

## SAVING SEA TURTLES FROM THE GROUND UP: Awakening Sea Turtle Conservation in Northwestern Mexico

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**ABSTRACT** Sea turtles have held important, diverse, and evolving values for the peoples of northwestern Mexico for centuries. Today all five sea turtle species inhabiting the waters of this region are in danger of extinction, and human use and misuse of these animals have contributed to this dilemma. In response to this predicament, a group of fishermen, biologists, and conservationists founded a community-based conservation network, *Grupo Tortuguero*, in 1999 to work to preserve the region's populations of these marine species and their environment. The sea turtles have become flagship species for the group's broadening efforts to address the social as well as ecological roots of these problems. Here we share the strategies we have employed, the successes and difficulties we have experienced, and the challenges we have faced working at the interface of advocacy and academia.

### Introduction

Below the Mexican border the water changes color; it takes on a deep ultramarine blue ... This is the region of the sea-turtle and the flying fish.

By two p.m. we were in the region of Magdalena Bay. The sea was ... smooth, and a light lacy fog lay on the water. The flying fish leaped from the forcing bow and flew off to right and left.

Tiny is a natural harpooner; often he had stood poised on the bow, holding the lance, but thus far nothing had appeared except porpoises, and these he would not strike. But now the sea-turtles began to appear in numbers. He stood for a long time waiting, and finally he drove his lance into one of them.

Sparky promptly left the wheel, and the two of them pulled in a small turtle, about two and a half feet long. It was a tortoiseshell turtle [*Eretmochelys imbricata*] ... They hung the turtle to a stay where it waved its flippers helplessly and stretched its old wrinkled neck and gnashed its parrot beak. The small dark eyes had a quizzical pained look and a quantity of blood emerged from the pierced shell. Suddenly remorse seized Tiny; he wanted to put the animal out of its pain. ... Tiny swore that he would give up sea-turtles and he never again tried to harpoon one. In his mind they joined the porpoises as protected animals (Steinbeck 1951:36-39).

On March 11, 1940, John Steinbeck, Edward F. Ricketts, and the crew of the fishing boat *Western Flyer* embarked on a voyage from Monterey Bay, California, to explore

the beauty and the biology of the Pacific Ocean and the Sea of Cortez that surround northwestern Mexico's Baja California peninsula. During their six-week expedition, Steinbeck, Ricketts, and crew learned much about the dizzying diversity of flora and fauna that inhabit these Mexican waters. Steinbeck's account of the voyage, *The Log from the Sea of Cortez*, provides not only a fascinating documentary of the marine biology of northwestern Mexico, but also offers an insightful look at the author's perspectives on our planet's humanity and our relationship with the natural world. The opening passage above, quoted from *The Log from the Sea of Cortez*, relates an encounter between the crew of the *Western Flyer* and a hawksbill turtle. The passage poignantly illustrates the transformation of one man's perception of sea turtles: for Tiny, these animals evolved from something to be killed and eaten to something to be saved and protected.

Similarly, this paper will consider the evolution of the relationship between humans, the environment, and sea turtles in northwestern Mexico. Specifically, we will examine the centuries-old relationship between people and sea turtles and the diverse nutritional, economic, and cultural values that these animals have held for



Figure 1. Map of Northwestern Mexico

various inhabitants of the region. Next, we will assess how human use and misuse of these marine inhabitants and their environment have contributed to the endangerment of all five sea turtle species populating the waters surrounding the Baja California peninsula. Finally, we will consider at length the emerging role of these species as an icon for marine conservation in coastal northwestern Mexico (Figure 1). We will share the successes we have enjoyed, the challenges we have faced, and the lessons we have learned working at the interface of science and advocacy to promote marine conservation by emphasizing community participation in research, by building a community-based conservation network, and by promoting community-focused communication and education.

### **Seri Indians and Sea Turtles**

For one of the many native peoples of northwestern Mexico, the Seri Indians of coastal Sonora, sea turtles have for centuries held important nutritional, utilitarian, and cultural values. Northwestern Mexico was once one of the harshest regions on the North American continent for human survival. Fresh water and food were limited and seasonal, so the peoples of this area were largely nomadic. The Seri ranged along the Sonoran coastline from Guaymas northward to Puerto Libertad, Tiburon Island, and San Esteban Island, where abundant sea turtle populations once thrived. The green sea turtle in particular was essential to the diet of this hunter-gatherer society, and little or none of a captured animal was wasted. After the turtle meat was consumed, its flippers were fashioned into footwear, its stomach was used as a water bag, and its shell was used as a covering for a Seri abode. Moreover, sea turtles were an important part of the culture of this indigenous society, and as a part of community celebrations and ceremonies the Seri honored sea turtles in poems, myths, chants, and songs (Caldwell 1963; Davis and Dawson 1945; Felger and Moser 1985; Nabhan 2003).

### **Colonisation to Modernisation and the Expanded Significance of Sea Turtles in Northwestern Mexico**

In the centuries that passed from the Spanish colonial era of the sixteenth century through the twentieth century, incredible changes occurred in society, the environment, and the relationship between the two. The population of northwestern Mexico increased from a relatively small number of indigenous peoples, such as the Seri, to the millions of Mexican peoples who now populate this region (INEGI 2000). As the population of the area increased over time, the cultural and economic significance of sea turtles expanded concurrently, and the demand for these animals increased accordingly. During this time, turtle meat was -- and still is for some -- an important source of protein. Turtles were regularly consumed locally in a variety of forms, prompting Caldwell and Caldwell's reference to the green turtle as the 'black steer,' due to its importance as 'the chief source of meat in that barren peninsula' (Caldwell and Caldwell 1962:14). Further, consumption of '[sea turtle] meat became equated with increased physical vitality and stamina, or virility' (Cliffon, Cornejo, and Felger

1982:203). Sea turtle blood and oil were believed to have medicinal qualities and were prescribed to treat ailments such as anemia and bronchitis, respectively. These traditions are still very much alive today, and many coastal inhabitants still include sea turtle meat as a regular, if not frequent, part of their diet. Indeed, one would be hard-pressed to locate a native Baja Californian who has not been raised eating sea turtle meat and who has not been once treated with turtle remedies (Garcia-Martínez and Nichols 2000).

In addition to its nutritional and medicinal importance, the sea turtle also gained broader significance in various cultural celebrations. In particular, Mexican Catholic culture has valued sea turtle as a traditional Lenten time meal. During the Easter season, Catholics observe specified days of abstinence from consuming red meat, and seafood has been a traditional meal on these days. Many Mexicans in the coastal regions of the northwest consider turtle a prized seafood, and procurement of a sea turtle for family gatherings during Holy Week, or *Semana Santa*, has become nearly an unstated requirement (Zarembo 2001; Fox 2002; Pesenti 2002). Moreover, in addition to this Lenten tradition, turtle meat has become a culinary centerpiece for numerous traditional days of celebration including Christmas, Mother's Day, Sundays, and weddings (Garcia-Martínez and Nichols 2000).

The expanded significance of sea turtles as a valued nutritional resource and cultural object resulted in an increased economic significance for these animals, and through the mid-1900s many families in Baja California relied on sea turtles to earn a living or worked in some way in the procurement and distribution of these animals (O'Donnell 1974). The deeply integrated nutritional, cultural, and economic significance of sea turtles for the peoples of northwestern Mexico is interestingly mirrored by a similar tradition among the Miskito Indians of Nicaragua. Cultural geographer Bernard Nietschmann has nicely stated the pervasiveness of sea turtles in Miskito culture:

Turtling is more than a means to get meat, turtles are more than simply a source of meat, and turtle meat is more than just another meat ... turtling and turtles are part of a way of life, not merely a means of livelihood. The activity and the product are not elements that can be simply lost or substituted without consequent deep change in cultural patterns (Nietschmann 1982:441).

This statement is similarly applicable to the significance of these animals for many of the peoples of northwestern Mexico.

### **Ecological and Social Impact of Increased Demand for Sea Turtles**

By the early twentieth century, greater human populations throughout northwestern Mexico and higher demand for sea turtles led to expanded commercial markets and intensified commercial fishing. In turn, the region enjoyed a thriving and lucrative turtle fishery (O'Donnell 1974), but this also caused significant pressure on local populations of these animals. Unfortunately, like many boom and bust fisheries around the world, the turtle fishery in northwestern Mexico expanded rapidly, and by the mid-1900s, with the help of modern technologies such as outboard motors

and monofilament nets, surpassed its ability to sustain hunting levels. In fact, fishermen report that by the 1980s, numbers of green turtles had dramatically declined, and the species was considered commercially extinct. Local and regional consumption of turtle meat continued, however, as turtles were occasionally caught in fishing gear or were harpooned (Cliffton, Cornejo, and Felger 1982).

In response to decimated sea turtle populations throughout Mexico -- as well as to national and international political pressures -- in 1990 the Mexican government banned the extraction, capture, and pursuit of all species of these animals from Mexican waters and beaches (DOF 1990). However, the ban did not mitigate high demand for sea turtles, but instead precipitated a lucrative black market for poaching and selling turtle meat and eggs. In turn, the new illegal market yielded still newer economic significance for sea turtles in northwestern Mexico. Today, turtle meat is reported to sell for the equivalent of around fourteen us dollars per pound in the markets of Tijuana (Dibble 2003), and we have learned through personal experience that live turtles are sold for the equivalent of about fifty us dollars each in smaller coastal communities.

The new economic -- albeit illegal -- importance of sea turtles has yielded new social significance for these animals as well. In particular, sea turtles have emerged as an emblem of wealth and power for those who serve or eat them. A study, unpublished for political reasons (F. Zuniga Arce pers. comm.) conducted by scientists at the Autonomous University of Baja California Sur has indicated that demand for turtles comes primarily from politicians, military personnel, and teachers in the region. People from groups such as these typically enjoy the means to purchase turtle meat, and these relatively wealthier persons often serve this expensive delicacy at celebrations such as birthdays, weddings, and traditional family gatherings. Moreover, PROFEPA, Mexico's environmental protection agency, has acknowledged that Mexican politicians often serve sea turtle meat at campaign dinners in an effort to impress voters and to win votes (Niiler 2001; Anonymous 2004). Indeed, during the course of our own recent study of issues surrounding sea turtle consumption in Baja California Sur (BCS) (Delgado and Nichols unpublished data), we listened to numerous stories of corrupt government and military personnel not only consuming and serving turtle, but also selling the animals and their meat.

While crime and corruption are not new to Mexico (Riding 1985) -- or any other nation for that matter -- the black market demand for, and the corresponding illegal harvest and trafficking of, turtles have added a new facet to the problem of crime and corruption in northwestern Mexico and have yielded a new social significance for sea turtles. For persons who enjoy a measure of affluence or influence, eating and serving turtle meat has become a symbol not only of their wealth, but also a symbol of their positions of power that allow them to avoid prosecution despite their illegal acts (Niiler 2001; Dibble 2003). For poachers -- or *guateros* -- and traffickers, exploiting sea turtles has become a symbol of illegally but easily achieved wealth. PROFEPA has recently determined that organised networks involved in poaching, smuggling, and selling of sea turtle meat and eggs are active throughout Mexico. Moreover, these networks are similar to Mexican drug trafficking networks, and they are often connected (Anonymous 2004). Mexican poet and director of the environmental organisation *Grupo de los Cien*, Homero Ajidris, has succinctly summarized the unfortunate impact of the illegal turtle trade: 'Poachers are not only

driving the sea turtle population into extinction, they are destroying their own communities by perpetuating crime and corruption' (Fox 2002).

### **Present-Day Socio-Ecological Dilemma for Sea Turtles**

While the nutritional, economic, and cultural significance of sea turtles in northwestern Mexico has evolved over time, human demand for and impact on these animals have persisted and have contributed to the endangerment of extinction of all five species inhabiting the waters of northwestern Mexico (IUCN 2004). Legal prohibitions intended to control human actions such as predation, consumption, and fisheries by-catch of sea turtles, as well as pollution and destruction of their habitats, have been ineffective. Despite the 1990 ban on killing sea turtles and collecting their eggs, and despite penalties that include prison sentences as long as twelve years for doing so (Código Penal Federal de México 1996), the illegal hunting of sea turtles and gathering of their eggs continues. For example, biologists estimate that as many as 35,000 turtles are killed annually in the Baja California peninsula region alone (Nichols 2002). Recently, PROFEPA Deputy Minister Francisco Gines warned: '[W]e cannot do anything against illegal [sea turtle] trafficking on our own. We need the population's help to completely stop the consumption of eggs and meat' (Rutler 2004).

It should not be surprising that the relatively recently enacted laws against killing sea turtles and collecting their eggs would fail to halt the centuries old traditions of consuming turtle meat and eggs. In this light, a Mexican fisherman from Isla Holbox, an island off the Yucatan Peninsula of Mexico, aptly illustrates the cultural conflict between the need to respect local traditions that have existed for hundreds of years and the need to save sea turtle species that have existed for millions of years:

Since we were little kids, we've had the importance of eating turtles impressed upon us. It's as if they taught you, as a child, to believe in the Virgin Mary, the Virgin of Guadeloupe, and then from one day to the next they tell you not to believe in her (Macys and Wallace 2003:623).

This example, from another part of Mexico, accurately reflects a similar cultural dilemma in northwestern Mexico: human actions are the most direct and significant threats to sea turtle populations, but carefully understanding and addressing the cultural practices and social pressures associated with consumption and exploitation of these species are necessary if we are to successfully change their destructive course. While the cultural -- as well as economic, social, and ecological -- challenges of sea turtle conservation are indeed difficult, the clear need for the protection of these species and the marine environment that they inhabit is immediate and imperative if we hope to preserve both.

The tension between humans and the environment that is central to the problem of northwestern Mexico's endangered sea turtles was clearly recognised and nicely elaborated more than two decades ago by a group of scientists who insightfully considered a social as well as a biological perspective in analysing the problem at hand:

Organisation of a private citizen's committee to fund research and conservation programmes for sea turtles in Mexico seems a logical step to the protection of these magnificent animals. Excessive take, poaching and loss of habitat have brought the sea turtles of Mexico to the brink of extinction. The social and economic pressures that have led to this ecological disaster need to be assuaged by setting new priorities in the very near future. We believe that Mexico's sea turtles can probably still be saved (Cliffton, Cornejo, and Felger 1982:208).

In addition to recognising the sociological component of the ecological dilemma of northwestern Mexico's sea turtles, these scientists perceptively suggested that citizen involvement and novel tactics would be keys to addressing this problem.

### **A Community-Based Conservation Network**

As Cliffton, Cornejo, and Felger foresaw some years ago, a grassroots conservation movement of local citizens from many walks of life is growing throughout northwestern Mexico. The mission of these concerned citizens is to address the myriad challenges confronting the conservation of the region's sea turtle populations and the protection of the marine environment that is home to the turtles – as well as to a rich diversity of other flora and fauna. The sea turtles have become flagship species for this community-based conservation movement, and the group at the core of the movement is aptly and proudly called *Grupo Tortuguero* (Sea Turtle Network/Group).

The organisation was formed on January 23, 1999, in the town of Loreto, BCS, in a meeting at the office of the local non-profit organisation *Grupo Ecologista de Antares, A.C.* (GEA), and originally called *Grupo Tortuguero de las Californias*. In attendance was a small, but diverse group of individuals, including fishermen from five local communities, officials from local Mexican government institutions, representatives from Mexican and American non-profit organisations, and various Mexican and American citizens and scientists. Director Fernando Arcas of GEA, moderated this inaugural meeting and the participant discussion emphasised the equality of each group member. In this spirit of equality and democracy, the group voted on various ideas, and the group decided that its mission of community-based conservation would focus on the use of research, education, and communication. The co-author of this paper, Wallace J. Nichols was in attendance that day, and Nichols has continued to be a vital contributor to the group's efforts. In 2004, recognising the group's expanding geographic role, the name of the network was shortened to simply *Grupo Tortuguero*.

The group's approach to its conservation efforts has evolved to presently include three primary components: building a conservation network to enhance cooperation, utilising participatory research to gain knowledge, and employing strategic communication and education to promote a conservation ethic. Paramount in the efforts of *Grupo Tortuguero* is its respect for human values. As an icon for the group, the sea turtle is being redefined as a symbol of respect for the marine envi-

ronment, for the human community, and for the inseparable relationship between the two.

A primary focus of *Grupo Tortuguero* has been to build a community-based conservation network that includes a broad spectrum of viewpoints and individuals. Indeed, the group has grown from its original membership of approximately forty-five people from six Baja California communities in 1999 to involvement of nearly 500 people from more than twenty-five communities throughout northwestern Mexico today (Figure 1), including members from two Seri villages along the Sonoran coast. While the growth in the number of members and member communities is an encouraging measure of the success of *Grupo Tortuguero's* efforts, so too has this represented a challenge for the group as we strive to communicate, coordinate, and cooperate effectively. Due to the expansiveness of the geographic region, the remote nature of many communities, and a limited supply of economic resources, we struggle to maximise our impact while meeting the needs of all member communities. Even the idea of community has been problematic. For many reasons, some locations possess a strong sense of community, while others are definitely lacking a sense of social coherence. As we strive to meet these numerous challenges on a case-by-case basis, we believe that comprehension of network science is as important as understanding sea turtle ecology. An ideal network is diverse and decentralised while being flexible and resilient (Barabási 2002). Here, sea turtles as flagship species serve as an appropriate metaphor for our community-based network: the diversity of our network's membership -- fishermen, students, teachers, scientists, Seris, Mexicans, Americans -- is mirrored by the diversity of northwestern Mexico's sea turtles -- greens, loggerheads, olive ridleys, hawksbills, and leatherbacks. Further, our respect for the diversity of viewpoints and values of our various members is similar to our respect for the turtles and the environment. The widely decentralised authority and geography of our network is comparable to the widely traveled oceans and beaches by the planet's sea turtles. One loggerhead turtle, named "Adelita" after the daughter of a fisherman who helped us attach a transmitter to her carapace, was tracked using satellite telemetry from Baja California to her natal waters of Japan. The story of Adelita's one-year, 12,000-kilometer journey and the fishermen and biologists who documented it is now retold as part of the regional lore. Adelita's story serves as an important reminder to network members that their local actions have a global reach.

The community-based nature of the *Grupo Tortuguero* network has in turn facilitated a comprehensive participatory research programme. Network members are directly involved in research projects examining the ecology and natural history of the sea turtles of northwestern Mexico, and valuable local experience and knowledge are thereby added to our scientific programmes. *Grupo Tortuguero* also provides an easily accessible network of personal contacts and local guides for short-term researchers seeking to access a diversity of sampling locations. While the sea turtle is at once the subject of, and an icon for, our participatory research programme, our research efforts extend beyond the confines of the physical and biological environment to include critical consideration of the economic, political, social, and cultural milieu of the Baja California region (Bird *et al.* 2002).

Most recently, community-based sea turtle population-monitoring programmes have been initiated at ten locations. Network members, together with local



school children, conduct monthly in-water and beach surveys for sea turtles. In the case of in-water surveys, the teams camp for twenty-four hours, net turtles, then measure, tag, and release the animals. Information on growth rates, survival, demographics, and even finding out who in the community is eating 'our' turtles is being generated. The ten teams meet twice each year to share, analyse, and discuss their findings. Notably, community members and resource managers consider the information highly credible.

Knowledge of sea turtle populations gained through this programme has helped to promote a network of marine protected areas, ranging from Biosphere Reserves and National Marine Parks along El Vizcaíno peninsula, Loreto, and Cabo Pulmo, to a local community-proposed sea turtle sanctuary in Bahía Magdalena which is currently being reviewed by the Mexican government. In Punta Abreojos, the sea turtle flag is being flown to bring attention to the local fishing cooperative's sustainable lobster management practices, their strict ban on eating turtles, and efforts to reduce by-catch in near-shore fisheries. This attention has helped to promote Marine Stewardship Council (MSC) certification, an internationally recognised 'green label' denoting that the product adheres to strict sustainability guidelines, for the region's spiny lobster fishery. This represents the first MSC-certified fishery in Latin America (Tarica 2004). Network communities have also succeeded in securing low interest eco-loans to facilitate a shift from two stroke to more fuel-efficient four stroke outboard motors, in increasing low-impact surf tourism (including an annual surfers' tournament), and in obtaining funding from foundations for the various local conservation initiatives.

The members of *Grupo Tortuguero* have invested significant time, effort, and resources into a strategic communication and education programme. Here, our efforts employ the principles of community-based social marketing, environmental communication, and environmental education. Community-based social marketing (CBSM) is a communication strategy promoting sustainable individual and social change through a communication approach that seeks to assess and address the specific factors that encourage or discourage individual behavior change (McKenzie-Mohr 2000). Specifically, CBSM advocates assessing the barriers and benefits to performing a behavior (refraining from eating sea turtle for example), developing a communication strategy to promote this behavior, pre-testing the strategy, and implementing and evaluating the strategy. Recently, co-author Stephen Delgado became involved with *Grupo Tortuguero* at the group's sixth annual meeting in January 2004, and he has been working in the BCS region to help design future social marketing campaigns promoting sea turtle conservation. Environmental communication in turn draws from the ideas of CBSM and advocates sequentially identifying a specific goal (sea turtle conservation for example), a target audience (fishermen, for example), an appropriate communication medium, and a tailored message (Monroe, Day, and Grieser 2000). Environmental education is essentially a process that empowers individuals to solve or prevent environmental problems. While environmental education may advocate a specific environmental behavior, it more generally promotes environmental concern by increasing awareness, acquiring knowledge, changing attitudes, providing skills, and encouraging participation (UNESCO 1978). As flagship species, sea turtles are becoming a highly visible and recognisable icon for our strategic communication and education programmes.

While sea turtles are flagship species for *Grupo Tortuguero*, our conservation efforts are not limited to the preservation of these animals alone. Conservation of the entire marine environment is important to our coastal communities as well as to the protection of sea turtle species. For example, recent surveys of several communities in BCs have shown that contamination of the coastal environment by trash is the number one environmental concern in these locations (Delgado and Nichols, unpublished data; Santillán, unpublished data). These same communities have also indicated that the sea turtles are the species that best represent their communities (Santillán, unpublished data). Accordingly, a ‘community pride’ communication and education campaign is underway in these communities to promote product recycling, waste reduction, and product reuse. Sea turtles are the emblematic species for these campaigns and information regarding conservation of these species is creatively integrated into these communication and education programmes.

The network has creatively used music, murals, posters, children’s storybooks, comic books, videos, T-shirts, hats, and stickers to advance the conservation message as well as develop the identity of the group. The *Grupo Tortuguero* logo portrays all five sea turtle species swimming along side a human diver (Figure 2) and appears on all network materials. Videos of network members conducting research and conservation activities are shared at meetings and in gatherings in town plazas. Festivals celebrating sea turtles and the marine environment are becoming more common and more popular, and turtle releases and turtle costumes have become highlights of these celebrations (Figure 3). Such media represent the modern artistic expression of the human-sea turtle relationship. These creative media enhance the celebratory feeling of network gatherings and reflect the genuine fun and camaraderie of *Grupo Tortuguero*’s approach to sea turtle conservation.

In the mass media, members of the conservation network have been passionate and credible spokespersons for sea turtle conservation on regional, national, and international radio and television programmes, including some of the most popular music programmes. Working with the *Grupo Tortuguero*, Francisco Fischer, a former sea turtle hunter, has given compelling testimony in Mexico’s national tele-



Figure 2. *GT* LOGO

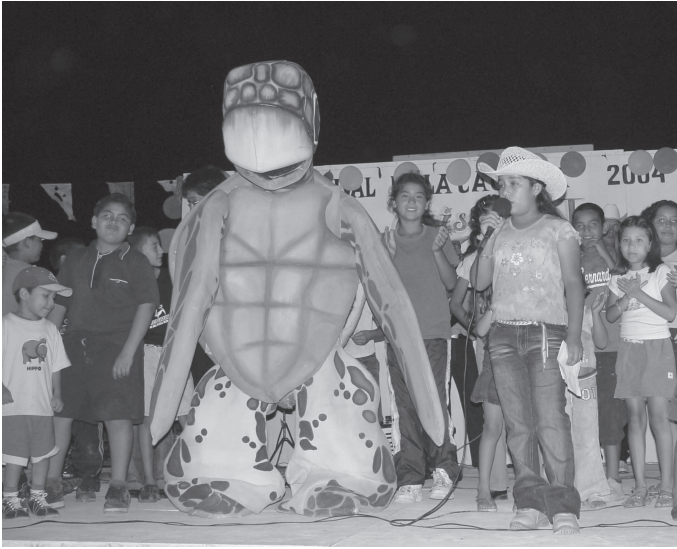


Figure 3. *Second Annual Festival de la Caguama in Puerto Adolfo López Mateos, Baja California Sur, Mexico, August 2004. Photographed by Stephen Delgado.*

vision, radio and print outlets regarding Baja California's habits of killing and eating sea turtles, and also the black markets in cities like Tijuana and Ensenada that drive demand for sea turtles in remote locations such as Laguna San Ignacio, a world-renowned Biosphere Reserve. Fischer was one of Mexico's most well-known and prolific turtle poachers, and his participation in *Grupo Tortuguero* was inspired by a visit by network members to Fischer during his six-month prison sentence. Openness among the national media outlets to discuss such politically charged environmental issues is new in Mexico. One member of *Grupo Tortuguero* has received a call from his estranged father, after eight years of silence, warning him not to publicly criticise the government. He explained to his father that the efforts of the group to save sea turtles were part of a larger movement toward transparency, democracy, and an emerging environmental ethic. The efforts of the *Grupo Tortuguero* reach the roots of profound social issues with implications far beyond sea turtles. Specifically, changing some of the social norms that permit or encourage sea turtle consumption and exploitation is critical to our efforts. However, we need to be realistic about what changes we might be able to affect and recognise the pitfalls and dangers that accompany this expanded stage.

While we firmly believe in a community-based conservation approach to saving sea turtles, changing the human behaviors that threaten these animals, as well as modifying the social norms that underlie these behaviors, continues to be a difficult task. In our recent survey in the Bahía Magdalena region of BCS, eighty-eight per cent of respondents indicated that they believe sea turtles are in danger of extinction, and ninety-nine per cent of respondents indicated that they believe these species should be protected; yet, fewer than half indicated that they believe that human consumption and poaching are contributing to the extinction of these animals. Moreover, survey respondents acknowledged that on average nearly half of their community members eat sea turtle with varying frequency.

This disconnect between peoples' beliefs and behaviors has been difficult to

understand as well as to address. Our dilemma is certainly not unique, as a meta-analysis of environmental behavior research has suggested, 'Despite the wealth of information which exists concerning environmental behavior, it is not known which variable or variables appear to be the most influential in motivating individuals to take responsible environmental action' (Hines, Hungerford, and Tomera 1987:1). Our task then is complex, as we must endeavor to gain a rigorous scientific understanding of the human behaviors that contribute to the endangerment of sea turtle species and then devise and implement strategies to change these harmful behaviors, as well as the social norms that support them -- tasks that are unquestionably in the domain of the social sciences.

In our efforts to employ communication, education, and participation strategies promoting behaviors and social norms that will help preserve sea turtles and their habitats, we are faced with the additional challenge of evaluating these efforts. We would like to know that the strategies we employ are being effective, particularly given our limited resources; yet, measuring the impact of our efforts is an extremely difficult task. Systematically observing and evaluating behaviors that threaten sea turtles -- directed take, trafficking, consumption, contamination, fishery by-catch -- presents enormous methodological challenges, not only for spatial and temporal considerations, but particularly because most of these behaviors are illegal and carried out clandestinely and not uncommonly under dangerous conditions. Hence, we are left with less reliable measures such as auto-evaluations and anecdotal reports of behavior change. Thus for the moment we must rely more on our sense of what is working, rather than a rigorous social scientific evaluation of our strategies. Nonetheless, we persist in our efforts to work within a socially acceptable framework to save northwestern Mexico's sea turtles, even as we struggle to evaluate the determinants of harmful human behaviors as well as evaluate our strategies to catalyze more socially and environmentally acceptable alternatives.

### **Evolution of the Sea Turtle as Cultural Icon**

Our world has changed in unimaginable ways in the millennia since humans first populated northwestern Mexico. Yet, sea turtles have remained an intrinsic element of Mexican life and culture throughout the centuries. Today, unfortunately, the human threat to sea turtles -- unsustainable consumption of their meat and eggs, fisheries by-catch of turtles, and pollution and destruction of turtle habitats -- continues to drive the region's sea turtle populations towards extinction. In contrast, there are a growing and dedicated number of citizens -- teachers, students, fishermen, conservationists, scientists -- who are committed to preserving northwestern Mexico's sea turtles and their marine environment. This contrast is a reflection of what has been expressed as the disparity between the human exception paradigm -- a belief that humankind is above the environment, and the new ecological paradigm -- the belief that humankind is part of the environment (Dunlap *et al.* 2000). Today, the sea turtle seems to be at once an icon for both sides of this duality. On one hand, the sea turtle is a tragic symbol of the worldview that Earth's resources may be exploited at humankind's whim. On the other hand, the sea turtle is becoming a hopeful symbol -- a flagship species -- for the worldview that many of the Earth's

species must be carefully stewarded by humankind. In northwestern Mexico, the dedicated members of *Grupo Tortuguero* are striving to ensure the preservation of the sea turtle and the environment, and to promote the belief that humankind and nature are inexorably interdependent.

As flagship species for *Grupo Tortuguero*, the sea turtle is a valuable cultural symbol that is assuming important new meanings for the communities of northwestern Mexico. Cultural symbols are intrinsic elements of human society. It is through symbols, such as language, art, and music, that humans send, receive, and share meaning about our world and ourselves. Symbols may evolve in meaning over the course of time, and cultural symbols may adapt new meanings in response to the changing social world similar to the way living species may develop new traits in response to the changing ecological environment (Rindos 1985). Moreover, it has been suggested that cultural symbols, which sea turtles are for many people in northwestern Mexico, have meanings that are social constructions, with creators and receivers for these constructed meanings (Griswold 2004). In the past, our flagship species has been a cultural symbol that has signified basic nutrition, traditional celebration, physical well-being, and economic exploitation. Today, however, the members of *Grupo Tortuguero* are striving to bring new symbolic meaning to northwestern Mexico's sea turtles: conservation and community.

Concerned individuals and communities, such as the members of *Grupo Tortuguero*, are recognising the incredible challenges that today face our environment and our society. In our mission to promote environmental conservation through community participation, our flagship species is the vital cultural symbol that signifies our efforts to preserve marine species and to conserve the marine environment while improving individual lives. Whatever academic arguments may exist for or against the value of cultural symbols to inspire action, we continue to believe in, to strive towards, and to look forward to the day when our flagship emblem -- the human species swimming together with the five sea turtle species of northwestern Mexico -- represents the reality of human beings living together in harmony with each other and their environment.

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