

# Chapter 13

## Assessing Human–Wildlife Conflicts and Benefits of Galápagos Sea Lions on San Cristobal Island, Galápagos

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**Abstract** Human–wildlife interactions shape perceptions and the conservation of wildlife populations. San Cristobal Island is the main fisheries port in the Galápagos archipelago and hosts one of the largest sea lion colonies. Local tourism and the population have grown drastically over the past decade and so does human impact on Galápagos sea lions. Here, we analyze human perceptions of the endemic and endangered Galápagos sea lion, using interviews and behavioral observations of sea lions' responses to humans.

There is overall agreement that sea lions should be protected, but some fishers do not share this view nor are compliant with protection efforts. Direct anthropogenic impacts in the form of sea lion entanglements in fishing gear and debris (nylon, plastic), diseases, and fishers' aggressions toward sea lions have substantially increased in the past 2 years. Sea lions are highly tolerant to human presence, but they flee when approached at distances closer than 4 m. Injuries and death of sea lions caused by humans increased dramatically over the last 5 years. To improve conservation, it is essential to investigate the dynamics and challenges of human–sea lion interactions on San Cristobal. Socioeconomic activities influence these perceptions, and possible reasons explaining the different attitudes toward these animals are shaped not only by economic interests but by the symbolic and political context in which these positions take form.

### Introduction

Human–animal interactions shape perceptions of wildlife, which can be complex and multidirectional, based on people's productive strategies and on cultural schemata (Descola 1992). Most studies on human–wildlife interactions concern the

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threat that animals pose to human economic and subsistence bases (Ezealor and Giles 1997; Wang et al. 2006). Yet, human perceptions of conservation icons interfering with daily activities are poorly studied. Interactions between people and Galápagos sea lions (*Zalophus wollebaeki*) on San Cristobal Island, Galápagos, where sea lions live in the town center, Puerto Baquerizo Moreno (i.e., the second largest city and the capital of the Galápagos Province), are part of the day-to-day life of both sea lions and humans. Predation by wildlife on prey that has an economic value has been identified as the main driver of people's negative attitudes toward predator species (Sekhar 2003; Walpole and Goodwin 2001). Marine mammals preying on commercial fish populations, or on aquaculture facilities, cause conflicts worldwide (Read 2008), including the Galápagos Marine Reserve. Here, we explore the relationship between humans and endangered Galápagos sea lions (IUCN Category A2a; Aurioles and Trillmich 2008) on San Cristobal Island.

Sea lions spend most of their lives in nutrient-rich oceans but rest and breed on land. They are normally restricted to temperate areas rather than to tropical or subtropical environments such as those of the Galápagos Islands. The Galápagos archipelago receives cold nutrient-rich waters from the Humboldt Current in the south and the Cromwell Current upwelling in the west, which extends to the western coasts of the islands (Feldman 1985). However, the Galápagos waters are not productive year-round; the warm, nutrient-poor Panama Current affects the islands from January to April each year. Additionally, El Niño events occur within a range of every 3–7 years, increasing the sea surface temperature, deepening the thermocline, and causing dramatic responses in primary production (Chavez et al. 1999), and, thereby, limiting access to food for many marine organisms at higher trophic levels (Glynn 1988). El Niño events severely affect sea lions and fur seals (*Arctocephalus galapagoensis*), creating high pup and adult mortality rates in both species (Trillmich and Limberger 1985; Trillmich and Dellinger 1991; Salazar 1999; Alava and Salazar 2006). After the last strong El Niño event in 1998, an increasing number of sea lions settled in Puerto Baquerizo Moreno, forming what is now one of the largest colonies in the archipelago (Páez 2008). According to Aurioles and Trillmich (2008), total population numbers have decreased over the past few decades. Presently, approximately 18,000 individuals inhabit the islands, representing a 50 % decrease in the population since the last major El Niño event (Alava and Salazar 2006; Aurioles and Trillmich 2008). The colonies in Puerto Baquerizo Moreno have an estimated total of 1,500 individuals (Denkinger et al. unpublished data).

It is likely that El Niño events may increase in strength and frequency (Timmermann et al. 1999), posing serious threats for the sea lion population in the long term (Salazar and Denkinger 2010). The dynamic environment of the Galápagos, with alternating favorable and poor feeding conditions, leads to smaller sea lion and fur seal colonies compared to other pinniped species (Trillmich 1984; Riedmann 1990). To increase pup survival, Galápagos sea lions have long nursing periods of up to 2 years and may nurse a yearling and newborn at the same time (Trillmich 1984), though competition within siblings is often fatal for newborns (Trillmich and Wolf 2008). Rookeries of several females and one alpha male prefer

flat sandy beaches where they are resting and nursing, whereas nonbreeding males and subadults tend to reside in less favorable habitats such as rocky shores (Wolf et al. 2005). Therefore, beaches are key habitats and require special management, especially considering the highly complex, social, and playful nature of sea lions. Alpha males of Galápagos sea lions are extremely busy guarding their harem and taking care of curious pups and juveniles that would otherwise venture out in the sea. While on land, pinnipeds need to rest to conserve energy for their biological needs (Costa and Gales 2003). Overall, Galápagos sea lions are an especially curious species and frequently approach humans. In fact, they seem more habituated to humans than any other sea lion species (Riedmann 1990). Pups and juveniles hone their skills with extensive play periods. They enjoy playful interactions with tourists, accompanying snorkeling biologists on their scientific projects, stealing research gear and biting scuba fins and quadrates, or simply following along.

## Study Area and Social Background of San Cristobal and Galápagos

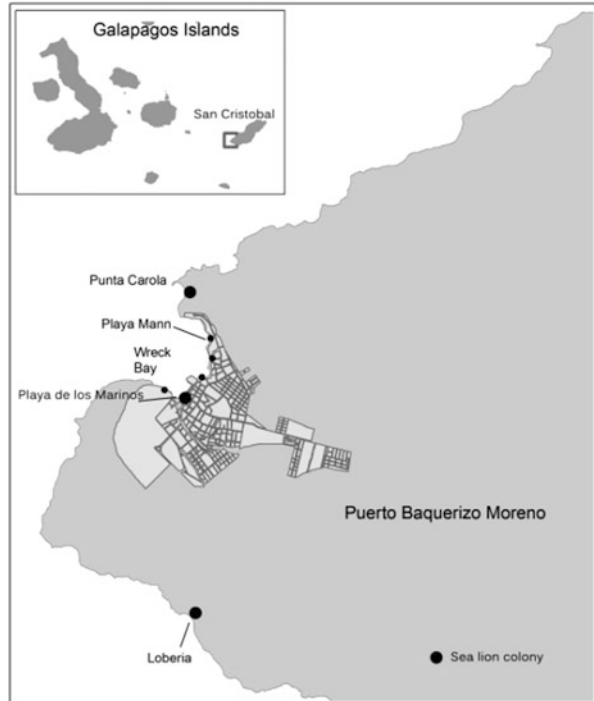
The study took place in the capital city of the Galápagos Province, Puerto Baquerizo Moreno ( $0^{\circ}54'07.12''/89^{\circ}36'40.34''$ ), where some of the major sea lion colonies are located. Puerto Baquerizo Moreno is situated at Wreck Bay on the southern tip of San Cristobal Island (Fig. 13.1). The bay is also the main harbor for fishing vessels and the second most important for tour boats. San Cristobal is located in the southeast of the archipelago in a mixing zone (Edgar et al. 2004), where it receives warmer waters at the northern tip of the island and colder waters with strong winds and upwelling in the south of the island.

Annexed by the Ecuadorian government in 1832 and declared a National Park in 1959, the Galápagos Islands are still considered one of the best-preserved archipelagos in the world. The archipelago was designated a UNESCO World Heritage Site in 1978, placed on the list of World Heritage at risk in 2007 for its mounting problems associated with the rapid growth of tourism, escalating human population, and increased introduction of nonnative and invasive species (Watkins and Cruz 2007). Afterwards, various conservation organizations opposed its removal from the endangered list in August 2010.

In 1988, the passing of the Organic Law for the Special Regimen for the Conservation and Sustainable Development of Galapagos (LOREG) funded the Galápagos Marine Reserve (GMR) as it exists today. According to this law, only artisanal fishers registered with the National Park have permission to fish in the GMR (Hearn 2008a).

The number of fishermen registered in the Galápagos has increased from 752 in 1999 to 1,023 in 2008 though to date with the reduction of resources, the actual number of active fishers decreased from 628 to 400 (<http://www.Galapagospark>).

**Fig. 13.1** Geographical situation of San Cristobal Island in the Galapagos Archipelago and study site at Wreck Bay



org), representing roughly 2 % of the total population. By the year 2006, fishing made up less than 4 % of local income (Watkins and Cruz 2007).

Artisanal fishers see tourism as a less strenuous and dangerous economic activity and many have already transitioned, at least partially, to the tourism sector. In San Cristobal, they pilot tour boats and work as guides. Still, they continue to struggle to reap the benefits that the Galápagos brings to those in tourism and conservation. Some fishers have proposed several projects including *pesca vivencial* (fishing with tourists and sport fishing) and catch and release sport fishing (see Chap. 10).

Tourism, on the other hand, is the most important source of income and comprises approximately half of the island income (Watkins and Cruz 2007). The local population, especially fishermen as boat operators, first became involved in tourism in the 1960s (Quiroga 2009; Watkins and Cruz 2007). With increasing numbers of tourists arriving in the 1970s, the National Park began training tour guides. In 1974, the Charles Darwin Research Foundation recommended limiting the maximum number of tourists to 8,800 per year. The islands quickly exceeded this limit in 1979 with a total of 11,765 tourists, the majority of which stayed on live-aboard cruise boats, mostly owned by foreign companies. In the 1990s, more tourists came for local, land-based tourism. By 2008, annual visitation had risen to 184,000, and despite a temporary decrease in 2009, due mostly to the global

economic crisis, the numbers continued to increase in 2010 and 2011 with an expected increase to 150 % by 2020 (Watkins and Cruz 2007).

There has been an important increase in the availability of employment in the tourism sector. Since the 1970s, the human population has grown exponentially from a few thousands in the 1950s to the current official number of 25,124 people (Villacis and Carrillo 2013), thus intensifying the demand on local food supplies and transport of goods from the continent to the Galápagos. Consequently, pressure on pristine areas and the risk of species introduction have grown (Kerr and Cardenas 2004; Bremner and Perez 2002). This ongoing phenomenon occurring in the Galápagos has been defined as “continentalization” (Grenier 2010).

Human residents on San Cristobal regularly interact with sea lions. The Galápagos sea lion (*Z. wolfebaeki*) is endemic to the islands and found throughout the archipelago. Some of the largest sea lion colonies are at Playa de los Marineros, in the center of San Cristobal, and La Lobería and Punta Carola, recreational beaches close to town (Fig. 13.1).

## Methods

The study explores three areas (1) human perception and implications, (2) sea lion behavior, and (3) human impact and conservation issues.

### *Human Perception of Sea Lions*

Residents of Puerto Baquerizo Moreno were divided into different categories according to their primary economic activities. The categories include fishers, tourists, and others, such as merchants, public employees, and general public (referred to as “the community”). Surveys were conducted to examine two themes: how residents’ daily activities are affected by sea lions and people’s perception of sea lion conservation. Categorical variables were used to understand people’s perceptions, being related to the objectives of each open-ended or closed-ended question (Patton 2005; Table 13.1) and the sector of the population surveyed, while the discrete variables state the number of responses in each sector. Chi-square tests and contingency tables were used to analyze the statistical power ( $1 - \beta = 0.90$ ) of the results. With the aim to determine the sample size ( $N = 194$ ), the statistical software, G-Power, was utilized.

We conducted 70 surveys in each sector to reach the required sample size of  $N = 194$  with a total of 210 interviews. Temporary residents make up only 10 % of the 210 people surveyed. The Galápagos special law regulates residency and only permanent residents can live and work unlimitedly on the islands; in contrast, temporal residents live and work intermittently according to their work contracts. Responses were classified into positive and negative (see Table 13.1).

**Table 13.1** Categorical variables positive and negative responses used in interviews (open-ended and closed-ended questions) with local inhabitants of San Cristobal Island on their perspective to Galápagos sea lions

Value	Are sea lions attractive and likeable?	Would your life be better if sea lions disappeared?	Have you ever been attacked by a sea lion?	Do sea lions interfere with your daily activities?	Is it important to protect sea lions?
1	They are attractive	My life would be better	Yes	Yes	Yes
-1	They are not attractive	My life would be worse	No	No	No

### *Sea Lion Behavior*

Sea lion behavior was monitored at two sea lion colonies on Puerto Baquerizo Moreno (see Fig. 13.1): Playa de los Marineros, a beach with strong human impact due to regular boat crossing and reparation, and La Loberia, a recreational beach southwest of the Island (3 km from the town center) with moderate to low human impact. As fewer interactions between humans and sea lions occurred at La Loberia, the observations of interactions were mainly focused at Playa de los Marineros. Behavioral surveys of Galápagos sea lions were carried out in March 2009 for a total of 18.5 h at both sites. Each survey lasted from 2 to 3 h in the late afternoon. Playa de los Marineros was surveyed from March 4 to March 15 and La Loberia from March 16 to March 26. The biggest colony at Playa de los Marineros consisted of an average of 230 individuals ( $SD = 41$ ), while the colony at La Loberia had an average of 40 individuals ( $SD = 7$ ). At both sites, we selected a focal harem consisting of an alpha male, females and their pups, and juveniles, and subgroups of bachelor males without harems. We recorded behavior for different age and sex classes such as adult males, adult females, females with pups, and pups (newborns until first moult). Next, we continuously observed the colony recording reactions (e.g., fleeing, barking) or duration of each behavior, including resting. Human interactions with sea lions are considered events and were classified as passive or aggressive. We recorded the interactions each time a person was present at the sea lion colony and calculated the percentage of aggressive and passive interactions of individuals relative to total actions at a distance of 10–20 m so that the observers' presence would not influence the behavior of humans or sea lions. To analyze the reactions of sea lions to human presence, we identified different situations: (a) aggressive approach (i.e., scaring the sea lions away, throwing sand or stones), (b) nonaggressive approach at a distance  $>4$  m, and (c) nonaggressive approach at a distance  $<4$  m. We calculated the frequency of each situation involving humans over total observation time. For each situation, the percentage behavior for each size class was calculated as a proportion of behavior to total observation time and compared within the different situations using chi-square tests.

## ***Human Impact and Sea Lion Conservation***

To assess human impact on sea lions, we used data of the sea lion colonies at Puerto Baquerizo Moreno from an ongoing monitoring program of the Galápagos National Park (GNP) and the Galápagos Academic Institute for the Arts and Sciences (GAIAS) and Galapagos Science Center (GSC) from February 2008 to December 2012 and from occasional reports to the GNP office. All cases were divided into the following impact categories according to the cause of death or injury: shark attacks (i.e., round bite wounds), dog bites (i.e., clear patterns of dog teeth), human related (i.e., entanglement in rubbish or other items, propeller cuts, boat or car accidents, impact of knives or other objects), fishery related (entanglements in fishing gear), diseases (skin diseases, ulcers, eye infections, pup mortality), and starvation (hip bones and ribs clearly visible). Dead sea lions were externally examined and in some cases autopsies of sea lion carcasses were performed to study the cause of death. All impact categories were listed over the years as total numbers of all reports. In the same way, the health condition of the animals was recorded as *dead* animals, including juveniles and adults; *pup mortality*, when dead or aborted pups were observed; *injured*, when animals showed blows, cuts, or amputated limbs clearly not caused by sharks; *entangled*, when animals were entangled either in debris or fishing gear; *sick*, if animals had extreme mucus secretion, eye infections, skin diseases, parasites; or *starved* (see above).

## **Results**

### ***Human Perceptions of Sea Lions***

Consistent with our hypothesis, the results of 210 surveys with fishers, people working in the tourism sector, and the remaining community revealed that only the responses of the fishing sector tended to differ: fishermen expressed more negative perceptions of sea lions than the other two groups.

Both the tourism sector (66 %) and the rest of the community (69 %) perceive *sea lions as an attractive and amusing species*, while only 28 % of the fishing sector responded positively. Thirty-five percent of fishers stated that sea lions were neither attractive nor amusing and the remaining 38 % stated that they were indifferent to this species.

Personal experiences of *direct threats from sea lions such as attacks or other aggressive behavior* differed greatly ( $\chi^2: p < 0.001$ ) among sectors; 3 % of the tourist sector, 17 % of the rest of the community, and 33 % of fishermen reported attacks or aggressive behavior from sea lions.

In response to “*whether or not sea lions interfere with their work activities*,” 70 % and 86 % of the tourism sector and the rest of the community, respectively, answered that sea lions do not interfere with their daily activities. Meanwhile, 64 %

of the fisheries sector indicated that sea lions disrupt their work activities. Of those that answered positively, many commented that sea lions are noisy and unhygienic due to the fact that they defecate in public places. Among fisherman, 33 % responded that sea lions interfere with their daily activities by eating their bait and catch and by resting aboard their boats, dirtying, and at times sinking them.

Most people in all three sectors agreed, "*their lives would remain the same without the presence of sea lions.*" However, 33 % of fishermen responded that their lives would improve while 30 % of the rest of the community and 39 % of the tourism sector indicated that their lives would be worse without sea lions (Fig. 13.2).

With regard to sea lion conservation, the responses of all three sectors converged for the first time: 93 % of the community, 91 % of tourism, and 89 % of fishermen indicated it was *critical to protect this species*. Concerning *sea lion population numbers*, most respondents in all sectors incorrectly stated that there are more sea lions now than 10 years ago. Few people (6 % of the rest of the community and 9 % of the tourism sector) and none of the fishermen interviewed were aware of the *endangered status of the Galápagos sea lion* (Fig. 13.3).

### ***Sea Lion and Human Interactions***

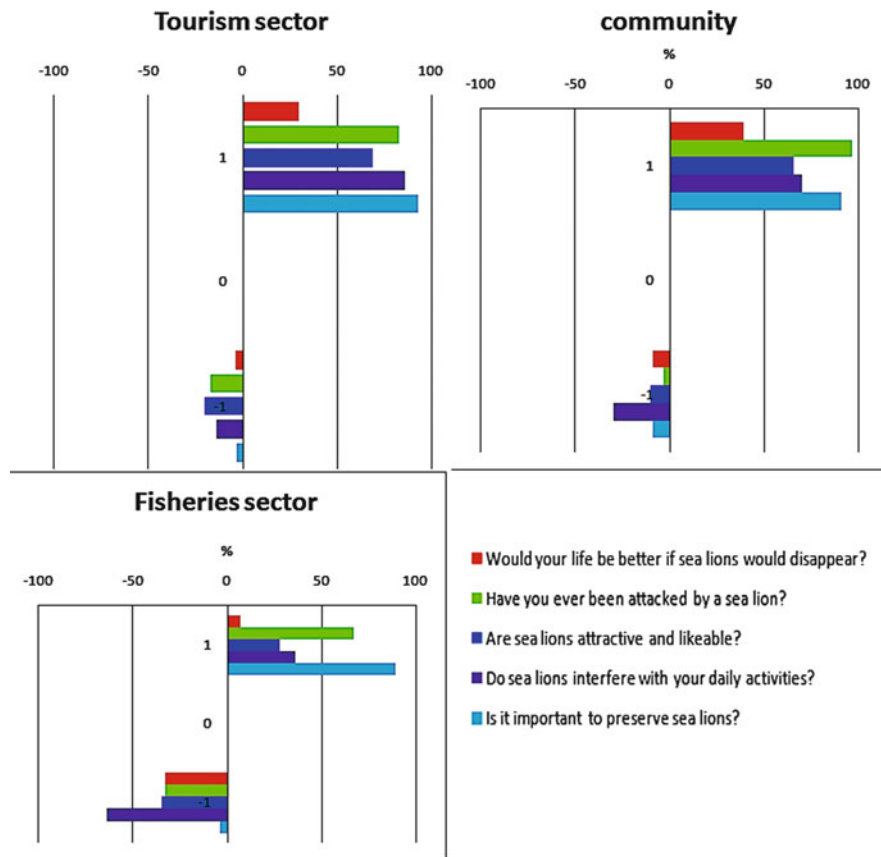
All sea lions tended to escape and pups appeared to be especially frightened when approached aggressively by humans (2–4 escapes/h). We found human behavior with respect to sea lions significantly more aggressive at Playa de los Marinos, where people perform various daily and work-related activities in the presence of sea lions, than at La Lobería, where people primarily go to relax (*t*-test,  $p < 0.005$ ; Fig. 13.4). Though the GNP recommends that people must maintain a 2-m distance from wildlife, sea lions already react strongly at a 4 m distance. We observed that most people approached sea lions at a distance of less than 4 m (Fig. 13.4).

Approaches at distances of less than 4 m caused stronger reactions at Playa de los Marinos than at La Lobería. At the former, females moved away, whereas pups, males, and females with pups tended to defend themselves. Mothers with pups focused primarily on nursing, ignoring aggressive approaches on some occasions. At distances greater than 4 m, sea lions in all age classes simply observed or did not react to human presence (Fig. 13.5).

### ***Human Impact and Conservation Issues of Sea Lions at San Cristobal***

From February 2008 to December 2012, the GNP and the Galapagos Science Center received a total of 648 reports of dead, injured, or sick sea lions, with an

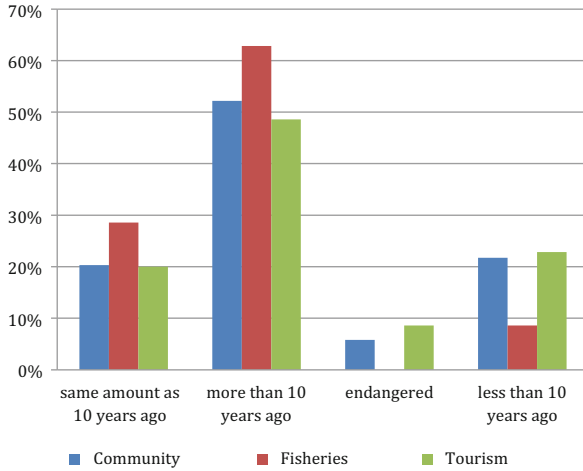




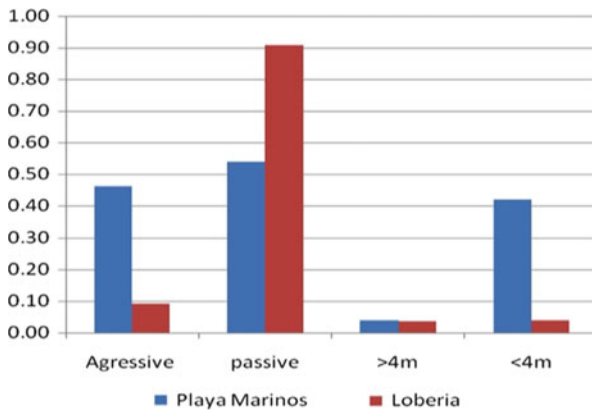
**Fig. 13.2** Human perception of different social sectors on Galápagos sea lions based on interviews using a set of five open-ended and closed-ended questions (see Table 13.1)

increasing number of incidents occurring in the latter half of this 4-year period. As shown in Fig. 13.6, adult and juvenile mortality peaked in 2010 and 2012 with 20 animals reported in both years, while pup mortality increased from 35 dead pups in 2009 to 96 pups in 2011, reflecting a 64 % increase in mortality. Even though pup mortality decreased slightly in 2012 to 68 pups, animals observed with disease symptoms continuously increased to 98 animals in 2012. Similarly, the amount of injured animals rose dramatically from 4 animals reported in 2008 to 96 animals by November 2012 (Fig. 13.6).

Threats were mostly related to diseases (51 %) followed by death or injuries associated with direct anthropogenic impacts accounting for 20 %, whereas interaction with fishing gear only affected 2 % of the sea lions observed. Only 4 % of sea lions suffered shark attacks, while dogs caused 3 % of the problems reported.



**Fig. 13.3** Human perception of different social sectors on the status of Galápagos sea lion conservation



**Fig. 13.4** Observed frequencies of human approach to sea lions at Playa de los Marininos and Loberia on San Cristobal Island

Possible natural causes, such as parasitic infections (2 %) or malnutrition (3 %), are minimal compared to human-inflicted injury and death or disease (Fig. 13.7).

Both disease (including pup mortality)- and human-related problems have drastically increased from 2008 to 2012. Fishery-related problems peaked in 2010 coinciding with the sport fisheries event organized by the municipalities of San Cristobal. Dog attacks peaked in 2011 with a total of six cases of injured or dead sea lions (Fig. 13.8).

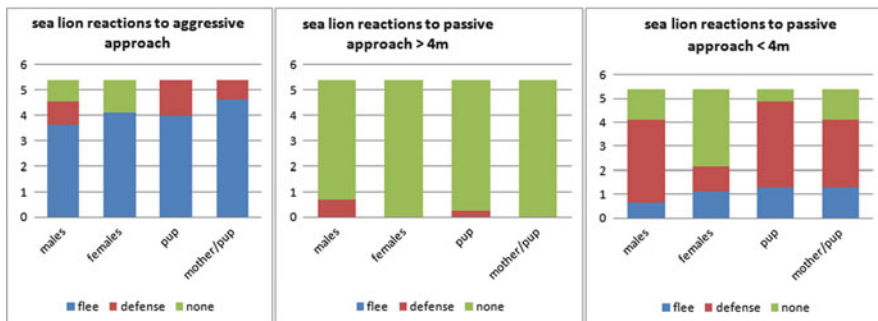


Fig. 13.5 Sea lion reactions to different distances of human approach

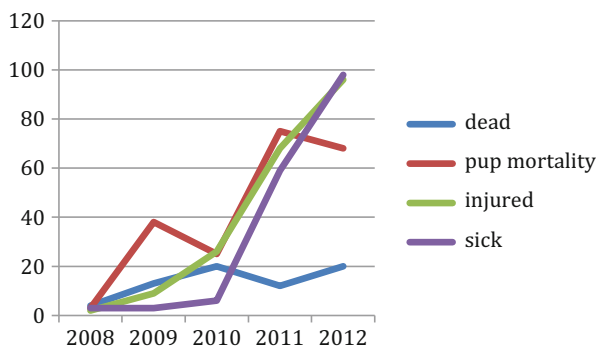


Fig. 13.6 Temporal trend of the condition of Galápagos sea lions reported to the Galápagos National Park Office at San Cristobal from 2008 to November 2012 ( $N = 648$ )

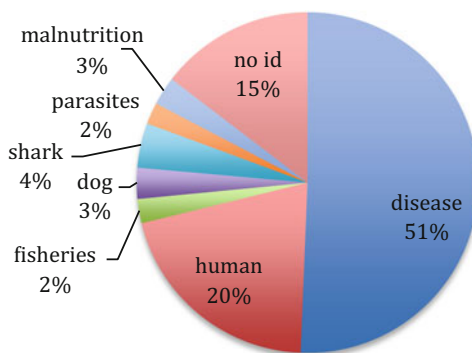
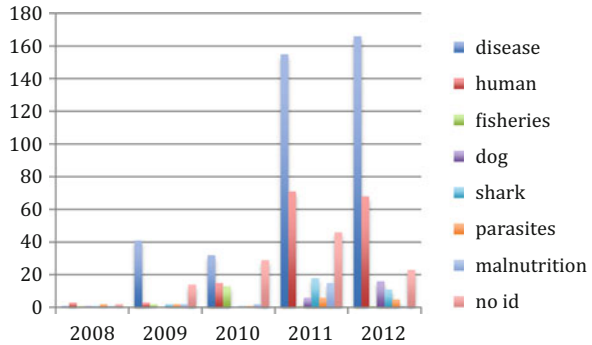


Fig. 13.7 Proportion of cumulative natural and anthropogenic threats reported for Galápagos sea lions on San Cristobal Island ( $N = 780$ )

**Fig. 13.8** Annual frequency of natural and anthropogenic threats reported to the Galápagos National Park Office on San Cristobal from February 2008 to November 2012



## Discussion

Wildlife conflicts emerge when human and wildlife requirements overlap (Distefano 2008). The growing number of humans and expanding urban landscapes across the globe affects wildlife habitats and populations, thus creating conflicts, especially between large carnivores and humans (Beckmann and Lackey 2008; Thornton and Quinn 2009). The municipalities of Galápagos have experienced an accelerated increase in the number of residents with population growth driven to a large extent by tourism, averaging 5.2 % a year between 1950 and 2001 (INGALA 2012).

During the middle of the twentieth century, many environmentalists promoted a western, postcolonial view of nature and conservation, called the Yellowstone model that emphasized charismatic animals and parks free of people. They encouraged an eco-centric discourse and elevated the conservation of nature above human needs and their societies, according to ideals adopted from the industrialized nations (Quiroga 2009). Likewise, with the foundation of the GNP in 1959, many Galápagos species, including sea lions, came to have multiple and contested symbolic meanings. Though people engaged in science, tourism, and conservation see emblematic species like the sea lion as an endemic and unique species in need of protection, many local people engaged in fisheries activities perceive them not only as a nuisance since they compete for the same resources but as a symbol of a repressive and exclusionary social, political, and economic system.

As expected, our survey responses revealed that people's productive activity shapes their perceptions, desires, and cognitions with respect to local fauna. Their practical and material concerns determine their belief systems, which depend on whether or not sea lions attract commerce in the form of tourism or constrain their livelihood activities, as in the case of Galápagos fishermen. The tourism sector and the community have a generally positive view of sea lions. Sixty-nine percent of the community and 66 % of people working in tourism stated that they found sea lions both attractive and amusing, and the majority of both sectors stated that lions do not

disrupt their daily activities. For both groups, these marine mammals constitute one of the most attractive species, owing to their popularity among visitors. For divers and snorkelers, swimming and diving with sea lions is a unique experience. Part of the attraction that people find in sea lions lies in the way these creatures cross boundaries between humans and animals, water and land, and the domestic and the wild, among others (Mullin 1999). Animals like sea lions also share some level of personality making them attractive and inspiring for tourists (Mullin 1999). As tourism becomes a more important economic activity, many fishing households depend increasingly on tourism as a source of income. Currently, tourism makes up about 50 % of the total Galápagos income, and fishing constitutes less than 4 % (Watkins and Cruz 2007). In San Cristobal, local people who own hotels, restaurants, boats, and other properties operate and manage most of the industry.

Sixty-eight percent of the fishermen described sea lions as disruptive of their daily livelihood activities. They expressed a more negative view of sea lions than the tourism sector and the rest of the community; only less than one third of fishermen stated that they found the marine mammals attractive and amusing.

The fact that sea lions pose a threat to fishers' livelihoods has been given increasing attention on a global scale. Since World War II, global fisheries, especially in the Southern Ocean, have shifted to deeper fishing grounds (200–500 m in depth) as a result of the depletion of fish stocks in shallower waters (Pauly et al. 2005). As a consequence of overfishing in Alaska, for example, Steller sea lions (*Eumetopias jubatus*) suffer from nutritional stress associated to reduced stocks of Pacific herrings (*Clupea pallasii*) and other forage fish species and reliance in low-energy or low-quality fish (e.g., pollock, *Theragra chalcogramma*) (Rosen and Trites 2000; Trites and Donnelly 2003). Thus, sea lions have increasingly taken over to competing for marine resources with fishers, resulting, at times, in their injury or death (Alverson 1991).

In the Galápagos, some fisheries such as lobster (Murillo et al. 2004; Hearn et al. 2006) and the sea cucumber harvesting have all but collapsed (Shepherd et al. 2004; Toral-Granda 2005). The lack of monetary income, resulting in part from market fluctuations and the increasing number of restrictions on fishing activities, has forced fishers to dive deeper and risk their health, or life, to gather sea cucumber and lobster and also to navigate to distant areas such as sea mounts. Therefore, pelagic and demersal fisheries, located in shallower waters or sea-mounts, have become critical for fishers. As in other parts of the world, these conditions result in a conflict between fishers and marine mammals as they compete for the same increasingly scarcer resources. According to Galápagos fishers, sea lions tend to congregate close to their fishing grounds and follow fishing boats in order to take advantage of the catch while hauled on board. Studies show that in many places, sea lions do in fact benefit from feeding in close association with commercial fishery fleets (Hückstädt and Antezana 2003). In the Galápagos, as elsewhere, marine mammals are at times slaughtered in order to improve fish stocks or to protect the fish caught or aquaculture production (Lavigne 2006). In 2008, a massacre involving 53 male sea lions, 9 adult males, 6 adult females, 25 immature sea lions, and 13 pups occurred in Pinta Island, a remote island of the Galápagos

Archipelago, but no signs of dismemberments or the removal of organs were found (Hearn 2008b). Yet, this kind of assaults can cause the killing of mothers found in fishers' foraging grounds, therefore increasing the amount of starved juveniles and pups found in the colonies. Interestingly, a shifting baseline study with three generations of fishers on San Cristobal revealed that while the size of fish and amount of catch has decreased (Burbano 2011), sea lion populations have also decreased (Salazar and Bustamante 2003; Alava and Salazar 2006; Auriolles and Trillmich 2008).

On a worldwide scale, culling comprises 5 % of the human-induced threats facing small cetaceans in addition to bycatch (26.5 %) (Culik 2004). In the Galápagos, some fishers openly comment that they kill sea lions by stabbing them, clubbing them on the head, cutting them with a knife, or slaughtering them in their colonies. Several sea lions have been found dead with broken skulls or cuts on their throats on the beaches of San Cristobal and elsewhere in the Galápagos. This study included these records as human impact causes of injury and not as fishery interaction (Figs. 13.7 and 13.8).

The conflict between fishers and sea lions is not merely a question of competition for marine resources but at times represents a symbolic act of opposition to what some fishers see as a conventional, top-down style of local environmental management. Regulations, many of which recommended by foreign scientists and the Charles Darwin Foundation to GNP authorities, have resulted in severe tensions and conflicts with fishers and even in violent riots and protests (Stone 1995; Ferber 2000; Quiroga 2009).

Conflicts have also arisen from fishers' dissatisfaction with the GMR's governance framework, i.e., the participatory management system. Established in 1999, this system of comanagement comprises two levels of decision-making: the Participatory Management Board (PMB) and the Inter-institutional Management Authority (IMA). The PMB is made up of representatives from the fishing sector, the Galápagos Chamber of Tourism, naturalist guides, the Charles Darwin Research Station, and the Galápagos National Park Service (GNPS). Decisions on activities and regulations within the GMR must be reached by consensus within the board; cases go to the IMA if consensus cannot be achieved. According to a 2007 evaluation of GMR governance, while the comanagement regime has been successful with respect to strategic vision and participation rates, it has been less successful in terms of social justice, equity, and credibility (Heylings and Bravo 2007). Fishers have expressed resentment and accused the system of being prejudicial to their sector, a perception resulting from the fact that the majority of meetings in the PMB have dealt with fishing issues and regulations while not dealing with issues of other sectors (Heylings and Bravo 2007). Some fishers complain that other economic actors and sectors, especially the tourism sector, have the capacity to dispute and resolve issues outside of the system by taking advantage of their economic lobby and political connections. Many of the fishers prefer to take issues to the streets than addressing them in participative management meetings and the IMA. Overall, the fishers perceive that the social and political system in the GNP favors the tourism and conservation sectors.

In the past, political struggles have used other emblematic species such as tortoises as a symbol. For example, fishers threatened to kill Lonesome George, the last member of the Pinta Island tortoise species (*Geochelone nigra abingdoni*) and a famous tourist attraction, as well as other tortoises from the tortoise-breeding center at the Charles Darwin Research Station (Ferber 2000). Fishermen have complained that local people often lack access to adequate medical attention, while military helicopters rescue tortoises during volcanic eruptions (Nichols 2006; Grenier 2007). Like the tortoise, sea lions are a popular species among tourists. Although sea lion conservation has received less attention than that of tortoises, their relatively recent classification as an endemic species (Wolf et al. 2007) has given them a special status among the marine mammals of the Galápagos. In some cases, therefore, fishers' attacks against sea lions may become part of a symbolic act against the growing political and economic power of the tourism and conservation discourses.

Local institutions, including the GNP, the Charles Darwin Foundation, and other environmental NGOs, increasingly endorse a conservation vision emphasizing the importance of maintaining balanced marine ecosystems and protecting their resilience against fisheries and climate change. These campaigns and educational programs have shaped local people's views on nature and conservation and have placed fishers in a complicated position vis-à-vis the Park's goals. Yet, fisheries' regulation cannot be seen merely as an oppressive act on the part of the Park as there are also practical benefits to protecting fisheries' resources. Maintaining healthy marine environments helps ensure the long-term sustainability of Galápagos fisheries and thus local fishing activities, an idea that at least many fishers agree on. The primary issue, then, lies in finding ways to reconcile local conservation objectives with the needs of the people most likely affected by those objectives.

Despite the conflicts between fishers and sea lions, 89 % of interviewed fishers expressed support for sea lion conservation, a figure comparable to the 91 % of tourism or 93 % of the rest of the community. Therefore, a view that places fishers strictly outside of the Park's conservation strategy is not only misleading but also fails to capture the ways in which local people negotiate their practical concerns with their support of environmental protection measures. The global view of nature and emblematic species has created a hybrid worldview among members of the local population, where acceptance and rejection of the conservationist discourse coexist in complex forms (Quiroga 2012). Discourse of the local authorities and leaders demonstrates an example of this hybrid mentality. In 2008, the municipality of San Cristobal declared the sea lion "*La cara de San Cristóbal*" (the face of San Cristobal) and fenced in the boardwalk to the central beach, with several signs indicating regulations for sea lion observation. The boardwalk has consequently become a major attraction, especially in the evenings, when most sea lions are present on the beach.

Some fishers have transitioned into the tourism sector, allowing them to take advantage of the practical benefits of protecting local fauna. As those in tourism witnessing interactions between tourists and sea lions, they increase their awareness

of the importance of these animals for the local economy. Many fishers now offer land-based tourism packages, where tourists visit the inhabited islands on small speedboats and stay in hotels. The development of a kind of tourism that generates opportunities for the local population to start their own businesses and that emphasizes environmental sustainability adds an important component to local conservation strategies. There exist, however, various legal, economic, and political barriers that hinder the possibility for fishers to totally transition into the tourism sector. Furthermore, some fishers have no interest in switching to tourism, as they have dedicated their lives to the specialized skill of fishing and value their identities and ways of life as fishermen. Some also see the move toward tourism as an imposition by GNP authorities and other groups. Thus, in order to address the tensions between economic activities and ecological conservation in the Galápagos, one must revise the structural factors that allow the inclusion of some groups in the larger vision of the National Park while excluding and marginalizing others and recognize that some local actors have a greater voice in the design of this vision.

The complex local views about conservation and endemic animals reflect an economy in transition. For the past 10 years, local officials and authorities explicitly promoted a move away from extractive activities such as fishing. With the economy increasingly dependent on non-extractive activities, especially tourism, the population now appreciates and values native animals, including the sea lion. Tourists' expectations put pressure on local administrators to maintain what they construct as "natural" and "pristine" environments (Errington and Gewertz 2003; West and Carrier 2004). The vision of nature as a provider of goods thus increasingly replaces and in many cases hybridizes, one in which nature provides cultural and regulatory services.

While the majority of people interviewed in all three categories mentioned the importance of sea lion conservation, our observations of human–sea lion interactions revealed that many do not act accordingly. At Playa de los Marineros, nearly half of the interactions appeared aggressive. In reality, many people show little concern for sea lions in their daily lives or recreational activities. With the increasing proximity of humans and animals at Playa de los Marineros, sea lions now react more aggressively to humans, while sea lions at the more remote and less visited La Lobería are generally passive. Since rest on land remains crucial for sea lion survival, constant approaches and the presence of humans nearby present a stress factor that can alter resting and nursing patterns (Allen et al. 1984; Suryan and Harvey 1999), increase energy expenditure in females (Suryan and Harvey 1999), change social and mating behavior (Richardson et al. 1995), and, in the long term, result in a decrease in breeding success and population size (Johnson and Lavigne 1999), all of which reflected by the drastic increase of diseases and pup mortality.

On the whole, Galápagos sea lions tolerate human presence far more than sea lions in other areas of the world as they do not react when people approach to less than 4 m distances. Australian sea lions (*Neophoca cinerea*) on Carnac Island become aggressive when humans approach them at less than 15 m (Orsini 2004). California sea lions (*Zalophus californianus*) at Los Islotes in Mexico have reacted



aggressively when tourist boats approached within 20 m of the colonies (Labrada-Martagon et al. 2005).

In recent years the number of dead or injured sea lions has increased as reported by the GNP. Numerous causes could contribute to this increase: despite regular monitoring efforts since 2008, people may report death and injury more consistently; an increase in fishing activities and recreational activities in sea lion colonies leads to more possibilities for negative human–sea lion encounters; or perhaps decreasing sources of food for sea lions versus increased predation of fishers' catch can result in more human–wildlife interactions. Reports of hooks attached to sea lions have increased in 2010 as well as cases of sea lions trapped in nets and other marine debris. The 20 % of human-related sea lion deaths, as opposed to 4 % by sharks (see Figs. 13.7 and 13.8), illustrates the need to raising awareness about human impact on sea lion populations. The past has seen mass killings of sea lions; similar to the Pinta Island massacre in 2008, 15 sea lions, including 11 males, but with their genitals removed, and 4 females, were found dead near La Lobería in San Cristobal Island in 2001 (Salazar 2001; Salazar and Edgar 2001). In addition, two more individuals were recently slaughtered, one in 2010 (Murillo, pers. obs.) and another in 2011. Sea lion genitals are sold as aphrodisiacs in the Asian black market and in traditional Chinese medicine stores (Malik et al. 1997). While Galápagos sea lions have lost a considerable amount of their populations during El Niño years (Trillmich and Limberger 1985; Trillmich and Dellinger 1991), growing anthropogenic interactions, increased competition by sea lions, and the resentment from fishers toward the conservationist pose new challenges to the resilience of the population and ultimately to its survival.

Survey results revealed that the local population in general, whatever their economic activity, could benefit from informational campaigns about sea lions. Sixty-three percent of fishers, 52 % of the community, and 49 % of the people in tourism stated that there are more sea lions today than a decade ago. Furthermore, fishermen constantly complain that the increase in the numbers of sea lions diminishes their catches. This perception held by all three sectors is partly true since sea lion populations reduced by 50 % in the 1997/1998 El Niño event (Salazar 1999; Salazar and Bustamante 2003). The current population size is less than 50 % of the population that existed before the 1982/1983 El Niño (Alava and Salazar 2006; Aurióles and Trillmich 2008). Future declines are very likely (see Salazar and Denkinger 2010) since El Niño events are estimated to become stronger and more frequent (Timmermann et al. 1999; Sachs and Ladd 2010). None of the fishermen surveyed and only 9 % of tourism and 6 % of the community correctly identified the Galápagos sea lion as an endangered species even though they were designated an endangered species by the IUCN in 2008 (Aurióles and Trillmich 2008). Thus, the local population lacks education about the state of the sea lion population and the threats they face. Furthermore, it is important to highlight the benefits of the sea lions as an ecological and economic resource. Sea lions are valuable for ecosystem services as top predators and keystone species, as well as for tourism. Globally, marine mammals remain important assets for tour operators; both whale watching

(Hoyt 2001) or pinniped watching (Kirkwood et al. 2003) are sources of income in many parts of the world.

## Conclusions

As human development and activities expand into wildlife habitats in the Galápagos, including the sea lion colonies in the center of Puerto Baquerizo Moreno, conflicts between animal and human communities have become more prevalent. Benefit shapes the perception of wildlife since fishers share a more negative view on sea lions as they are directly affected by sea lions, dirtying or even sinking their boats and stealing their catch. On the contrary, people involved in tourism and other activities state that they do not feel bothered by the presence of sea lions in the town center of Puerto Baquerizo Moreno. Even though fishers just as the rest of the population support sea lion conservation, the nature of human behavior is not accordant when they approach sea lions in their daily lives. As the intensification of human impacts is a matter of concern for sea lion conservation, management strategies should focus on increasing the benefit of local people on their nature resources along with continuous education programs.

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