believe it is necessary to draw management techniques and strategies from the different areas of our toolbox. This is not an issue that can be addressed with only the "hard sciences," nor can it be approached solely through the social sciences. The issue of sea turtle conservation is multidimensional, as its causes are multifaceted. Therefore, it is the responsibility of the conservation-oriented anthropologist to advocate management techniques that will address the issue in a holistic framework. Community-based management is one strategy to use in order to address sea turtle recovery objectives.

However, before this type of management can occur, and be successful in the long-term, there are several areas that need to be analyzed and understood.

Conservation Ethics

While environmental ethics have expanded outwards from the early "dominion over the land" mentality, anthropocentric utilitarian ethics are among the most common, particularly in less developed areas. To look beyond instrumental value towards a deeper cultural value implies some aspect of privilege or luxury: in this way, behavior or motivation is not driven solely by an immediate need to utilize nature as a resource to support oneself or one's family.

In the case of the fishing communities of Bahía Magdalena, the survey results which indicate that the demand for turtles is driven more by culture than by financial necessity is evidence of this distinction between instrumental commercial value and non-utilitarian cultural value. Even though the community harvests some turtles, part of this can still be viewed as a form of non-utilitarian value because the primary motivation for harvest is based in cultural tradition and not in the necessity of economic or food subsistence. It is of great importance to understand these underlying causes of sea turtle use as well as the community's motivation for supporting turtle conservation projects. With this knowledge and understanding, it is clear that any research conducted must be addressed from within this cultural perspective in order for conservation to be successful. As a result, turtle conservation

strategies that would be based solely on economic incentives, such as providing an alternative source of income for turtle harvest, may be met with minimal success.

While there is an aspect of instrumental value associated with some *pescadores* who derive a great portion of their income from the harvesting of sea turtles, the majority interest within the community seems to be of greater non-utilitarian cultural value. This can be a powerful tool in conservation efforts, particularly because the *pescadores* have expressed a concern for future generations, often stating that they hope their children will be able to know sea turtles and have them continue to be a part of their culture and traditions.

The Community-Based Research Approach

Because of the intimate relationship between the turtles and the local community, the use of community-based conservation strategies has been extremely important. Involving the knowledge and trust of the *pescadores* of Bahía Magdalena has been crucial to recent research and conservation efforts. Because of the illegality of harvesting turtles, the locals were initially very suspicious of any questions about it and were quiet and reserved in their discussions. It has taken a great deal of time and patience to build up trust within the community, and now they are beginning to speak more freely with us. This trust is crucial to the continued success of research and conservation projects in the area. It has allowed us access to increased understanding of the complexity of the issue of sea turtle recovery, as well as providing us more tools to work with. Involving local knowledge has proved to be beneficial in our research

objectives. Some *pescadores* have provided us with advice in finding the best locations to capture turtles for measurements and tagging. Others have even taken us out to places where they have seen and/or caught turtles.

In many places around the world, external researchers only have the time and resources to make a snapshot assessment. The typical approach of a research project is to "get in and get out" - gathering as much data as possible as efficiently as possible. Once the data are collected researchers may never return. They may enter the host community with complete autonomy, for instance with their own boat, equipment and food. Alternatively, our experiences in Baja have shown that through a certain dependence on the host community - for food, equipment, labor and guidance - a special connection can be made which fosters trust and builds partnerships. We suggest that such partnerships have laid the foundation for long-term conservation success in the region.

Local Knowledge and Outside Science

Our work in Baja has shown that the inclusion of local people in resource management can provide many benefits. Stronger conservation alliances based on the mutual sharing of knowledge, along with the combination of local science and structured monitoring, may produce the greatest conservation benefits. To date, the Baja sea turtle conservation initiatives have resulted in great success. This has been due, in large part, to the partnerships formed between locals and outsiders and the information that has been shared as a result of these partnerships. Outside research

and conservation projects aren't necessarily doomed to failure without the contributions of the local community; however, projects are much more likely to be met with success when local knowledge is integrated alongside the knowledge brought in from the outside researchers. Through my experiences in Baja, I have learned that this local knowledge can take a variety of forms, such as region-specific technical expertise and logistical support.

Although outside researchers may enter a community with a textbook knowledge of ecosystem functions and indicators, the local fishing population knows the intimate details of the bay. While many members of the local community were not formally educated about the general ecology of the bay, their home and living comes from the resources that the bay provides. When their livelihood is directly related to their ability to effectively and reliably locate the desired resources in order to earn their income and feed their family, an intimate knowledge of the workings of the bay is necessarily acquired over time.

I found that several of the practical contributions which Stevens (1997) suggested that local groups can provide to be true in the Baja turtle project as well -- most notably, an intimate knowledge of local geography and ecology. We were quickly taught that drift-nets were more effective than anchored nets. During one outing in the boat, we went to set our drift-nets to catch turtles in the bay. From the surface of the water everything looked the same to me, however at some seemingly random point in the middle of this very large bay the *pescadores* we were with stopped their motors and began to set the net. They said that beneath us was a deep channel

where the currents were very strong and any turtles that were moving about with the tide would swim through this area. I had little faith in this since we hadn't been catching turtles all week, but to my surprise we were successful in catching turtles there, and not just on that one occasion. This area became the main site where we would set our nets for the rest of the field season, always timing our outings with the locals' knowledge of the tides and currents.

In addition to helping us locate productive areas to set our nets, we were also provided with logistical support in reaching some of the fish-camps that had been identified to us as well as the beaches known for strandings. For example, several barrier islands surround Bahía Magdalena and in order to access the open waters of the Pacific a quick glance at a map shows the location of the mouth of the bay at the south end of Magdalena Island. However, if you want to reach a small fish-camp on the northwest side of the island this would make for a long boat ride down and around the island. By working in partnerships within the local community, we learned that if we beached our boat in Puerto Magdalena, we could have a truck tow our boat across a narrow stretch of dunes to the other side of the island. From here we could set our boat out again and into the open waters of the Pacific, reaching the desired fish-camp much more quickly.

It is important to recognize that local knowledge can make valuable contributions to science. The local knowledge that is contributed has the potential to greatly impact the outcome of current scientific studies as well as helping to shape the direction of further studies. Within this case study, which highlights the successful

integration of local knowledge into sea turtle conservation and research projects, the results of community-based efforts have enhanced the biological studies. Conversely, the locals who have been actively participating have also been learning more from the scientists – for example, the satellite transmitter data showing that loggerheads migrate from Japan – and incorporating such knowledge into their understanding of their coastal environment. The results of this integrative approach have gained attention within the wider network of sea turtle conservationists, with potentially broader impacts on other projects.

The Conservation Mosaic Revisited: Future Goals and Feasibility

At last year's (2001) Annual Sea Turtle Symposium in Philadelphia, Frazier (*in press*) posed the question: "is increased scientific production conserving turtles?" stating that "we are learning more and more about what is becoming less and less." There have been great advancements in our understanding of sea turtle biology and behavior and the science of conservation is continually developing new tools. Unfortunately "science" does not always translate into "conservation" on the ground. As researchers become increasingly aware of the cultural motivations involved in sea turtle exploitation, it is critical to shift conservation efforts to *actively* include local communities, in particular the *pescadores* who are making choices that directly impact the fate of turtles.

If the turtle community is concerned about the fate of turtles, local knowledge *must* be valued and utilized and finally integrated alongside the knowledge that outside

researchers bring into the community. Aside from any moral or ethical arguments about community participation and respecting the local host communities we live and work in – of which there are several – working with the community is just good conservation sense. When dealing with any threatened or endangered species or habitat it is imperative that we draw upon all the available tools and all the existing knowledge which is readily accessible in order to create conservation strategies in a timely fashion. We don't have the time to wait for "science" to establish more information and tools to work with, particularly when there is often a vast body of knowledge waiting to be accessed within the local community.

Within a *conservation mosaic* (Nichols, 2001), the incorporation of both biological and social research methods and communication are critical and have proved to be valuable tools in the ongoing projects in Baja. Placing value in the opinions, experiences, and knowledge of the *pescadores*, and involving them directly in the project from the first step has formed strong conservation alliances within many of the coastal communities of Baja.

In order to be successful in our conservation aims, we must utilize all of the knowledge available to us, evaluate it and put it to use within our conservation projects. By taking a little bit of extra time to investigate what locals know, we may save ourselves from conducting unnecessary research in the long term, saving research funds and support staff to tackle other aspects of projects that may be in greater need of research and conservation efforts. An interdisciplinary approach allows for the utilization of many "sciences" and provides a more holistic view of how sea turtles fit

into the grand picture. By avoiding a purely biological and "turtle-centric" approach and instead investigating the overall turtle habitat, including the cultural and socioeconomic communities of which turtles are a part, our understanding may be greatly enhanced.

Measures of Success

Within the context of this project, it is difficult to define the indicators of overall success. The research approach has been highly integrative, comprised of both biological and socio-cultural components, making it difficult to weigh individual subsets of results as successful or not. For example, while it is relatively easy to work with numbers of turtle mortalities due to strandings or harvest, it is not as easy to gather the cooperation of the locals in providing the knowledge and assistance to first obtain these numbers and then feel that they are an accurate representation of what is actually occurring within the community. Even if survey results indicate an increase in turtle mortality from one year to the next, this information may in fact be an indicator of success within the program: potentially representing a greater incidence of participation on the part of the locals in providing this valuable data in confidence. This is a strong indicator of process success because the research approach and methods are proving to be effective at building the types of relationships needed in order for such participation to occur.

I was fortunate to become involved with a project that had already been underway for several years, because it does take a longer investment of time to yield

the successful results that we have witnessed. The length of time that had already been spent building rapport between outsiders and locals – due in large part to the positive relationship between the SFS school and the community – allowed for the recognition of common values. Because outsiders and locals were not fighting about values – instead sharing a common interest in maintaining the sea turtle population in Bahía Magdalena – the potential for conflicts was minimized. This is not the case in all places; in some cases a common platform can never be reached no matter how much time outsider researchers spend within the community. Even if no common values are recognized, the level of project success can be enhanced by the type of relationship that is built between different interest groups.

True community-based conservation is happening in these coastal communities of Baja California. Since my time in the field, more and more communities have been coming together to share information and discuss conservation strategies, including the establishment of several protected areas for sea turtles and other threatened resources. Meetings are being organized within the communities and there has been a greater interest in collaboration between communities. These efforts are now truly being initiated at the grass roots with a higher level of awareness and participation. As the community has become more interested in protecting sea turtles and education programs have provided community members with a more global perspective on the turtles of their bay we have been hearing more and more *pescadores* say “I will not be harvesting any more turtles.”

To add to these community-level successes, this year at the annual sea turtle conservation symposium to be held in Miami, Florida (April 2002) reports will be made of an increased population of sea turtles at some of the nesting beaches at Michoacán, mainland Mexico – one of the primary areas where the Baja turtles migrate to during the breeding season. Preliminary results of these nesting beach counts were reported at the 4th Annual meeting of the Sea Turtle Conservation Network of the Californias (25-27 January 2002, Loreto, BCS), showing a large increase from only 500 nesting females in the 2000-2001 season to 3,000 nesting females in the 2001-2002 season (Presenti, 2002). Because sea turtles show strong nesting site fidelity – meaning they return to reproduce at the beach where they were hatched – these results indicate that more turtles from the nesting beaches of Michoacán have been surviving to reach reproductive age. While it is too early to judge whether this data represents a positive upward trend in the nesting population, it is likely that this observation is a result of the decades of increased sea turtle protection that began with the regulation of commercial harvesting in the early 1980's and the complete ban in 1990 as well as a combination of stronger protection on nesting beaches and ongoing conservation initiatives at foraging areas in Baja California. There is a lag time of approximately 20 years – the time required to grow from hatchling to reproductive adult – before the results of these conservation efforts may be seen. While turtles continue to be harvested in Baja's communities, the numbers being taken – as reported by locals – have been slowly decreasing, meaning that more turtles of reproductive age are surviving to nest again.

Although there has been great success within this case example, there are still some issues that will remain of concern. One of the potential limitations in such projects is the time investment needed in order to build the partnerships necessary to be successful. It takes a high level of commitment on the part of an outside researcher to come into a community with a primary goal of truly working with the members of the community, integrating their knowledge and values into the project at each step. However, if such a commitment is made the potential for self-sustaining long-term conservation success increases. In several of the communities we work in, we have witnessed a great increase in community members taking conservation into their own hands -- voicing their concerns, educating their peers, and organizing meetings within their communities as well as cross-regionally. This increased vocality has enabled the recognition of common goals; as a result some fishing cooperatives that have historically been in opposition have been building a more professional working relationship.

Policy and Advocacy From an Interdisciplinary Perspective

I have struggled with my identity as a researcher in the past -- at times trying to fit into the mold of anthropologist and at other times that of the biologist. There are some seemingly obvious differences in how these two professions define proper data collection techniques, and even differences in the formulation of the research problem statement in itself. At the bottom often lie conflicting amounts of weight placed in the value of quantitative and qualitative data. But, these fields are expanding rapidly --

as anthropology becomes more applied, and the new focus in conservation anthropology (as discussed at length at the 2000 AAA meetings in San Francisco) is emerging, conservation biology is also expanding into the "human dimension" more and more. I found that I could remedy my identity crises by rationalizing that I could hold more than one professional identity. I began to thrive on my multidisciplinary background, and felt that I was able to incorporate both positions into my work -- and my work was better off for this blending of perspectives and approaches.

As a conservation-oriented anthropologist, or a people-oriented biologist, I believe that the current debates over advocacy are particularly relevant. For some reason there is a common misperception that science, in its objective nature, should have no place in advocacy. This is particularly relevant to current debates closer to my current home in the Pacific Northwest-- the salmon and what to do about the dams on the Columbia River. This type of controversy exists around the sea turtle project in Baja as well. Ultimately it comes down to distinguishing between anthropocentric and ecocentric worldviews and values. But, just because a scientist does "science" does not mean that they must shed their values. Science, in its purest sense, exists as objective knowledge to be used in ways pertinent to a specific question of interest -- and the element of subjectivity and bias is never completely neutralized.

Through my research experiences I came to the conclusion that if I was concerned about *either* the fate of the turtles *or* the local community, I necessarily had to be concerned with the other. In this case, and many other environmental conflicts, the future of both the threatened resource and the local resource-dependent

community are inextricably woven together. Protecting the turtles means protecting the cultural traditions of the people. Advocacy of decreasing turtle harvest without penalizing the community for its use of turtles displays a respect for the community's dependence on and value in the resource. After all, I was only a visitor and a guest in the community, and after my departure the turtles and the *pescadores* of Bahía Magdalena continue to be living together.

Research Implications

With sea turtle populations continuing to decline globally, it is imperative that conservation strategies remain under constant evaluation. The major causes of sea turtle decline stem from anthropogenic factors, and with an awareness that there are cultural motivations involved in sea turtle exploitation, conservation efforts necessarily need to be shifted in the direction of the people at local levels. The human dimension may be the area of research where most conservation gains can be made. By combining the knowledge gained through scientific investigations with the insights of the social sciences, we stand a much better chance of succeeding in our recovery efforts. Advocacy of adaptive management techniques that are designed through community-based research and action are appropriate within the context of natural resource conservation.

The research conducted illustrates an example of what could be called *people-oriented conservation biology*. Through the incorporation of various research techniques from multiple disciplines, we have developed an approach that integrates local

knowledge and interests along with outside science. We believe that this approach leads to greater success of conservation projects. This approach, as well as the research findings, may be useful as a model stressing the importance of local participation and cooperation in conservation efforts in other communities dealing with threatened or endangered resources. Additionally, our approach has indicated that there are a variety of factors that need to be taken into consideration while working within a local cultural framework in order to create such partnerships.

Revisiting Feldmann's (1994) assertion that conservation strategies imposed from the outside "may be ineffective if they are incompatible with customary or traditional rights recognized at the community level" (397), this dilemma becomes quite obvious in the case of the sea turtles of Baja. As illustrated in Murray's (1987) domestication of wood project in Haiti, when the local community is consulted – and given the opportunity to participate fully in conservation projects – locals maintain the feeling of control over their resources. We also witnessed another of Stevens' (1997) assertions about local resource-dependent communities to hold true: a populace deeply committed to defending their resources against outside encroachment. When considered together, these feelings often lead to locals taking some form of ownership over the conservation project. We have witnessed a strong community-based commitment to the protection and defense of local territories, particularly in the form of fishing concessions and the resources contained therein.

In the earlier discussion of community-based conservation, a fundamental assumption of CBC was described: that individuals will necessarily choose to care for

the things they have a vested interest in. Our research findings support this assumption. In our experience in Baja, members of the local community, including the *pescadores*, have demonstrated an interest in conservation for conservation's sake, as well as for preserving a major source of their traditional livelihood and an occasional source of food. When the locals display this sense of ownership, they seem to act as guardians over their resources and their knowledge of the resources specific to their territory. Additionally, if the local stakeholders are consulted and feel their knowledge is valued, they are much more likely to cooperate with outsiders. Because our research approach is culturally sensitive and we recognize the economic and social values associated with sea turtle use within the community, there has been mutual respect between *pescadores* and researchers. This mutual respect is paramount to any form of collaborative research and greatly impacts the outcome of this and other natural resource conservation projects.

OUTLOOK

At the recent Putting Fishers' Knowledge to Work conference (August, 2001, University of British Columbia, Vancouver), I heard Bob Johannes recollect the words of fisheries biologist Frederick Ommancey who, nearly forty years ago, stated that the indigenous fisher 'has forgotten more about how to catch fish in his waters than we shall ever know.' This statement made a profound impression on me. I believe that it is often the case that outside researchers entering communities greatly underestimate the local knowledge that is present within those communities. If we are able to recognize that this local knowledge exists, and often in greater detail than the general knowledge that researchers bring with them, Johannes goes on to question how we can generate enthusiasm in local fishers for collaborating with us? He also poses a very important question: "how can we function as plausible and useful advisors if we don't first assimilate this local knowledge, test it where practical, and integrate it with our own?" (Johannes, *email comm.*, 1 November, 2001).

The issue of local cooperation is central to any conservation initiative, particularly in rural areas like those communities involved in sea turtle recovery efforts in Baja. While it has been shown that local communities can contribute their knowledge as a tool in resource conservation issues, there has been a tendency to use the catch-phrase "community participation" to disguise what may really be viewed – or treated – as cheap labor. In order to understand the complexities of any resource use and conservation issue, there needs to be an awareness of the motives that drive

communities to become involved as well as a respect for the local community processes which need to be maintained.

In our research, we have allowed the community to identify the ways in which turtles are valued and utilized without projecting our own interests and values onto them and judging their beliefs or actions. We have provided interested members of the fishing community with up-to-date information about the global status and distribution of the sea turtle population that spends a portion of their life within the bay. We have also involved the locals in the formulation of research ideas, equally integrating their needs and contributed knowledge alongside the information and techniques that we have shared with them. These actions have allowed for a working relationship built on reciprocal respect. Such a relationship is necessary for the continued success of these and other conservation projects.

Oftentimes the objectives behind "western science" of external researchers are not that different from the "local science" of fishing communities. The integration of knowledge generated through quantitative approaches with the knowledge of local fishers may provide the most detailed information -- daily observations, leading to a 365 days/year account of turtle behaviors and movements. We need to contribute our knowledge and accept others'.

Recognizing that outsiders and locals share the goal of conserving sea turtles, we recognize that all involved have a right to be -- and must be -- part of the solutions. In this way, the fishing community has maintained its feeling of control over the

resources and has established a strong sense of pride in the natural richness of their coastal system -- and community pride can be one of the most powerful motivators for conservation.

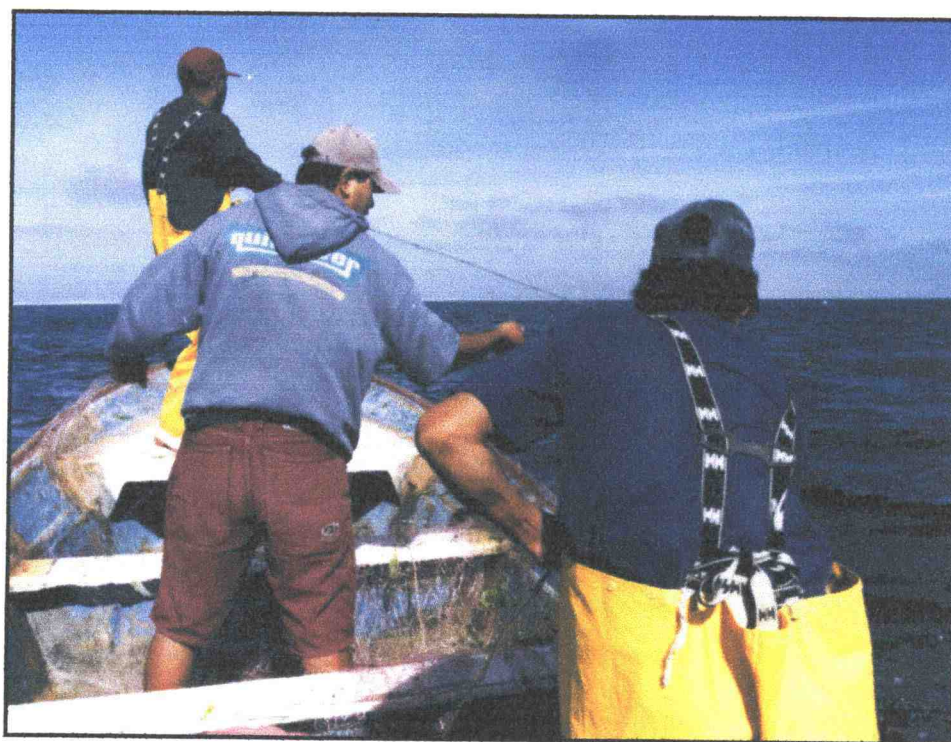


Figure 9. *Pescadores* pulling in the nets:
Bahía Magdalena, Baja California Sur, Mexico

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NOTE: For more information and on-going progress on sea turtle conservation activities discussed in this case study see: www.wildcoast.net

APPENDICES

APPENDIX 1

INTERNSHIP SUMMARY REPORT - SUMMER 2000

Intern: *Kristin E. Bird*

Sponsor: *Wallace J. Nichols, Science Director WiLDCOAST*

Internship Location: *SFS Center for Coastal Studies, Puerto San Carlos, BCS, Mexico*

Duration of internship: *24 June - 22 August 2000*

Internship activities: As an intern, I spent approximately 9 weeks working closely with representatives of the organization WiLDCOAST, an international conservation team working to preserve the endangered marine species and last remaining coastal wildlands of the Californias. The Baja California sea turtle conservation project initiated by Wallace J. Nichols, Science Director, is one of these efforts. Early on in the summer, Nichols described the turtle project as being two-fold: including both conservation research and community involvement - which means incorporating both biological and social research methods and communication. Local education, informal conversation and community meetings are a fundamental part of the sea turtle project in Magdalena Bay. During the past summer, I was able to assist in the community-based research aspects of the sea turtle project, including conservation education and outreach.

Local accommodations were provided by the SFS Center for Coastal Studies, so we were able to work in partnership with some of the faculty, staff and students at the Center as well. I conducted interviews with some of the people who have been involved in sea turtle conservation efforts, both within the SFS community and the local community of Puerto San Carlos. Additionally, I conducted a few interviews with representatives of other coastal communities in Baja, including the director of the sea turtle project in Bahía de Los Angeles, BCN, Mexico and representatives of other coastal communities in order to gain some information about similar projects based in small fishing communities. I participated in important community meetings and was able to take notes and make observations about how conservation initiatives work at the community and regional level.

Benefits To The Intern: This internship allowed me to further develop my independent research and analytical skills. This position also afforded me greater confidence in my communication skills. By working closely with people from varying backgrounds - including scientists and students from the United States and Mexico and representatives of different coastal communities in Baja, I was able to understand sea turtle conservation efforts in a broader spectrum. Additionally, the total immersion in a Spanish-speaking culture allowed me to learn more of this language. I was very happy with my increased ability to understand the language by the end of the summer, so that I was able to follow what was discussed at the community meetings

APPENDIX 1 (continued)

we attended. By traveling to other coastal communities, I was able to learn how the local socio-economic system impacts conservation efforts which have the potential to impact turtle recovery regionally and internationally. For this reason, it is important to understand the local cultural context and work within the community itself.

Internship Contributions: My project was created to examine a specific case of community-based research and conservation from multiple perspectives and relate it to the evolution of sea turtle recovery efforts, including the designation of the first in-water protected area for sea turtles, in Magdalena Bay. I have been able to document how the first Committee for the Protection of Sea Turtles in Bahía Magdalena was formed. By incorporating data generated within the local community of Puerto San Carlos and the SFS community the impacts of cross-cultural exchange of conservation knowledge and values became visible. My research activities helped in providing a greater understanding of community-based conservation efforts and how they may work in small coastal fishing communities in Baja California, Mexico. Additionally, with the data that I gathered during this internship, I hope to create a comprehensive report on the process and evolution of community-based research in sea turtle conservation in Magdalena Bay that may be used as a reference and source of information for other community-based projects and initiatives. I will also be presenting my results and emphasizing the importance of community-based conservation initiatives at the 21st Annual Sea Turtle Symposium in February 2001.

Acknowledgments: I am very grateful for the continued assistance and support provided by Wallace J. Nichols of WILDCOAST and Salvador Garcia-Mártinez of the SFS Center for Coastal Studies, both of whom have helped me immensely during the course of this research project. I also wish to extend my thanks to Carlos de Alba Pérez, SFS Center for Coastal Studies Director, and the rest of the faculty, staff and students at the Center for Coastal Studies. I am particularly grateful for the support shown by all of the individuals who granted me an interview and wish to acknowledge the fishing cooperatives of Puerto San Carlos and Punta Abreojos for allowing me to sit in on some of their meetings and record my observations. Additionally, I would like to acknowledge the Education Foundation of America for providing the financial assistance which made this project possible.

Kristin Bird

21 September, 2000

APPENDIX 2

Survey Questions: Assessing the Demand for Sea Turtles in Magdalena Bay

1. What is your age?
 - a. under 18 years
 - b. 18-30 years
 - c. 31-50 years
 - d. over 51 years
2. Gender?
 - a. Female
 - b. Male
3. Occupation?
4. What is your income per month?
 - a. Less than \$5,000 pesos
 - b. \$5,000-\$10,000 pesos
 - c. more than \$10,000 pesos
5. How many members are in your family?
6. How long have you and /or your family lived in Puerto San Carlos?
 - a. Less than 5 years
 - b. 5-10 years
 - c. 11-20 years
 - d. 21-30 years
 - e. over 30 years

If your answer is either a or b, what is your state of origin?

7. What is your educational background?
 - a. No formal education
 - b. Through primary school
 - c. Through secondary school
 - d. Through preparatory school
 - e. College graduate
8. do you think that turtles are in high demand (popular to eat) today?
 - a. Yes
 - b. No

APPENDIX 2 (continued)

9. After 1990, it was not possible to continue the commercial trade of turtle meat and products. Do you think this caused a decrease in the consumption of turtle?
- Yes
 - No
10. Circle three of the choices below where you have used or seen turtle being used most often.
- Christmas
 - Weddings
 - Mother's/ Parent's day
 - With special guests/visitors
 - Semana Santa (Easter week)
 - Sundays
 - Medicinal purposes
 - household decorations
 - other
11. Do you feel turtles need to be protected?
- Yes
 - No
- Please explain why or why not:
12. have you ever consumed sea turtles?
- Yes (go to question 13)
 - No (go to question 14)
13. Have any of the factors below affected your consumption of turtle? (Please circle all that apply)
- The population decrease of turtles
 - The price of turtle has increased
 - The Federal government ban of 1990
 - You do not like the taste of it
 - Your income level has decreased
14. Have you noticed a decrease of sea turtle populations in Bahía Magdalena?
- Yes
 - No

APPENDIX 3

Interview Questions: Assessing the Demand for Sea Turtles in Magdalena Bay

1. Is there a problem if someone harvests or sells sea turtles? If your answer is yes, please comment.
2. What do you think about the control of the harvesting of sea turtles?
3. Why do you believe that commercial harvesting of sea turtles is prohibited?
4. As far as you know, how much would it cost to buy a sea turtle?
5. Does your income remain constant during the year?
6. Out of the income you earn, how much comes from the harvesting of sea turtle?
7. What other uses does the turtle have, other than being consumed for food?
8. Do you believe that the sea turtle is an important part of your culture?
9. Have you consumed sea turtle or used some products from it?
10. Are you interested in the conservation of sea turtle?

APPENDIX 4**Survey Questions: Assessing the Supply of Sea Turtles in Magdalena Bay**

1. What is your age?
 - a. Under 18
 - b. 18-30
 - c. 31-50
 - d. over 51
2. What is your gender?
 - a. Male
 - b. Female
3. What is your educational background?
 - a. No formal education
 - b. Completed primary school
 - c. Completed secondary school
 - d. Completed prep school
 - e. College graduate
4. Circle any of the following marine animals that you typically harvest
 - a. Abalone
 - b. blue crab
 - c. fin fish
 - d. lobster
 - e. shrimp
 - f. scallop
 - g. turtle
 - h. other
5. How many individuals are you responsible for supporting?
 - a. None
 - b. 1-3
 - c. 4-6
 - d. more than 6
6. What was your approximate total income for the last month of June?
 - a. Less than 3,000 pesos
 - b. 3,000-10,000 pesos
 - c. more than 10,000 pesos

APPENDIX 4 (continued)

7. From your typical monthly income, approximately what percentage comes from the harvesting of sea turtles?
 - a. 0%
 - b. 1%-49%
 - c. 50%-89%
 - d. 90%-100%
8. Have you ever been a position where you depended on a turtle to earn money or to feed your family?
 - a. Yes
 - b. No
9. Do you believe that sea turtles are an important part of your culture?
 - a. Yes
 - b. No
10. Circle any of the following situations for which you have used or seen turtles being used:
 - a. Christmas
 - b. Weddings
 - c. Mother's/father's day
 - d. Special guests/ visitors
 - e. Semana Santa
 - f. Sundays
 - g. Medical/ health purposes
 - h. Household decorations
 - i. Other
11. Per week, on average, how many sea turtles are caught and not thrown back?
 - a. 1-5
 - b. 6-10
 - c. more than 10
12. Do you respect the laws against the harvesting of sea turtles?
 - a. Yes
 - b. No
13. Are you interested in the conservation of sea turtles?
 - a. Yes
 - b. No

APPENDIX 4 (continued)

14. If the government were to lift the ban, would you be willing to not harvest sea turtles anyway?
- a. Yes
 - b. No
15. If a fisherman catches a sea turtle, what is typically done about it? (Circle all that apply)
- a. Eat it
 - b. Sell it
 - c. Throw it back

APPENDIX 5

Interview Questions: Assessing the Supply of Sea Turtles in Magdalena Bay

1. How important are sea turtles to your livelihood?
 - a. Are sea turtles especially important to your culture? How?
 - b. Have you ever been in a position where you depended on a turtle to earn money for your family or to feed your family? Please explain.
2. Of the fishers you know, how many of them harvest sea turtles, either accidentally or intentionally?
3. What is the general feeling among fishers towards the ban on harvesting sea turtles? What is your feeling?
4. How does the law affect your fishing practices?
5. Do you know of any situations when officials have not caught fishers for illegal harvesting of sea turtles because of a bribe?
6. Are you aware that the sea turtle population is declining?
7. How do you think you will be affected if there are no more turtles to harvest in the future? What will you do?
8. What kinds of actions do you think should be taken to help restore the sea turtle population?

APPENDIX 6**SFS Student Questionnaire, July 2000**

1. What is your age?
2. What is your gender?
3. What is your major in college? If already graduated, please list your degree and date received. If not yet in college, please list your area of interest.
4. What year will you be entering fall 2000?
 - a. In high school
 - b. Freshman
 - c. Sophomore
 - d. Junior
 - e. Senior
 - f. Just graduated and am not enrolled for fall 2000
 - g. Enrolled in a graduate program (new or continuing)
 - h. Not currently in school
5. Why did you choose SFS Baja?
6. Were you aware of the sea turtle conservation project being conducted here prior to your arrival? If so, did that have any impact on your decision to attend this program?
7. What do you think about the conservation of sea turtles?
8. How do you think sea turtles are valued in the local community?
9. In 1990, the Mexican government passed legislation which banned any and all harvesting of sea turtles. What do you think about the 1990 ban?
10. Do you think that the local community is interested in the conservation of sea turtles?
11. What do you hope to gain from your SFS experience?

Appendix 7. List of Meetings Attended

Meeting Date	Location	Time	Attendance	Topics Discussed	Results
06/25/2000	SFS kitchen	8AM 3h	J and 4 members of turtle team, 4 SFS-related folks	Intro. projects and team members objectives for the season	Prioritize goals for the season, collaboration
07/11/2000	SFS kitchen	6 PM 2h	Approx. 20 children from PSC, ages 5-14 J and 6 members of turtle team	art contest & activities, slide show, equipment demonstration	beautiful artwork, smiling faces, fun winner chooses "Max" for the next turtle name
07/12/2000	SFS kitchen	7 PM 3h	3 men from La Extra newspaper 2 men from PSC, 5 members of turtle team		
07/24/2000	SFS Palapa	8AM 1h	SFS students, 3 members of turtle team	Adan leads a seminar discussing his relationship to turtles growing up	SFS students gain awareness of cultural context
08/04/2000	Pta. Abreojos	5 PM 3h	14 people from Pta. Abreojos (incl. 2 women) 5 men from PSC cooperatives, 1 NPR reporter J. Nichols, Serge Dedina - WILDCOAST	status of sea turtles in region, idea of forming a protected area, education projects	community-level collaboration and action
08/07/2000	SFS kitchen	8 PM 3h	5 members of turtle team 12 +/- men from 4-5 PSC cooperatives	the Pta. Abreojos meeting overview and experiences, idea of a protected are in BMA	Formation of the Comité para la Protección de las Tortugas Marinas
08/12/2000	SFS palapa	5 PM 2.5h	17 men from PSC representing 8 different cooperatives, 4 researchers from UABCS, 4 members of turtle team	how to elect members to the COMITE discussion of the COMITE's role tomorrow's community meeting	Election of officers within the COMITE Draft resolution/ mission statement. Plan the meeting at CETMAR tomorrow
08/13/2000	CETMAR	7 PM 1.5h	The Comité, invited officials/ titled men, members of the cooperatives, students and staff from SFS. In total, over 100 people	shared local information on sea turtles introduced COMITE and it's goals recognized individuals/ organizations	COMITE sworn in, oath to uphold the mission support from marines, SEMARNAP & PROFEPA (?) and fishing cooperatives
08/14/2000	CETMAR	9 AM 3h	SFS staff and students, CETMAR director CETMAR students and teachers, invited guests - harbor master, SEMARNAP	Student oral presentations: turtle recovery plans	local community gains further knowledge on sea turtle ecology and conservation and projects conducted at SFS school