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Issue Definition and Planning for Whalewatching Management Strategies in Ensenada, Mexico

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The exceptional growth of whalewatching in Baja California Sur (BCS) and other parts of Mexico during the last 10 years motivated the design and implementation of a Mexican whalewatching law based on experiences in BCS. However, recent research in the Ensenada whalewatching area confirms that this law is insufficient in this area because whalewatching boats and other fishing, cruising, or drifting boats influence the behavior (swimming direction and velocity) of migrating gray whales. In the long term, the migration corridor might be displaced offshore, and whalewatching may become infeasible. This study proposes a management planning process to adapt regulations to this area, to promote adherence to regulations by encouraging self-regulation and strengthening law enforcement, and to enhance the tourist service on board. The actors involved were identified.

Keywords coastal ecotourism; Ensenada, Mexico; gray whale; management; whalewatching

Introduction

The development of ecotourism in the Third World appeals to destination areas, tourism enterprises, tourists, and governments alike (Cater, 1997; INE, 2000). This form of travel has emerged as a popular strategy for protecting biodiversity in many regions throughout the world (Clark, 1998; Mendelssohn, 1997). In practice, however, it appears that many ecotourism programs are failing to protect the biodiversity on which they depend.

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Unregulated tourist behavior frequently causes negative impacts to local communities and irreparable damage to natural resources (Garen, 2000).

Whalewatching, a special form of ecotourism, has grown and expanded around the world during the last 10 to 15 years. Therefore, concern about the possible effects of whalewatching on marine mammals arose (Hoyt, 1995; IWC, 1995). Since 1986, the International Whaling Commission (IWC) has discussed the reactions of cetaceans to vessels (IWC, 1986). It was already noticed that responses varied according to species. In 1993, the IWC determined it was urgent to identify and assess the potential impacts of marine mammal viewing (IWC, 1993). In 1994, the IWC Scientific Committee established a Sub-Committee on Whalewatching (IWC, 1995). This Sub-Committee was to analyze where whalewatching occurs worldwide, how impacts could be evaluated and would propose working priorities and recommendations to the IWC Scientific Committee (IWC, 1995).

In 1995, after the Sub-Committee on Whalewatching had gathered information related to this problem, a first workshop was held to discuss scientific aspects on managing whalewatching. The situation was analyzed and several methods were proposed to measure short- and long-term effects on cetacean populations (IFAW et al., 1995). In addition, several international workshops were held to discuss the educational values of this ecotourist activity (IFAW et al., 1997), as well as socioeconomic (IFAW, 1998) and legal aspects (Birnie & Moscrop, 2000; Spalding, 1998). At IWC's meeting in June 1996, the Sub-Committee on Whalewatching determined that insufficient information was available, and that there was considerable variation among species (in their behavior, distribution, feeding, and breeding habits), among habitats of one single species and different whalewatching modes (i.e., watching from land or boats, feeding by tourists, or swimming with dolphins). Therefore, they decided it was impossible to propose general (worldwide) guidelines for regulation of whalewatching activities and recommended case-specific assessments of effects on cetacean behavior to propose adequate guidelines for regulation and management of whalewatching activities by species and by whalewatching area (IWC, 1997).

Recent studies have measured many short-term effects (immediate reactions) of cetaceans, searching for scientific ground to regulate whalewatching (Arnold & Birtles, 1998; Barr & Slooten, 1998; Bejder & Dawson, 1999; Constantine & Baker, 1996; DeNardo, 1997; Gordon et al., 1992; IFAW et al., 1995; Janik & Thompson, 1996; Montero et al., 1997). In the St. Lawrence River, Canada, stronger law enforcement and education was recommended by Blane and Jaakson (1994) after they found that belugas (*Delphinapterus leucas*) were disturbed by boats. However, little evidence is available to determine whether or not short-term effects result in long-term effects on individuals, groups, or populations (Bryant, 1994).

To accomplish successful regulation and management, however, both human and ecologic dimensions must be understood, integrated, and balanced in management planning. To ignore either is to invite conflict that will result in the degradation of the resource and its habitat (Duffus & Dearden, 1993). The long-term effects of whalewatching have been proven to be detrimental to a cetacean population at only one site (Monke Mia, Australia). Bottlenose dolphins (*Tursiops truncatus*) were hand-fed by tourists on the beach and survival of calves of provisioned dolphins was significantly less than that of surrounding, unprovisioned dolphins (Wilson, 1994). Feeding was not prohibited because many human livelihoods depended on the meet-the-dolphin phenomenon (Corkeron, 1998), although strict regulations were implemented that have not been evaluated yet.

Whalewatching Management along the Pacific Coast of North America

Whalewatching is a widespread industry along the coasts of Alaska, U.S.A.; British Columbia, Canada; the western coast of the United States (including Hawaii), and the

Baja California peninsula, Mexico. Since the 1960s, many whale, dolphin, and pinniped species have been the subject, or at least part, of commercial cruises or boat tours, and as in many parts of the world, the industry has grown exponentially since the late 1980s (Hoyt, 1995). Concern about the effects of cetaceans and about the sustainable use of this natural resource motivated governments, researchers, tour operators, and nongovernmental organizations to assess whalewatching and find proper management practices. Workshops have been the tool to accomplish this. In 1988, U.S. and Canadian stakeholders from many whalewatching areas participated in a workshop to develop a sound whalewatching policy (Atkins & Swartz, 1989). Recommendations were focused on more regulation and research, although public education to private boaters was also mentioned. This view evolved in the following years, as it became clear that enforcement was difficult to carry out, practically and financially. Therefore, regulation and education (of commercial and private boaters as well) became combined to mitigate the impacts of tourism without sacrificing its benefits (Birnie & Moscrop, 2000). Similar multistakeholder workshops have taken place in Canada (University of Victoria, 1999) and Mexico (Heckel, 2001a).

Furthermore, from 1998 to 2001, the North American Commission for Environmental Cooperation (NACEC), a government organization whose members include Canada, Mexico, and the United States, promoted sustainable tourism in natural areas of these countries, as a means to conserve biodiversity. In this context, a network of marine protected areas and whalewatching stakeholders in the so-called Baja to Bering (Baja California to the Bering Sea) priority region was organized (NACEC, 1999; Heckel, 2001b). Stakeholders from Canada, Mexico, and the United States, representing local governments, nongovernmental organizations, local communities, the tourism industry, tour operators, and academia have exchanged information during several workshops (NACEC, 1999; Heckel, 2001b) and on the Internet (MariNet, http://www.cec.org) on how whalewatching and its management occurs.

During these meetings and information exchanges between North American whalewatching stakeholders, best practices have been identified and adapted to local needs. These have included: (a) *legal tools*: legal frameworks to protect marine mammals and their environment, specific whalewatching regulations adapted to each species and area that involve minimum approach distances and other details; permit systems; water, time, and distance zoning; creation of marine protected areas; (b) *research methods*: mainly behavioral studies and bioacoustics; (c) *voluntary codes of ethics*: nonlegally binding principles and guidelines, coupled with some mandatory regulations; (d) *educational tools*: nature guides on board, signs at landing piers, leaflets with whalewatching guidelines, talks at schools and marinas, training courses for tour operators; (e) *public participation*: all stakeholders in a whalewatching area are part of conservation efforts (Duffus & Ford, 1995; NACEC, 1999; Carlson, 2000; Heckel, 2001a).

Whalewatching in Mexico

Eastern Pacific gray whales (*Eschrichtius robustus*) undergo one of the longest annual migrations (about 20,000 km) known for mammals (Rice & Wolman, 1971). Because they move so close to shore from Alaska, U.S.A., to Baja California Sur (BCS), Mexico, it has been possible to watch them from vantage points on land and in boats for many years (Wilke & Fiscus, 1961).

In Mexico, whalewatching started in 1972 when charter boats from San Diego, California, began visiting San Ignacio Lagoon on the Mexican Pacific coast of the southern Baja California peninsula, where gray whales breed and give birth every winter (Gilmore, 1955; Figure 1). The tourist activity expanded to Ojo de Liebre Lagoon in 1988 and

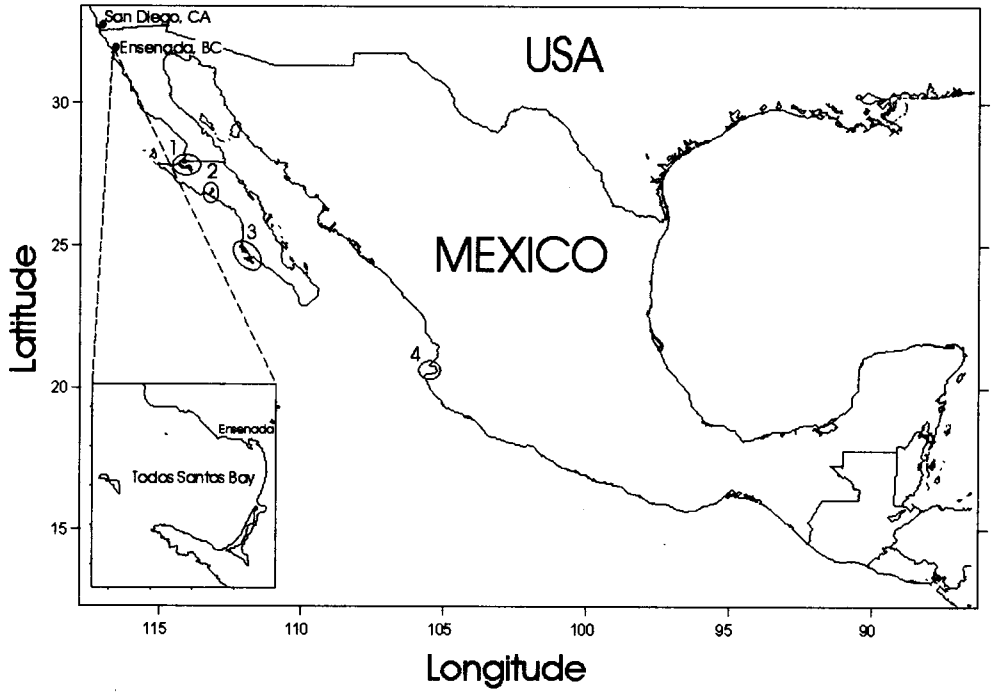

Figure 1. Map of Mexico and localization of the study area: Todos Santos Bay, Baja California, Mexico. Other areas for whalewatching are: (1) Ojo de Liebre Lagoon, (2) San Ignacio Lagoon, and (3) Madgalena Bay in the state of Baja California Sur (gray whales), and (4) Banderas Bay, in Jalisco-Nayarit (humpback whales).

Magdalena Bay in 1990 (Sánchez, 1998), and has grown considerably, from less than 1,000 visitors in 1982 (Jones & Swartz, 1984) to 28,500 in 1997 (Ávila & Saad, 1998; Sánchez, 1998). Not surprisingly, whalewatching is now a more important economic activity than fishing in these areas (Dedina & Young, 1995).

The wide distribution of gray whales during the winter motivated whalewatching activities to expand along the migratory route from December to April, including the Port of Ensenada, located in northern Baja California. Since 1989, the demand for whalewatching has grown, creating competition and the need to design its management under Mexican laws and guidelines, because gray whales display quite different behavior in this migrating area than in the breeding lagoons of BCS (Figure 1).

Do Whalewatching Boats Affect Gray Whales?

Scientific research to evaluate the effects of whalewatching boats on gray whales has been carried out in the breeding lagoon of San Ignacio, BCS (Jones & Swartz, 1984; Urbán et al., 1997; Urbán et al., 1998). Some accounts of the effects of vessels on migrating gray whales have been reported along the migratory route (MBC, 1989; Moore and Clarke, in press), although the first systematic investigation was achieved in Ensenada, Mexico (Heckel, 2001a; Heckel et al., 2001). The swimming direction and velocity of migrating whales was compared in the presence and absence of whalewatching vessels during the winters of 1998 and 1999 (Figure 2).

Sightings were separated into northbound and southbound migration, and variability of whale swimming direction was analyzed by circular statistics. Whale swimming di-

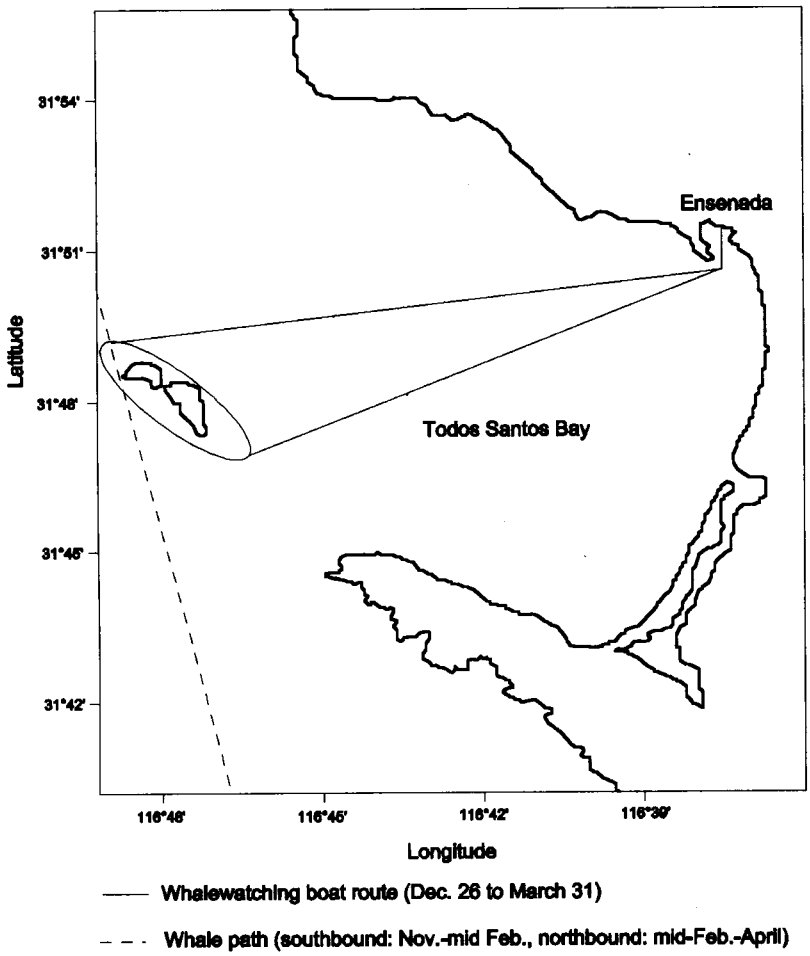

Figure 2. Usual whalewatching route of boats departing from Ensenada. Season starts on 26 December and ends on 30 March each year.

rection was not different in the absence and presence of whalewatching boats during the southbound migration. This variable, however, was statistically different during the northbound migration with whalewatching boats ($p = .007$). Whale swimming velocity showed significant differences without boats and with whalewatching boats during both migrations (northbound, $p = .04$; southbound, $p < .001$). In addition, head-on approach to whales by whalewatching boats changed significantly their swimming direction ($p = .05$) and velocity ($p = .015$) when compared with approach toward the rear or flanks (Heckel, 2001a; Heckel et al., 2001).

With respect to long-term effects on gray whales, during the 1960s increasing boat traffic in San Diego, California, appeared to be causing an increasing proportion of gray whales to migrate far offshore (Gilmore, 1978; Reilly, Rice, & Wolman, 1980; Rice, 1965; Sumich & Show, 1999). Whalewatching may cause other biologically significant effects, such as in their distribution, abundance, energetic expenditure, acoustic communication, and diseases (IWC, 2001).

Every year, more boat owners wish to offer marine mammal watching tours, and the Mexican government controls permit issue. Regulation of this activity has been questioned by some tour operators because the actual link between short- and long-term effects on

whales has not been determined yet. The desirability of expanding the whalewatching industry for economic reasons has to be weighed against the need to protect marine mammals from the adverse effects of such growth on both cetacean populations and the dependent industry (Birnie & Moscrop, 2000).

Because long-term effects are difficult to establish, regulations and management should be designed following the "precautionary principle." This principle of environmental conservation, as expressed in the Rio Declaration on Environment and Development in 1992, states that "where there are threats of serious irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (Birnie & Moscrop, 2000). In the case of whalewatching, for example, we cannot wait until the gray whale's migratory corridor is displaced (as in San Diego, California) to put regulation into action, because this long-term effect would be irreversible. Management has to be based on the best available knowledge (such as the short-term effects identified in Heckel et al., 2001) and the precautionary principle. While more research and experience is accomplished, regulation and management should be adapted collectively (with stakeholders' participation, including tour operators) by loosening or tightening the limits established for this tourist activity.

Impact Mitigation and the Role of Public Participation

To prevent or minimize environmental damage, countermeasures are employed, also called impact mitigation. This may take several forms, and minimization or reduction of impact is often the simplest approach (Clark, 1996). Regulation and management plans are often applied for this purpose.

In Mexico, a mitigation strategy for gray whales and their habitat was applied when Ojo de Liebre and San Ignacio lagoons (gray whale breeding areas) were declared whale refuges in 1972 and 1979, respectively. This strategy was expanded to Guerrero Negro and Manuela lagoons in 1980, and finally the El Vizcaíno Biosphere Reserve, established in 1988, included all of them (Dedina & Young, 1995). The expansion of whalewatching to Magdalena Bay motivated the design of an emergency law (Norma Oficial Mexicana NOM-EM-074-ECOL-1996, SEMARNAP, 1996) that regulated the activity in BCS.

However, people often become concerned about private and government projects because they have had limited access to the decision-making process. Demonstrations and destruction of signs and structures have occurred to stop projects in many parts of the world. Thus, in most countries a priority goal of coastal management should be to arrange for the most extensive participation possible (Clark, 1998). The objectives of public participation in the planning and management process are to ensure that popular knowledge and experience is integrated, to better guarantee for the quality of the solution identified and for its adaptation to a particular condition, and to ensure that all needs and priorities are taken into account in the formulation of a management decision. Stakeholders who have been involved in the formulation of policies and rules on resource use in coastal areas are more likely to support them. Public participation should be encouraged by the entire management community (resource users, public agencies, nongovernmental organizations, social groups, and local communities) to ensure the quality, the effectiveness, and the equity of management proposals (Clark, 1996).

Management Planning Is a Work in Progress

Today, after a three-year public consultation process, the Mexican Official Law NOM-131-ECOL-1998 (SEMARNAP, 2000) regulates whalewatching nationwide by specifying

maneuvers during whale encounters and the requirement of an official authorization for commercial and scientific whalewatching.

However, this regulation was designed originally for the breeding lagoons of BCS and based on only a few studies in San Ignacio Lagoon (Jones & Swartz, 1984; Urbán et al., 1997, 1998), the experience of government officials from the National Institute of Fisheries (INP by its Spanish acronym), and from the El Vizcaíno Biosphere Reserve administrative office. Moreover, whalewatching management in the areas where this tourist activity occurs is still in its infancy. Therefore, a management process in each area should evolve from issue definition to planning, institutional formalization, implementation, and evaluation (Olsen & Christie, 2000). Based on the scientific evidence that whalewatching affects gray whale behavior in Ensenada, the objective of this study was to describe the whalewatching issues in Ensenada by analyzing the legal, social, and economic aspects of this coastal ecotourism activity. A management process was proposed here with specific strategies and actions to minimize the effects on gray whale biology and to improve the tourist activity in this whalewatching area.

Study Area

Todos Santos Bay, Baja California, is on the northwestern coast of Mexico (Figure 1), and is located on the path of the California Current, a cold and productive marine ecosystem (Lynn & Simpson, 1987). The continental shelf outside the bay is steep and narrow, marked by the 200 m depth contour that is only 2 km from shore. A submarine canyon (550 m deep) separates two small volcanic islands from Punta Banda peninsula (CSDS, 1971). The Port of Ensenada is located in the center of the bay (Figure 2). The climate is dry in summer, with the rainy season in winter. The annual mean temperature is 22°C.

In 1990, 170,000 people lived in Ensenada (INEGI, 1996); 89,000 were engaged in economic activities: 68% in commerce and services (including tourism), 16% in industry, and 12% in fisheries, agriculture, cattle, or timber. Of the working population, 70% earned less than 3.75 USD each day (INEGI, 1996). Today the population is estimated to be 203,000 (INEGI, 2000).

Methods

Two techniques for qualitative research were used: participant observation (i.e., observation of human activities through direct participation, Chadwick, Bahr, & Albrecht, 1984) and open-ended interviews (Taylor & Bogdan, 1990). This kind of interview is intended to obtain the interviewee's personal perception of the situation under study. The conversations started with informal questions and the interviewees were encouraged to speak freely, with few interruptions to remain on the main theme (the history and current situation of whalewatching in Ensenada).

From 1996 to 2000, 10 key stakeholders were interviewed. Questions regarded specific whalewatching activities (location, history) as well as development and conservation measures. The interviewees were two tour operators, two skippers, two guides, and four government officials who were selected mainly because of their long experience in the whalewatching industry.

Participant observation was used to gain insight into attitudes toward whalewatching activities and conservation measures (Dedina & Young, 1995). In February and March of 1997, the lead author embarked as an "auxiliary guide" on two whalewatching trips (duration: 4 hours) organized by the Science Museum. Approximately 30 passengers

(25% children) were on board. In addition, three observation sessions were made at the landing pier during the 1996–1997 whalewatching season.

Furthermore, from 1998 to 2000, the environmental ministry organized three meetings to design the national whalewatching regulation (SEMARNAP, 2000). A training course and two additional meetings took place to encourage the management of this activity on a local basis. Stakeholders were invited, and it was an opportunity to observe and interact with them.

Information also was gathered from the Science Museum and the Ensenada environmental ministry delegation office (SEMARNAP, by its Spanish acronym) regarding the extent of whalewatching (number of permits, trips, passengers, and ticket prices). A rough estimate of direct income generated through this economic activity was obtained.

Analyses

The interviews and participant observations yielded qualitative information to identify the apparent causes and the responsible actors for gray whale behavior modification during whalewatching. Management issues were recognized, such as the boat owners' and the Science Museum's interactions, the government officials' approach toward tour operators, the severe limitations of law enforcement, as well as the current coastal zone management and conservation policy process.

In order to be able to propose a management process for whalewatching in Ensenada, the conservation issues and problems had to be identified before countermeasures could be proposed ("issue analysis," Clark, 1996). Each issue should be evaluated for important aspects, including the extent of socioeconomic disturbance and resource loss that it causes; the degree to which it could be resolved by a management-type approach; and the consequences of not resolving it (Clark, 1996).

The primary whalewatching areas in Todos Santos Bay were identified and the history of whalewatching in Ensenada was investigated. Qualitative models were used to define the policymaking process that would be most feasible to approach (Fischer, 1999). Scientists tend to favor quantitative models, whereas decision makers prefer qualitative models because they are easier to understand and less expensive to design (less data are needed and available information is used; Cicin-Sain & Knecht, 1998). The modeling process is vital to the analyst because poorly structured problems can be simplified, essential and non-essential elements differentiated, and the analyst's deductions made explicit in diagrams (Fischer, 1999).

Causal loop diagrams were used to describe whalewatching activities in Ensenada (Ford, 1999; Ventana, 2002). This technique refers to cause and effect relationships of variables, considering information feedback (Ford, 1999). The objective was to design a descriptive model with three stages of whalewatching management in this geographic area: market-driven whalewatching (past), regulation-driven whalewatching (present), and research- and management-driven whalewatching (future).

Results

Historical Background: Market-Driven Whalewatching

Based on the interviews and participant observation, the historical background of whalewatching in Ensenada was assembled. From 1978 on, an elementary school teacher (Estela Parrilla) organized whalewatching trips for student groups by hiring one medium-sized sport fishing boat twice during the winter. For the owners of sport fishing companies and boats this substitute activity started being attractive because sport fishing declined in winter, as elsewhere (Manfredo, Lee, & Ford, 1988).

From 1989 on, Mrs. Parrilla was instrumental in the exceptional growth of whalewatching when she started promoting daily trips (and receiving a commission for sold tickets) to finance the establishment of Ensenada's Science Museum. The museum worked as a travel agency by promoting whalewatching through massive advertising and selling tickets. The museum placed tourists on five to six sport fishing boats represented by one to three sport fishing companies. During this time, whalewatching may be considered a "market-driven" activity because the number of trips responded to the demand of tourists and no regulation existed (Figure 3).

In the early 1990s, competition conflicts arose in the whalewatching activity. The museum booked the tourists' reservations, received them at the landing pier, and guided them to the boats. Therefore, the museum decided which boats would depart based on a previously agreed role with boat owners. Several boats stayed at the port. Conflicts arose when boat owners sold tickets directly at their offices and embarked clients before passengers booked the trip with the museum. Tourists embarked on other boats or waited for about four hours for the next trip. In consequence, the museum did not respect the departure order of boats previously agreed on with the boat owners, and later the affected company (whose boats were ignored during tourist allocation by the museum) claimed for damage.

Due to competition conflicts, in 1993 the museum requested governmental intervention to regulate the activity (Parrilla, 1996). Despite the signed agreements between boat owners, the museum, and the authorities, there was no legal basis for enforcement. The need for a whalewatching law in Mexico was evident.

The consequences of unregulated whalewatching were the effects on gray whale behavior (Heckel et al., 2001; Figure 3). In the long term, their migratory corridor might be displaced offshore, as occurred in San Diego, California (Compeán et al., 1995; Reilly

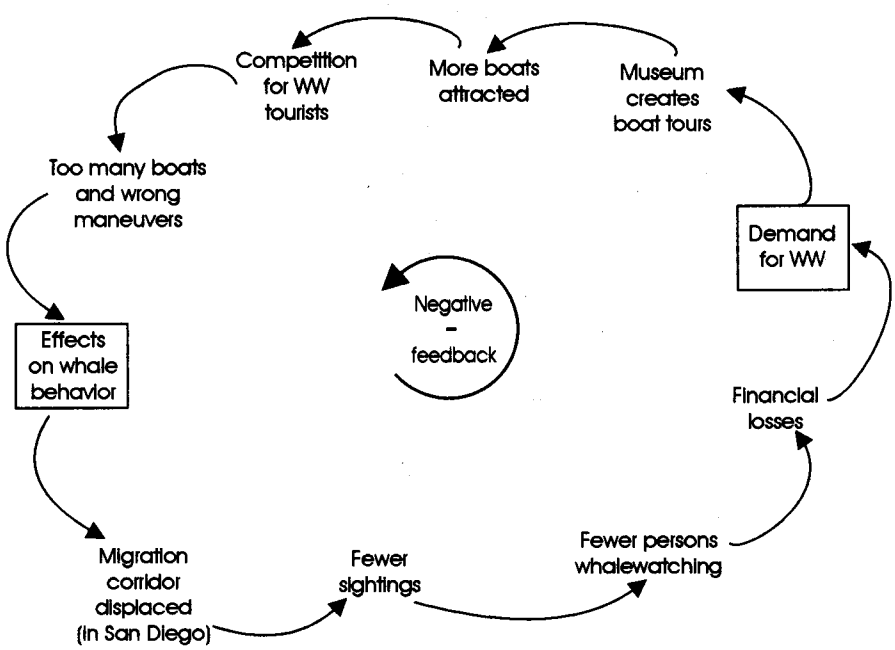

Figure 3. Market-driven whalewatching, before regulation was implemented and its consequences on whale biology and the economic activity. The causal loop diagram (closed chain of cause and effect) with a counter-clockwise direction means that the factors have a negative feedback on whale behavior, starting with the demand for whalewatching.

et al., 1980; Sumich & Show, 1999). This shift may reduce the number of sightings in today's prime whalewatching area around Todos Santos Islands. Therefore, the tourists' expectations would be less fulfilled, and they might not come back nor recommend whalewatching in Ensenada with tour operators suffering financial losses (Figure 3). Actors involved have suggested planning strategies to prevent impacts, to improve tourist services, and in consequence, to increase income.

Regulation-Driven Whalewatching

An emergency whalewatching law was published in 1996 (NOM-EM-074-ECOL-1996, SEMARNAP, 1996) that regulated only the lagoons of BCS. Because of Ensenada's regulating necessities, SEMARNAP began to issue whalewatching permits based on that law (Parrilla, 1998; Figure 4). However, several specifications were unsuitable for Todos Santos Bay, where the gray whales' behavior varied from BCS (migrating vs. breeding), boats were larger than in BCS, and navigation conditions were different (open seas vs. protected lagoons).

In 1998, SEMARNAP initiated an impact mitigation strategy (Clark, 1996) to prevent or minimize adverse effects of whalewatching on all whale species spending at least part of their life cycle in Mexican waters. Meetings were organized in all whalewatching areas where public participation was encouraged in the design of a Mexican whalewatching regulation and management of the activity. In Ensenada, 10 invited government agencies and three education and research institutions were always present, while tour operators increased from 4 at the first meeting to 15 at the last one. The lead author was present at all of these meetings (see Methods).

On 10 January 2000, the Mexican whalewatching law was published (SEMARNAP, 2000) giving a legal basis for law enforcement in all whalewatching areas in Mexico. The law defines terms, whalewatching purposes, and official permit requirements. It also

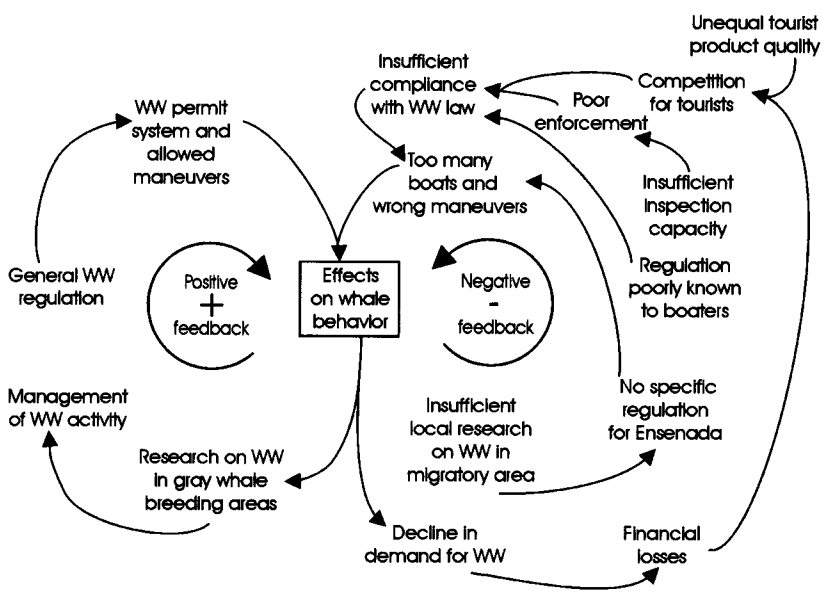

Figure 4. Regulation-driven whalewatching: There is positive feedback of the whalewatching regulation on gray whale behavior; however, this management strategy with poor enforcement, insufficient research, and lack of education still has consequences (negative feedback) on whale biology and the success of the economic activity.

specifies boat maneuvers in the vicinity of whale groups (approach from the rear and behind, a 30 m minimum distance) and prohibition of fishing, swimming, diving, and skiing. The Mexican regulation has many specifications, as in other whalewatching areas around the world; for example, New Zealand (Constantine, 1998), Canary Islands, Spain (Montero et al., 1997); Hawaiian Islands and Massachusetts, U.S.A.; and Australia (Birnie & Moscrop, 2000; Carlson, 2000). The Mexican whalewatching law also mentions that a yearly "announcement" will be published by the government in the Federal Register prior to the whalewatching season, based on updated information and research results. This announcement will describe controlled and restricted areas, season length, authorized number of boats, landing piers, and so on, specific for each whalewatching area. The specifications for the Ensenada whalewatching area have been discussed during multistakeholder meetings, where the lead author proposed several specifications for the Ensenada whalewatching area, and they were officially accepted by a publication in the Federal Register (SEMARNAP, 1999). Furthermore, during a training course for tour operators organized by the environmental ministry, the lead author presented preliminary results of the study regarding the effects of whalewatching boats on gray whale behavior (Heckel et al., 2001). Possible additions to the regulation were discussed with the boat skippers to perceive their acceptance toward proposed navigation rules. Reactions were positive (Heckel, 2001a). Continuous communication with the environmental ministry has resulted in the proposal and acceptance of controlled and restricted zones, based on geographic information systems, for the Ensenada whalewatching area (Heckel, 2001a).

Even with regulation, based on experiences from gray whale breeding areas in BCS, whalewatching boats in Ensenada still influence the behavior of migrating gray whales (Heckel et al., 2001; Figure 4). The reasons are many. There is unequal competition among whalewatching boats for tourists because they offer different qualities of the tourist product (nature guide, cabin to hide from wind and rain, comfortable seats, toilet, clean deck), which is the result of reducing expenses or no perception of added value when better services are offered. In addition, as boat operators compete for tourists, sometimes vessels are used inappropriately during whale encounters by tour operators because they feel under pressure to satisfy the tourists' expectations, and therefore there is insufficient compliance with the law regarding maneuvers during whale encounters. In addition, official publicity attracts private boats whose skippers are unaware of regulations, and thus do not drive appropriately during whalewatching.

Law enforcement is still difficult to achieve because the corresponding agency (PROFEPA, by its Spanish acronym), has insufficient human and financial resources to be effective. Only six inspectors carry out all enforcement activities in Baja California (Contreras, 1997; Santillán, 1998). San Diego, California, had only one agent in 1999 for fisheries law enforcement that included whalewatching (Zatwo, 2000). Poor enforcement also contributes to the fact that there are often too many boats (some of them unauthorized) in the whalewatching area around Todos Santos islands and wrong maneuvers occur. The knowledge capacity has to develop because regulations for Ensenada are not specific, thus local research on whalewatching has to increase (Figure 4).

Growth of Whalewatching in Ensenada and Direct Income

Permit issuing had promoted whalewatching as an attractive income possibility for owners of small boats. Between 1995 and 2000, the number of whalewatching boats increased from 7 to 19, with small boats making up the difference (Figure 5). None of these new boats have ever worked with the Science Museum. During two recent seasons (1998–1999, 1999–2000), the museum worked only with the largest boat company (190 passengers; Gascón, 2000).

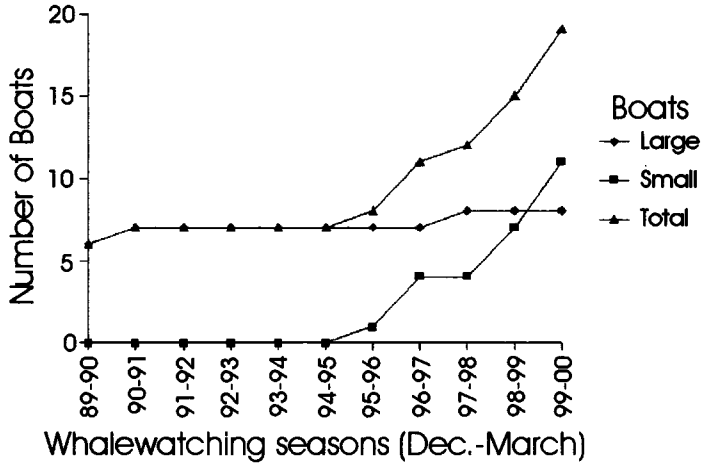

Figure 5. The growth of whalewatching in Ensenada with respect to the number of boats that have received official authorizations for commercial whalewatching. Data sources: environmental ministry delegation office in Baja California (SEMARNAP by its Spanish acronym) and Ensenada Science Museum.

The analysis of economic significance of whalewatching in Ensenada is incomplete because data in this study were provided mainly by the Science Museum (the most reliable data source) and the SEMARNAP delegation office, which received scattered reports since 1996–1997. Only the museum's income is reflected here.

The minimum direct income from whalewatching in Ensenada was estimated (Figure 6), and this summed 534,940 USD. From 1996 to 1999 income declined as the museum reduced its partners. Nevertheless, during 2000 the activity seemed to be recovering.

The estimated total direct income is relatively low when compared to whalewatching in the breeding lagoons. Direct income in BCS was USD125,000 in 1995, USD321,590

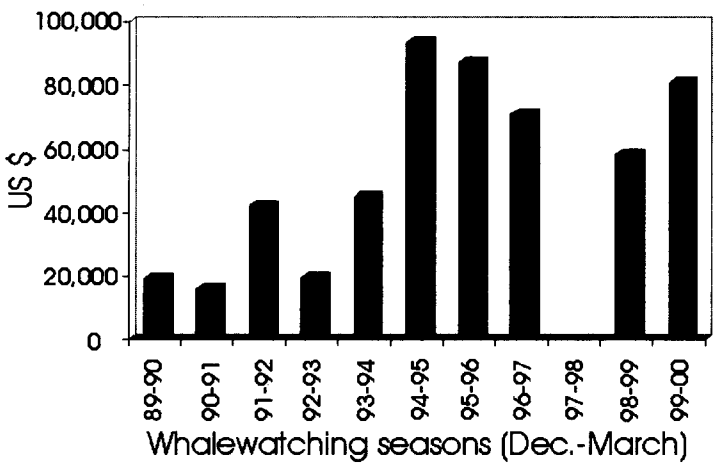

Figure 6. Minimum direct income generated by whalewatching in Ensenada. Data sources: Science Museum (1989–2000), and SEMARNAP delegation office (1998–2000). Lack of data for 1997–98 due to bad weather forecast. "El Niño" conditions in the Pacific Ocean caused severe storms along the entire coast of North America. SEMARNAP did not receive any reports from other tour operators, even though they worked during that season.

in 1996, and USD453,300 in 1997 (Ávila & Saad, 1998). These figures do not account for indirect income in any Mexican whalewatching area, that is, tourists' expenses for transportation, lodging, shopping, and so on.

More important is the total economic value estimation of this resource that should include intrinsic and ecologic values, natural functions, and goods (Costanza et al., 1998). Chien (1994) estimated the values that California citizens placed on migrating gray whales off the California coast: for a 50% increase in the population of gray whales the total value was about USD28 million annually. For a 100% increase in gray whale population, the estimate of total value was USD43 million.

Environmental Education

Since the Science Museum started organizing trips, they recognized the educational value of whalewatching (IFAW et al., 1997) and nature guides have been trained every year since 1989. During this study, it was observed that the guides gave accurate information about the history of Ensenada and the wildlife that was encountered during the trip (birds, sea lions, harbor seals, and gray whales). The guides and crew interacted well with the public when addressed by people. Some tourists complained about unhygienic conditions or lack of services on board. Some guides trained by the museum offer their services to other boats. Small boats usually do not carry a guide because they occupy one passenger's place, and the boats' owners (who are usually the skippers) consider the guide's service too expensive and worthless (González, 2000). Instead, they claim to have nature training in order to save guides' expenses. Therefore, a training course was organized by the local delegate office of the federal environmental ministry for all tour operators (Díaz & Orozco, 1998).

Actors

The actors involved in Ensenada's whalewatching and their power and support for regulation and management were identified (Figure 7). Some tour operators show low support because they consider that official whalewatching publicity (from the Baja California Tourism Department) favors only one tour operator (the Science Museum and its partner). The Navy does not support law enforcement because they say such belongs to PROFEPA alone. The harbor master is responsible for security measures on board, although they inspect boats infrequently. Commercial and sport fishing boats, as well as recreational boats, usually do not maneuver carefully in the whalewatching area. The local university has supported some research on this problem (Heckel, 2001a) and the local research station of the National Institute of Fisheries (INP) has provided qualified opinions during law discussion meetings.

The Possible Solutions: Research- and Management-Driven Whalewatching

The issues identified for the Ensenada whalewatching activity could be solved by implementing a local management process based on local research and experience of whalewatching tour operators (Figure 8). Annual meetings would bring this knowledge together and improve local regulation. Public participation has been implemented in other parts of the world to deal with management issues because this is the key to accomplish local feasible management (Olsen & Christie, 2000). Coastal management projects in East Africa (Torell, 2000) have succeeded with this approach and the national coastal policy for South Africa was designed with contributions from thousands of people (Glavovic, 2000). Whalewatching guidelines in Norway were developed in cooperation with commercial

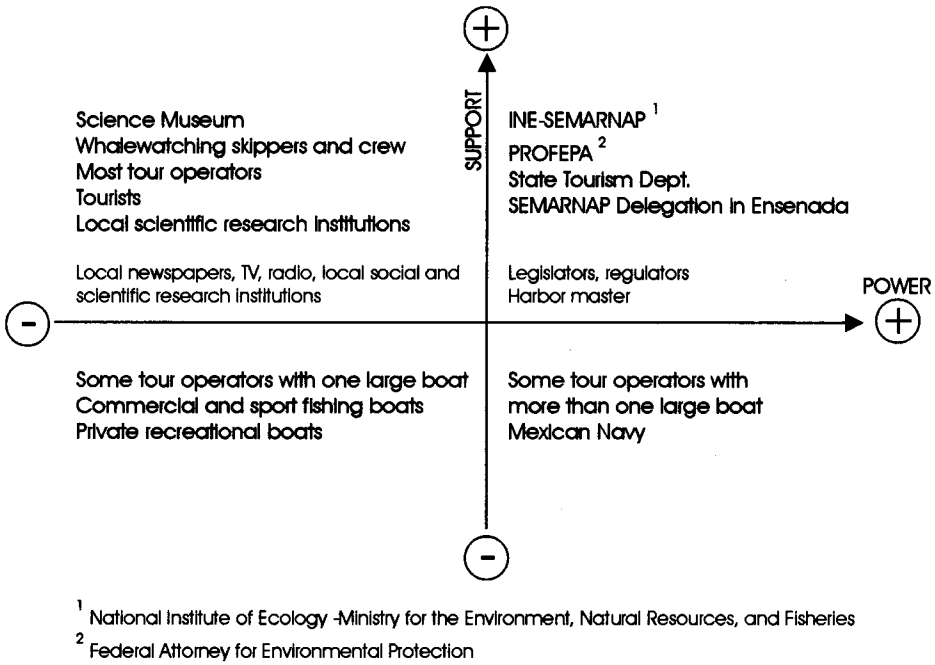

Figure 7. Actors involved in whalewatching in Ensenada, classified according to their relative power and support to the activity's regulation. Plus and minus signs indicate greater or lower power and support.

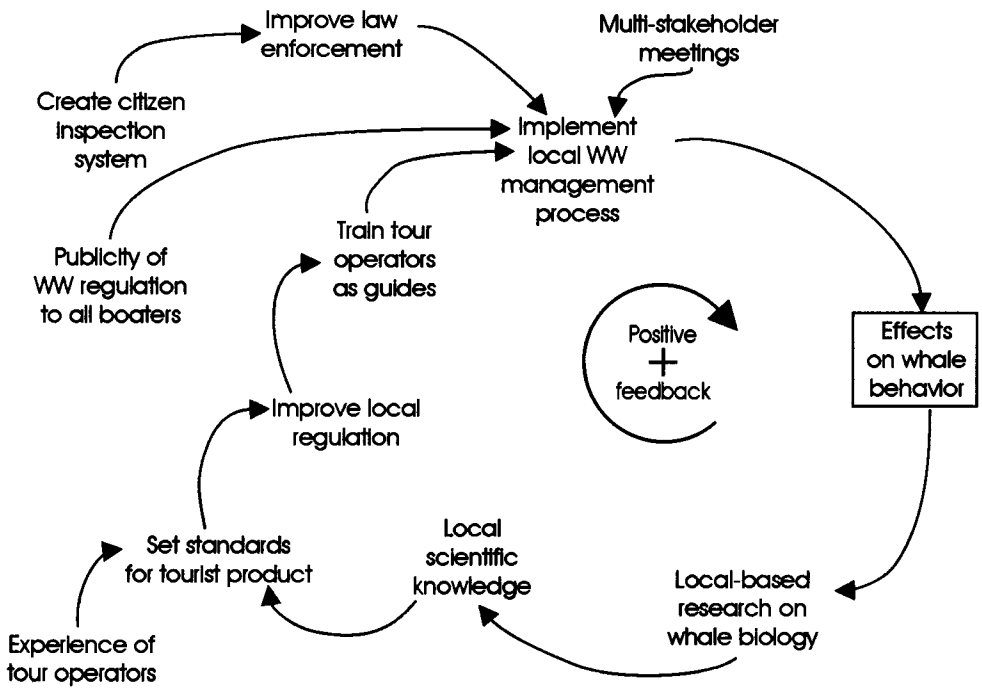

Figure 8. Research- and management-driven whalewatching: The possible solutions to whalewatching issues in Ensenada, Mexico, led to the implementation of a whalewatching management process that could have positive feedback on whale biology.

operators, biologists, and conservationists (DeNardo, 1998). In the United Kingdom, it has been recognized that any guidelines issued need to be sensitive to local circumstances and tour operators (Tasker, Holt, & Salmon, 1997).

In addition, standards for the tourist product have to be set by tour operators so the quality is improved and consumers are able to meet their expectations. Environmental education is an important component of whalewatching. The Science Museum has always used a nature guide on board, trained by the museum. The American Cetacean Society also has trained hundreds of guides to work on whalewatching boats in Los Angeles (Lewis, 1989).

Training of skippers as nature guides is necessary, even though a guide is not required by Mexican regulation. Including mandatory environmental education for a license to operate would allow for this. In the Canary Islands, the decree regulating pilot whale (*Globicephala macrorhynchus*) observation requires the presence of a monitor-guide on board (Montero et al., 1997).

Some tour operators argue that the lack of financial resources prevents them from having boats in the best condition. However, commercial whalewatching companies should be aware that many adjuncts to the whale contact influence the value of the experience—scenery, education programs, and other wildlife species. Tour operators could capture return customers and develop a positive reputation, as in the Canadian killer whale (*Orcinus orca*) viewing area near Vancouver (Duffus & Dearden, 1993).

The training course for operators organized once in 1999 by SEMARNAP should take place every year. In Hawaii, earlier reluctance of industry to accept guidelines or regulations changed when the National Marine Fisheries Service (NMFS) met with tour operators and private boaters to increase awareness of possible effects of boats on whales (Nitta, 1989). In general, increased education, monitoring, and enforcement are claimed to be necessary by agencies involved in whalewatching management, such as National Oceanic and Atmospheric Administration (NOAA) Fisheries (Karnella, 1989).

Furthermore, the whalewatching law has to be publicized with printed media, radio and television promotion. The general public, including private and fishing boat owners and some tour operators only poorly know the regulation. Private recreational boaters may be the greatest offenders in terms of harassing whales in most whalewatching areas, such as in Alaska (Zimmerman, 1989).

In Ensenada, citizen participation committees have a great potential as "watching" organizations for PROFEPA, and tourists also could report law violations. In San Diego, California, at least one case of gray whale harassment was prosecuted when witnessed by a tour operator in 1988 (Atkins & Swartz, 1989).

An ongoing research system has to be created with the aim to contribute to specific terms of local whalewatching regulation and management (suitability of the 30 m minimum distance originally designed for BCS, distribution of gray whales in the Ensenada area, etc.). Investigations in conjunction with tour operators are a good opportunity and have taken place in the United States (Atkins & Swartz, 1989; Chu, Mayo, & Weinrich, 1985), Ireland (Berrow & Holmes, 1999), New Zealand (Constantine & Baker, 1996; Lusseau, 2000), and Australia (Arnold & Birtles, 1998). A proper funding system could be established where tourists would pay an additional small amount for the ticket, and this would be invested in research and conservation measures. Local research at a federal institute (CICESE) and the Baja California state university (UABC) also may be funded by the Mexican national research council, the environmental ministry, and private national and international foundations interested in natural resource conservation and management in Mexico.

All these strategies will improve the quality of the whalewatching experience and whale-boat interactions. In consequence, fewer negative effects should occur on gray

whale behavior, distribution, and other biological treats. In the end, fewer financial losses should occur to tour operators and sustainable whalewatching in Ensenada will have succeeded (Figure 8).

Whalewatching management has had different approaches in many parts of the world, depending on target species for conservation or management, the size of the whalewatching area, the number of tour operators involved, the law enforcement capabilities, and the involvement of all stakeholders in management meetings. Even though long-term effects of whalewatching have been determined only at one site (Wilson, 1994), the precautionary principle has led at least 16 countries to design and implement whalewatching regulations and guidelines (Carlson, 2000). Enforcement in all locations is difficult to achieve due to the high costs involved. Self-regulation on a voluntary basis, coupled with education of operators and the public, is thus regarded by many as being the most effective means of ensuring compliance with all forms of measures in the long term (Birnie & Moscrop, 2000). This seems to be the best approach to comply with laws and management plans in such remote areas as Alaska and Abrolhos Archipelago in Brazil (Morete et al., 2000).

Conclusions

The growth of whalewatching in Ensenada during the 1990s is an example of ecotourist development. Many fishing towns have embraced this economic alternative in other parts of Mexico, such as in Puerto Vallarta, a breeding area for humpback whales (Ávila & Saad, 1998; Sánchez, 1998).

Mexican whalewatching regulation and management started in BCS many years ago. As in many parts of the world, regulations and management actions have been "tailored" to each whalewatching area in the breeding lagoons with the experience of tour operators, researchers, and regulators. This has contributed to the promotion of local "ownership" solutions. The regulation, however, still has to be adapted continuously to each particular area where this economic activity has grown very fast. In addition, many locations in Mexico have great potential for whalewatching (Hoyt, 1994). In the process of regulation design, all stakeholders should be included to minimize more narrow self-interest decisions and reduce mistrust (Clark, 1998). A good example of this procedure was the public consultation that resulted in the new Mexican whalewatching law (SEMARNAP, 2000).

The management of natural resources is an ongoing process that should constantly adapt to changes in the ecologic and human context (Meffe & Carroll, 1997). Adaptive management is based on involvement of stakeholders, transparency in the decision-making process, public education, and on reliable knowledge of societal and ecosystem change (Olsen & Christie, 2000). The proposed management procedure for whalewatching in Ensenada may function as a demonstration project that could be replicated at other sites in Mexico where marine mammal viewing is a tourist resource. At the local level, the process still has to advance from the planning step to institutional formalization, implementation, and evaluation (Olsen & Christie, 2000). Strong leadership and financing will be necessary to accomplish this. Even though governmental agencies have been instrumental in whalewatching management in several countries (Mexico, Canada, and the United States included), nongovernmental organizations have had success in leading conservation efforts, including by fostering and financing workshops, research, environmental education, and policy design. For example, in the Gulf of California, Mexico, nongovernmental organizations have been advocates of biodiversity conservation and sustainable development. Therefore, Mexican and international nongovernmental organizations, together with the Mexican government, should work together in a whalewatching management process not only in Ensenada, but in all whalewatching areas of Mexico.

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