RESEARCH ARTICLE

3	Connecting international priorities with human wellbeing in low-income
4	regions: lessons from hawksbill turtle conservation in El Salvador
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18	Connecting	international	priorities	with human	wellbeing in	low-income
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19 regions: lessons from hawksbill turtle conservation in El Salvador

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21 Abstract

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23 Hawksbill sea turtles (Eretmochelys imbricata) are highly endangered in the eastern Pacific 24 Ocean, yet their eggs continue to be an important subsistence resource for impoverished coastal 25 residents in El Salvador. The aim of this paper is to clarify the implications of differing 26 international and local priorities for hawksbill conservation and community development in El 27 Salvador and other low-income regions. We review socio-political developments in El Salvador 28 and sea turtle conservation along the Salvadoran coast. We then analyse interviews with 29 tortugueros (i.e., local egg collectors) to help explain how hawksbills fit into local priorities. Our 30 results demonstrate that among *tortugueros*. (1) the primary importance of hawksbills was the economic value attached to egg sales; (2) egg purchase by hatcheries is a socially just 31 32 conservation strategy that benefited both hawksbill and human wellbeing; (3) any eggs not purchased for protection are sold for consumption; and (4) most desired increased opportunities 33 34 to participate in decision-making regarding sea turtle conservation. We discuss the need to 35 harmonize international conservation priorities with local community development priorities and use hawksbill conservation in El Salvador as an example of how to simultaneously contribute to 36 37 long-term sea turtle recovery efforts and human wellbeing in low-income regions.

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Keywords: community-based conservation; conflict management; environmental economics;
human need; livelihoods; wildlife policy

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43 Introduction

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45 Sea turtles capture contemporary interest both at international and local levels. As charismatic 46 megafauna, they are perceived to have high intrinsic value (Witherington and Frazer 2003) and 47 attract significant public attention (Campbell 2003). The complex life cycles of sea turtles and 48 their pressing conservation status draw interest from the international conservation community, 49 such as the Marine Turtle Specialist Group of the International Union for Conservation of Nature 50 (IUCN) and many internationally oriented institutions. At the same time, sea turtles often are 51 viewed as a subsistence resource in low-income regions (Thorbjarnarson et al. 2000), which can 52 be rooted in cultural heritages (Nietschmann 1973, Morgan 2007). The divergence of these 53 perspectives fails to exploit potential synergies between local culture and sea turtle conservation, 54 and threatens the viability of existing conservation strategies, including sea turtle egg protection, 55 at both international and local levels. 56 Sea turtles are long-lived, late-maturing, and highly migratory species that frequently 57 cross jurisdictional boundaries while traveling between foraging areas and nesting beaches, 58 which can be separated by entire ocean basins (Nichols et al. 2000a, Luschi et al. 2003). Seven 59 species of sea turtles exist worldwide, most of which have global distributions. They include the 60 olive ridley (Lepidochelys olivacea), green (Chelonia mydas), loggerhead (Caretta caretta),

61 flatback (Natator depressus), leatherback (Dermochelys coriacea), Kemp's ridley (Lepidochelys

62 kempii), and hawksbill (Eretmochelys imbricata) turtles. All species, except the flatback, are

63 listed on the IUCN Red List of Threatened Species as Critically Endangered, Endangered, or

64 Vulnerable on a global scale.

65	Historically, hawksbill sea turtles were prized for their ornate shells that were collected to
66	fabricate a multitude of items for the tortoiseshell trade, including combs and jewellery;
67	however, centuries of exploitation have reduced hawksbill populations by more than 80%
68	worldwide and justified their classification as Critically Endangered by the IUCN (Mortimer and
69	Donnelly 2008). Dramatic declines are evident in the eastern Pacific Ocean, where hawksbills
70	were once common from Mexico to Ecuador (Cliffton et al. 1982), but now are among the
71	world's most critically endangered sea turtle populations (Wallace et al. 2011), with only 200-
72	300 females nesting annually along the region's 15,000 km coastline (Gaos et al. 2010). Because
73	roughly 45% of all known nesting for the species occurs along the 300 km coast of El Salvador,
74	conservation efforts targeting hawksbills along the Salvadoran coast have been identified as a top
75	priority (Liles et al. 2011). Despite the extensive abatement of the tortoiseshell trade in the
76	eastern Pacific, egg consumption, incidental capture in fisheries, and coastal development
77	continue to threaten hawksbill survival in the region (Gaos et al. 2010).
78	In low-income regions such as El Salvador, the direct use of natural resources remains an
79	essential livelihood strategy for many people (Hutton and Leader-Williams 2003, Mazur and
80	Stakhanov 2008), particularly in rural and coastal areas where poverty is most acute (Lehoucq et
81	al. 2004). As the smallest and most densely populated country in Central America, marine
82	resources in El Salvador are commonly overexploited, exacerbating the vulnerability of
83	historically marginalized coastal residents (Gammage et al. 2002). Because the need to satisfy
84	immediate needs often takes precedence over concern for dwindling natural resources, virtually
85	unregulated extraction contributed to the collapse of locally important resources (JICA and MAG
86	2002, Catterson et al. 2004; FAO 2009) and is compromising future generations' ability to use

these resources to meet their basic needs. This is particularly problematic when the declining
resources are endangered species, such as the hawksbills along the Salvadoran coast.

89 Cooperation among nations located within the geographical range of hawksbills is 90 essential for coordinated conservation actions to minimize threats in the eastern Pacific. 91 However, the resulting multi-scalar management strategies often emerge from international 92 agendas that may conflict with local priorities, particularly in resource-dependent areas of low-93 income regions. Priorities of the international conservation community often centre on biological 94 aspects and needs of hawksbills, whereas local priorities of coastal residents tend to focus on 95 socio-economic development and needs of human communities. Focusing on biological 96 dimensions of hawksbill conservation can result in local realities (i.e., context-specific social and 97 environmental conditions) of coastal residents being deemphasized or excluded entirely from 98 nest protection strategies supported by the international conservation community.

99 In this paper, we clarify the implications of differing international and local priorities for 100 hawksbill conservation and community development in low-income regions. We begin with a 101 brief review of important socio-political developments during the last 180 years in El Salvador 102 and then draw from the historical record to describe how sea turtle conservation, particularly 103 hawksbill conservation, emerged along the Salvadoran coast. Second, we analyse interviews with 104 local egg collectors to help explain how hawksbills and hawksbill conservation fit into local 105 priorities. Third, we discuss the implications of differing priorities at the international and local 106 level for hawksbill conservation and community development. Finally, we use hawksbill 107 conservation in El Salvador to demonstrate how the integration of local realities into nest 108 protection strategies can connect international conservation priorities with community

development to contribute to long-term sea turtle recovery efforts and human wellbeing in low-income regions.

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112 Study Area and methods

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114 Coffee and civil war: evolution of socio-political conditions in El Salvador

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In El Salvador myriad socio-political processes and events shaped natural resource use and conservation over the last several centuries. Although a detailed description of El Salvador's history falls outside the scope of this paper (see Browning 1971, Lauria-Santiago and Binford 2004), we briefly review key socio-political developments during the last 180 years to provide the social context in which natural resources are managed.

121 During its colonial period (\approx 1540-1820), various natural and agricultural commodities 122 were extracted from El Salvador, but the introduction of coffee in the 1830s triggered one of the 123 country's most significant socio-political transformations. To optimize economic productivity of 124 the land and full integration of commodities into international markets, Salvadoran landed elites 125 manipulated regional landscapes to make them more conducive to coffee production (Hecht et al. 126 2006). In 1880, coffee overtook indigo as the country's leading export, which prompted the 127 Salvadoran government to pass laws eliminating collectively held lands; communal and public 128 lands then were divided and sold to large-scale coffee and indigo estates in an effort to replace 129 sustenance farming with the production of cash crops (White 2009). These changes in land 130 tenure policy greatly increased tax revenues obtained by the government, which secured elite 131 landowners far-reaching influence, and led to the displacement of many *campesinos* (i.e., local,

132 small-scale farmers). Concurrently, numerous laws were passed to ensure that the displaced 133 *campesinos* provided sufficient labour for the coffee economy and to suppress their discontent. 134 By the 1930s, El Salvador was the third largest coffee producer in the world. Despite 135 anti-vagrancy laws, revolts by *campesinos* occurred, and the ability of the military to repress 136 them (e.g. La Matanza in 1932 where the military killed up to 30,000 civilians) demonstrated to 137 the elites the important role that the Salvadoran Army played in ensuring their continued success. 138 Likewise, the military realized their authority could be maintained by catering to the interests of 139 the elites. This alliance forged between the military and the oligarchy was central to the 140 Salvadoran political process for the following 50 years (Browning 1983). Coffee as a 141 monoculture and related exports yielded enormous profits and land quickly became concentrated 142 with a few families, allowing them to diversify their investments and venture into other 143 economic sectors, such as real estate, commerce, and tourism. As LeoGrande and Robbins (1980, 144 p. 1084) summarized: 145 146 The social and economic life of the nation has been dominated by a landed elite known popularly 147 as 'the 14 families' (Los catorce), though their actual number is well over 14. The family clans 148 comprising the oligarchy include only a few thousand people in this nation of nearly 5 million, 149 but until recently they owned 60% of the farmland, the entire banking system, and most of the 150 nation's industry. Among them, they receive 50% of the national income. 151 152 Between 1979 and 1980, an umbrella group entitled Farabundo Marti National Liberation 153 Front (FMLN) formed, uniting five leftist groups under the shared purpose of redistributing 154 power and resources to those members of society that had been repressed by the traditional 155 political and economic structure. In 1980, conflict between the oligarchy-military alliance and

156 the FMLN exploded in a civil war that lasted 12 years. Demonstrating its strategic importance to 157 the United States, El Salvador was the largest recipient of U.S. aid in Latin America during the 158 1980s, totalling more than \$4.5 billion (Seelke 2010). By making aid contingent upon the 159 implementation of structural adjustment programs aligned with neoliberal policies during the 160 civil conflict, the United States facilitated the processes of transformation that altered the role of 161 agriculture and natural resources in the Salvadoran economy (Hecht 2010). 162 When the Peace Accords were signed between the FMLN and the Salvadoran 163 government in 1992, the civil war had resulted in approximately 75,000 deaths and over 1 164 million displaced persons (i.e., 1/5 of the total population). The war impelled many families to 165 emigrate from the highlands and settle in coastal areas (Gammage et al. 2002). A number of 166 constitutional reforms were agreed upon through the Accords, including the disbanding of 167 several military-dominated police bodies and the creation of an independent National Civilian 168 Police (de Soto and del Castillo 1995). In 1993, a United Nations-sponsored Truth Commission 169 attributed the majority of crimes to military repression and right-wing death squads. Amnesty 170 was decreed for all "common political crimes" committed by both sides during the war, while 171 those that participated in "grave acts of violence" were allegedly convicted and sentenced 172 (Balovra 1992).

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174 Emergence of sea turtle conservation in El Salvador

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176 Four of the seven sea turtle species nest along the Salvadoran coast—the olive ridley, green,

177 leatherback, and hawksbill. The olive ridley is the most abundant sea turtle in El Salvador,

178 followed by the green, hawksbill, and leatherback, which combined lay approximately 9,000–

179 13,000 nests per year in El Salvador (Romanoff et al. 2008, Vasquez et al. 2008). In 1975, the 180 first project targeting sea turtle conservation was initiated at Barra de Santiago beach with 181 funding from the Ministry of Agriculture and Livestock (MAG). This project employed the first 182 use of hatcheries to protect and incubate eggs; in 2013 hatcheries remain the primary method of 183 nest conservation along the coast of El Salvador. High human density and acute poverty in 184 coastal areas have made the protection of sea turtle nests in situ (i.e., original site of deposition 185 on the beach) infeasible. Nearly 100% of eggs deposited by sea turtles are extracted by 186 tortugueros (i.e., local sea turtle egg collectors) and are sold to either hatcheries for protection or 187 the market for consumption. By purchasing eggs from *tortugueros*, hatcheries provide an 188 alternate economic incentive to sale for consumption and thus have gained acceptance among 189 coastal communities. Although hatcheries vary in size and quality, most are approximately 100 190 m^2 with a capacity of ca. 200 sea turtle nests, made from local materials, and placed in the broad 191 sandy nesting areas of beaches. Most hatcheries are project-funded, which means they are 192 economically unsustainable and require external funding for operation. Additionally, funding is 193 typically provided on an annual basis and is unstable. Inconsistent funding has led to dramatic 194 variations in the number of hatcheries that operate and the number of eggs incubated annually. 195 Since the Peace Accords were signed in 1992, the Salvadoran government has established 196 a legal framework to provide sea turtle protection through the ratification of international 197 agreements, such as the Convention on International Trade in Endangered Species of Wild Fauna 198 and Flora (CITES; República de El Salvador 1986) and the Convention on Biological Diversity 199 (República de El Salvador 1994a). National legislation recognizes and extends protection to sea 200 turtles as endangered species (República de El Salvador 1994b, 1997, 1998) and attempts to 201 mitigate the incidental capture of sea turtles in fisheries (República de El Salvador 2001, 2007).

202 Additionally, tortugueros were required to donate a minimum of one dozen eggs per nest, which 203 typically contain 100 eggs, to the local hatchery (if one existed); the remaining eggs then could 204 be legally sold for consumption. Despite this requirement, few eggs were protected (Vasquez et 205 al. 2008), which hampered El Salvador's ability to ratify the Inter-American Convention for the 206 Protection and Conservation of Sea Turtles (IAC). To address this problem, the Salvadoran 207 government prohibited the collection and sale of sea turtle products, including eggs, for purposes 208 other than conservation (República de El Salvador 2009), which further elevated the role of 209 hatcheries as a means of encouraging statutory compliance. According to the Ministry of the 210 Environment and Natural Resources (MARN), the decision to develop and approve the 211 moratorium stemmed from national and international pressure and was substantiated by (1)212 Chapter 17 of the Central American Free Trade Agreement (CAFTA-DR) with the United States, 213 (2) a study conducted by the United States Agency for International Development (USAID) that 214 demonstrated that tortugueros earned less than \$200 annually from the sale of eggs, and (3) a 215 survey of a sea turtle nesting beaches conducted by a local conservation organization and the 216 University of El Salvador (Vasquez et al. 2010). 217 For decades, the occurrence of hawksbill nesting along the coast of El Salvador was

unclear due to inconsistent data, much of which were anecdotal and inconclusive. Some
researchers claimed that existing records of nesting hawksbills were incomplete and could not be
confirmed (Hasbún and Vasquez 1999, Arauz 2000), while others stated that low-density
hawksbill nesting occurred 30 years ago on Salvadoran beaches, but no longer occurred in
modern times (Mortimer and Donnelly 2008). Recently, however, nesting by hawksbills in El
Salvador has been confirmed at levels critical to the continued survival of the population in the
eastern Pacific (Gaos *et al.* 2010, Liles *et al.* 2011). Since the discovery and systematic

226 have partnered with local egg collectors to conduct participatory research and conservation 227 activities at the nation's three primary hawksbill nesting sites: Los Cóbanos Reef Marine 228 Protected Area (Los Cóbanos), Bahía de Jiguilisco-Xiriualtique Biosphere Reserve (Bahía), and 229 Punta Amapala (Figure 1; Liles et al. 2011). 230 231 Data collection and analysis 232 233 From 2009 to 2011, we conducted semi-structured interviews using open-ended questions 234 (Peterson et al. 1994) in Spanish with 34 tortugueros from the three primary hawksbill-nesting 235 sites (Figure 1) to help understand how they prioritize hawksbills and their perspectives toward 236 hawksbill conservation in El Salvador. We used an ethnographic approach because it enabled us 237 to perceive how personal experiences and their social contexts shaped informants' perceptions of 238 reality and how language was used to construct that reality (Lincoln and Guba 1985). 239 Accordingly, we used a grounded theory approach to generate theory from data (Corbin and 240 Strauss 2008). To identify potential informants at each site, we confided in local contacts with 241 whom we had developed long-standing relationships of trust. These local contacts used their 242 established relationships with *tortugueros* from their communities to arrange interviews. 243 Informants chose the location of the interviews as a means of transferring control from the 244 researcher to the informant in an effort to increase trust and promote a relaxed environment. By 245 fully immersing ourselves in the context of the study area, we learned from informants how best 246 to interpret their realities (Peterson et al. 2002). We used a variety of techniques to manage 247 issues of accuracy with the data, including triangulation, informant validation, clarification

documentation of substantive hawksbill nesting along the Salvadoran coast in 2008, researchers

248	questions, and continual movement between data collection and analysis (Lincoln and Guba
249	1985). To ensure accurate data transcription, we requested consent from informants to record the
250	interviews. All fieldwork was conducted by M. J. Liles in accordance with Institutional Review
251	Board requirements (IRB Protocol #2009-0277) at Texas A&M University and a native
252	Salvadoran skilled in English transcribed and translated all interviews.
253	We conducted a thematic analysis of the transcribed text, which consisted of (1)
254	searching for themes in each transcript, (2) developing each theme, (3) determining the relative
255	significance of the themes, (4) searching for opposition among themes and thematic hierarchies,
256	and (5) comparing oppositions and thematic themes across transcripts (Peterson et al. 1994).
257	Data from the published literature and unpublished reports supplemented field notes and
258	interview transcripts. Whenever possible, we used the informants' own words to describe their
259	perspectives and experiences.
260	
261	Results
262	
263	By allowing the informants to guide the interview process, each conversation was unique and
264	tied to the contexts that defined their daily lives. Four themes emerged that were common across
265	all interviews (see list), which we discuss in detail below.
266	(1) The primary value placed on hawksbills by informants was the economic value attached to
267	egg sales.
268	(2) All informants identified egg purchase by hatcheries as a socially just conservation strategy
269	that unified hawksbill nest protection with human wellbeing.

270	(3) All informants explicitly stated that hawksbill eggs not purchased for protection by
271	conservation initiatives were sold to local markets for consumption.
272	(4) Most informants desired more involvement in decision-making regarding sea turtle
273	conservation, which they considered to be biased toward elite interests.
274	
275	The value of hawksbills
276	
277	All interviewees identified the economic value of eggs as the primary value of hawksbills.
278	Because poverty is rampant along the Salvadoran coast and employment options limited, coastal
279	residents are invariably linked to the natural resources that surround them. Whether consumed
280	locally or extracted and sold for income, the livelihoods of coastal community members depend
281	on resources from their local environment for essential goods and services, including hawksbill
282	eggs. One tortuguero from the Bahía commented:
283	
284	To make our community whole, we live off of fishing, mangrove cockles, and the extraction of
285	clams. But in the hawksbill nesting season we depend on the turtle. One goes to the beach and
286	finds a clutch of eggs and with that, you now have enough to buy food for your children and
287	siblings.
288	
289	This statement demonstrates how resource dependence shifts according to season, which can
290	make these communities particularly vulnerable to resource availability and seasonal fluctuations
291	during certain times of year. Traditionally, hawksbill egg collection buffered coastal residents
292	from the economic impacts of such transitions and fluctuations, particularly during the winter
293	(i.e., rainy season), which coincides with the peak of the hawksbill nesting season (Liles et al.

294 2011). Concerned about the implications of the moratorium on the sale of sea turtle eggs for 295 consumption during these seasonal shifts in resource abundance and weather, one informant 296 stated: 297 298 And in the winter? I explained to the Ministry [of the Environment and Natural Resources] that in 299 the winter the storms cause commerce to decline-mangrove cockles, fish-when you cannot go 300 out [to fish] because of the north winds, the strong, tropical storms, you go to the beach, find 301 turtle [eggs], and on that you maintain yourself. 302 303 Informants from all three sites explained that hawksbills typically are preferred by *tortugueros* 304 because they lay more eggs than the other species of sea turtles, which means higher profits. 305 Comments such as those of an egg collector from Punta Amapala were common: 306 307 Hawksbills always lay more [eggs]; olive ridleys lay few so it is more advantageous to search for 308 nesting hawksbills-produces more money for the family. 309 310 Although all informants highlighted the economic value of eggs, many tortugueros 311 described the relationship between hawksbills and egg collectors as more complex and profound 312 than might be expected. Most spoke of hawksbills with a reverence that reflected a deeply held 313 respect and appreciation. In describing his relationship with hawksbills, one informant, who is 314 both a *tortuguero* and community leader in the Bahía, embodied the comments of many other 315 interviewed tortugueros: 316

317	For me, [hawksbills] have great value because they relieve poverty. They relieve the poverty of
318	coastal communities, those that live along the edge of the ocean. [They provide] a great amount
319	of assistance to maintain families, because we are going from poor to poorer. There is the person
320	that goes to the beach in the evening without so much as 5 cents, he finds a turtle [nest], and come
321	morning he has between \$12 and \$15. Now he can provide for his family. They are content. He
322	returns to the beach; if he does not find a turtle that night, he will find one another night. The
323	primary value that I put on a turtle is that it favours the homes of the poor. For that reason, it has
324	great value to me.
325	
326	The relationship a tortuguero has with hawksbills can transcend economic terms with roots
327	firmly established in tradition. Although some informants spoke indirectly about tradition and
328	culture, one tortuguero from Punta Amapala acknowledged it directly:
329	
330	There are people that now do it [search for nesting hawksbills] as a custom, going every
331	nightwhether they find a turtle or not, it is a tradition.
332	
333	The habitual act of walking the beach each night demonstrates that the connection between
334	hawksbills and tortugueros can be as much of a process as an outcome. The way some
335	informants alluded to the similarities between the life cycle of turtles and humans, and the
336	suffering experienced by both, illustrated an empathic bond our informants claimed with the
337	hawksbills. When asked his thoughts on hawksbill conservation, one tortuguero from Los
338	Cóbanos responded:
339	

340	Think about how much a turtle suffers to become an adult; from its birth it has to swim as a
341	hatchling and at 10 or 15 or 20 years old it has to come back to nest. It is suffering to pass
342	through that large trajectory and then, perhaps, it might die in its youth. The life of a turtle is like
343	the life of a human—it is of great value and must be conserved and protected.
344	
345	Tortugueros are often portrayed by biologists as having very simplistic and superficial
346	interactions with sea turtles, usually driven by short-term self-interest with little concern for the
347	wellbeing of the turtle. Most tortugueros interviewed for this study demonstrated that their
348	relationships with hawksbills were much more complex and based on respect and appreciation.
349	Although informants identified the economic value of hawksbill eggs as primordial, they also
350	expressed a tension between satisfying their immediate economic needs and their desire to
351	conserve the species.
352	
353	Egg purchase by hatcheries: connecting the needs of hawksbills and humans
354	
355	All informants identified egg purchase by hatcheries as a socially just conservation strategy that
356	benefited both hawksbill populations and human wellbeing. Because coastal community
357	members are tied to local natural resources, they are particularly vulnerable to policy decisions
358	
	affecting the use and management of those resources. In Los Cobanos and Punta Amapala, many
359	<i>tortugueros</i> commented on the economic hardship created by the moratorium on the sale of sea
359 360	<i>tortugueros</i> commented on the economic hardship created by the moratorium on the sale of sea turtle eggs for consumption due to the absence of operating hatcheries, which essentially
359360361	<i>tortugueros</i> commented on the economic hardship created by the moratorium on the sale of sea turtle eggs for consumption due to the absence of operating hatcheries, which essentially outlawed the legal sale of hawksbill eggs. What was once an important source of legal income
359360361362	affecting the use and management of those resources. In Los Cobanos and Punta Amapala, many <i>tortugueros</i> commented on the economic hardship created by the moratorium on the sale of sea turtle eggs for consumption due to the absence of operating hatcheries, which essentially outlawed the legal sale of hawksbill eggs. What was once an important source of legal income for many coastal families was now prohibited. Informants emphasized their fear of economic

363	uncertainty and called for alternative sources of employment from the governmental or non-
364	governmental organizations to lessen the impact of the moratorium:

365

366 Sincerely, I say, that for me the ban has an impact. I do not look at it negatively: I look at it 367 positively because it is about the protection of sea turtles. What you do see is that it has had an 368 impact and has upset the poor members of the population, the communities that live in this sector, 369 because as egg collectors when the hawksbill nesting season arrives, many of our families earn 370 money to provide for our children [by collecting and selling eggs]. Now with the ban, we have 371 not received any alternatives and although they [the government] say that they are coming, we 372 still do not have a [material] reality to resolve this situation. But the part of ban being about the 373 conservation, management, and taking care of sea turtles, that is excellent. But we feel the 374 economic void and many families feel abandoned. If the Ministry [of the Environment and 375 Natural Resources] or other institutions would give some alternative solutions to our families, 376 then we believe that the ban would be good.

377

378 The need for alternative sources of income to replace egg sales for consumption was 379 echoed by all informants. They suggested implementation of a variety of alternatives, such as 380 aquaculture, artificial reefs for hook-and-line fishing, and tourism, to help replace the income-381 loss resulting from the moratorium. However, when asked if these alternatives would prevent 382 hawksbill eggs from being collected and sold for consumption, all informants said that they 383 would not. They also noted that alternative income sources needed to be appropriate to local 384 economic realities. Referring to an article that came out in a local newspaper stating that the 385 government would be providing chicken coops to tortugueros as an alternative to collecting and 386 selling eggs, a *tortuguero* from Punta Amapala stated:

387	
388	To change a person's way of life and say that now they cannot extract sea turtle eggs from the
389	beach, it is necessary to give that person another type of employment. Because one person can
390	change if you give him a chicken coopbecause that way he can maintain himself with six or
391	seven of those little animals. It would work for him. But they [the government] will not give a
392	coop to everyone along the beach. Not to everyone. If he [motioning to another egg collector]
393	stops collecting eggs, three more will come in and take his place, because we have a dense
394	populationhim alone [motioning again to the egg collector] has 6 kids. That is why it [chicken
395	coops] will not work.
396	
397	Informants stated explicitly that if nests were not purchased for protection, they would be sold
398	for consumption; no nest will be intentionally left where it was laid on the beach because if one
399	tortuguero does not extract it, another will:
400	
401	It is very rare that a hawksbill comes up to nest and only the person that collects the nest sees it.
402	There are always others who see who collected it. So, if I leave it there, because for me it is
403	illegal to take it, another person will come that night or later on and will harvest and take it,
404	whether it is to consume it himself or to sell it illegally. That will always happen. To have 12
405	dozen turtle eggs at \$3.00 per dozen that he'll be paid for them, how much did he make, eh? That
406	is how people think, in hiding and selling a dozen eggs to such a place or to such a family. If
407	there is only consumption [as an option for income], you hide them and you know it is prohibited;
408	people always feel that necessity.
409	
410	Many informants mentioned the struggle to negotiate tensions between the protection of
411	hawksbill eggs and the economic benefits generated from egg sales. The solution to this dilemma

412	as offered by all informants was the implementation of protected hatcheries. These hatcheries
413	would purchase the eggs from tortugueros, thus providing economic relief for the human
414	population. Hawksbill eggs would be incubated in hatcheries, from where the hatchlings that
415	were produced would be released to perpetuate the cycle.
416	
417	They [hatcheries and egg purchase] are two things that must be carried out side-by-side, they
418	must be carried out side-by-side because if they are not, one of the two things will be left behind;
419	and that one thing that is left behind will be the hawksbill because the economic situation is
420	always going to be difficult. But by having hatcheries that purchase the eggs from collectors, we
421	can achieve both objectives [hawksbill conservation and human wellbeing] at the same time.
422	
423	Some informants had hatcheries operating in their communities, while others did not. When one
424	tortuguero that lived in a community with a hatchery was asked what would happen if the
425	hatchery did not exist, he answered:
426	
427	In this area, if there was not a hatchery that was buying hawksbill eggs right now, the tortuguero
428	would leave. He would take the eggs and go sell them by the dozen [for consumption] because he
429	would have to get money to live.
430	
431	Other options, such as increased law enforcement by police, were not likely to result in nest
432	protection:

434 Of course the moratorium can work here; that's why the community has been requesting that a
435 hatchery be built. [But] if there is no hatchery, it won't work. [Expecting] the police to come
436 [patrol] is dreaming – an illusion.

437

In an effort to deter the illegal sale of eggs on local markets, the Salvadoran government placed a penalty of up to five years in prison for a person found with turtle eggs that were not destined for conservation purposes. Although many *tortugueros* mentioned that they feared being caught with eggs by the police, they felt that it was extremely unlikely. When asked how the threat of law enforcement by local police affected *tortugueros*, one informant from Punta Amapala replied:

444

445 The authorities here, the agents of authority like the police, we don't have their true support 446 because they don't have dedication; they don't have the adequate capacity to, let's say, support, 447 help, or protect hawksbills. They don't have it. I know that here there are only eight policemen 448 available and for all the communities that they have to attend to here, they are not able to handle 449 all of the work they have to do. The vehicles that they drive to go from one place to another are 450 often deficient; sometimes they don't have gasoline, or the personnel aren't around because they 451 are in one place or another. So there are many demands that they can't cover at the time that you 452 need them. They just can't handle it all.

453

Such statements by *tortugueros* indicate their awareness that Salvadoran authorities are unlikely
to enforce laws designed to protect hawksbills, often due to lack of resources and political will.
This situation leaves the fate of hawksbill nests resting in the hands of the *tortugueros*, since
ultimately they decide whether to sell the eggs for conservation or for consumption. This local

458	reality underscores the power and control tortugueros wield in determining the success or failure
459	of hawksbill conservation initiatives in El Salvador and the importance of including them as
460	stakeholders in conservation decision-making processes.
461	
462	Conservation decision-making biased toward elite interests
463	
464	The success of sea turtle conservation initiatives that use hatcheries as tools for nest protection
465	relies on the direct participation of tortugueros and other coastal residents. The long history of
466	hatchery use in El Salvador has fostered relationship building among tortugueros, government
467	agencies, and conservation organizations. The acknowledgement of coastal residents as
468	important stakeholders in sea turtle conservation efforts recognizes and validates local agency in
469	influencing conservation outcomes. As one tortuguero put it:
470	
471	Each year [sea turtle] numbers decline and we have worked with many institutions to protect and
472	conserve turtles since 1997. Think about how if we hadn't done this since that time, there would
473	be fewer turtles; we are now seeing the results of the hatchlings that we had released back then
474	that are now coming back to nest. So, you can see that sea turtle protection and conservation have
475	a huge impact and keeps them from disappearing here, because if not, in 10, 15, or 20 years our
476	children and nieces and nephews won't experience them.
477	
478	Active participation by coastal residents in the design and execution of sea turtle projects fosters
479	joint-ownership and promotes resource stewardship. However, tortugueros's motivation to
480	protect sea turtles via collaboration with public and private institutions is not unconditional. To
481	exclude local communities in decision-making processes that have outcomes that affect them

482	may jeopardize the relationships of trust and understanding that have been built over decades.
483	Most informants expressed feelings of betrayal at the surprise announcement of the moratorium
484	on the sale of sea turtle eggs for consumption. They were angered that they received no advance
485	communication regarding the decision; instead, they simply heard or read about it through media
486	outlets. Given El Salvador's socio-political history, many viewed the moratorium as another
487	example of government catering to elite interests while sacrificing those of the poor. One stated:
488	
489	[Coastal] people are human; although we may be poor, we are human. All of us are humans; we
490	feel and everything the same. It is necessary to communicate with [poor] people during the
491	[decision-making] process, because [the decision] will harm some and not others. Clearly, there is
492	the one that has everything, like the [rich] that has, let's say, cattle, property, has a place to live.
493	Then there is the one that doesn't have anything, that is in his little shack and living from off of
494	the ocean—that is the one that it harms.
495	
496	Interviewees suggested that actively involving coastal residents in decision-making
497	processes that will affect them may produce negotiated outcomes that are more likely to be
498	sustained than outcomes forced upon stakeholders. Decisions that are formulated without the
499	participation of those who will be responsible for adhering to them (e.g. tortugueros) may not
500	have incorporated local realities. For example:
501	
502	They [lawmakers] said yes [to the moratorium] without thinking about the poor that survived [on

rney [lawmakers] said yes [to the moratorium] without thinking about the poor that survived [on
 egg sales], that is the big problem. They didn't think, meditate, about the poorest of the poor that
 maintained themselves off of that, maintained their children, their home. I am certain that if the
 [local] communities would have been able to provide ideas then coastal residents would have

506	been more flexible to some sort of negotiation—even if the agreed upon outcome was not exactly
507	what we wanted, at least we would have been able to negotiate.

508

Some informants also questioned the validity of the decision by the Salvadoran government to prohibit egg consumption, which affects the poor, instead of addressing adult turtle mortality by industrial fisheries, which would affect more powerful interests. Many *tortugueros* claimed that improving regulations on industrial shrimp trawls would reduce the number of adult turtles killed and have much larger conservation impacts than focusing efforts on egg protection. As one respondent put it:

515

516 *Tortugueros*, the poor people, we are the victims. Those that have made large sums of money, the 517 most powerful in our economy, by using the famous bribes to government officials to exploit our 518 resources, it's because of them that the turtles are faced with extinction. And now this 519 moratorium comes that affects all of us, even though we are not to blame for the endangerment of 520 these resources. The maximum authorities should be thinking of how the government has 521 committed enormous errors by permitting the millionaires of the country to do illegal things, 522 inadequate uses of resources, uses of land, and whatever other use that hurts the poor populations. 523 They know that we know and that's why government officials never come to meet with fishers or 524 tortugueros. They know we will criticize the authorizations that have come down from above to 525 help the rich, so instead they send people to hand out t-shirts and hats, to appease the victims until 526 their term is over.

527

Overall, informants expressed high levels of distrust in current decision-making processes
 regarding conservation policy and expressed frustration with perceived corruption within the

- government. With few exceptions, interviewed *tortugueros* desired more participation in political
 processes that have a direct influence on their wellbeing.
- 532
- 533 Discussion
- 534

535 To summarize our results, interviewed tortugueros highlighted the economic value of egg sales 536 as the primary value of hawksbills, but spoke of deeper connections to turtles that transcended 537 traditional economic terms and drew on experiences rooted in cultural tradition. Informants 538 identified egg purchases by hatcheries as a conservation strategy that benefited both hawksbills 539 and human communities, and unequivocally stated that any hawksbill eggs not purchased for 540 protection by conservation initiatives were sold for consumption. Finally, most interviewed 541 tortugueros desired more participation in decision making regarding sea turtle conservation, 542 which they deemed to be biased toward elite interests.

543

544 Divergence of international priorities from local realities

545

Hawksbills are highly regarded by both the international conservation community and coastal
residents in El Salvador; however, priorities concerning hawksbills for both groups are divergent.
Priorities of the international conservation community often centre on the biological aspects and
needs of hawksbills, whereas local priorities of coastal residents tend to focus on the
socioeconomic development and needs of human communities. By prioritizing the biological
dimensions of hawksbill conservation, local realities of coastal residents are deemphasized or
excluded entirely from nest protection strategies supported by the international conservation

553 community. Examples include pressure to protect eggs *in situ* and disapproval of payments for 554 conservation outcomes-which are considered economically unsustainable-such as the 555 purchase of hawksbill eggs for their relocation to hatcheries. In contrast, the material realities of 556 coastal areas and residents dictate local priorities and nest protection strategies that are aligned 557 with community development and informed by existing socioeconomic conditions. Examples 558 include the use of hatcheries for egg protection and payments for conservation outcomes, 559 including the purchase of hawksbill eggs for their relocation to hatcheries. 560 The divergence of the priorities of experts within the international conservation 561 community from those of coastal residents in low-income regions can have serious implications

for hawksbill conservation and local community development. As Campbell (2007, p. 313) observes, "when these experts are active in policymaking at the international and national levels, and in designing conservation projects at the local level, their beliefs translate into material outcomes for local people living with sea turtles." The approval or disapproval of a given practice by the international conservation community can essentially grant or deny its legitimacy in the eyes of international policymakers and funding organizations (Rodriguez *et al.* 2007).

568

569 Hatcheries and direct payments for conservation outcomes: biological and social dimensions
570

571 The ubiquitous use of hatcheries for sea turtle eggs worldwide underscores their importance as a 572 tool for local sea turtle conservation (e.g., Mortimer *et al.* 1993, Marcovaldi and Marcovaldi 573 1999, Formia *et al.* 2003, García *et al.* 2003, Chacón-Chaverri and Eckert 2007, Patino-Martinez 574 *et al.* 2012a). Hatchery design and construction vary depending on a number of factors, such as 575 desired capacity and availability of funds and building materials. Conservation organizations and

576 groups have attempted to standardize hatchery operations by developing guidelines that detail 577 proper methodologies for hatchery construction, clutch extraction and relocation, and hatchling 578 release (e.g., Eckert et al. 1999, Chacón et al. 2008). Despite these efforts, hatcheries often are 579 criticized for operating under poor management practices that produce inadequate biological 580 processes and outcomes (Pritchard 1980), such as low hatching success (Boulon et al. 1996), 581 biased sex ratios of hatchlings (Morreale et al. 1982), and increased hatchling mortality (Pilcher 582 and Enderby 2001). Indeed, the Marine Turtle Specialist Group has made its position regarding 583 hatchery use unequivocal: "relocation of eggs to a protected hatchery site should be undertaken 584 only as a last resort and only in cases where *in situ* protection is impossible" (Mortimer 1999, p. 585 175). Utilizing proper methodologies throughout the hatchery implementation process, however, 586 many of the undesired biological outcomes can be avoided or successfully mitigated (e.g., 587 Marcovaldi and Marcovaldi 1999, Kornaraki et al. 2006, Patino-Martinez et al. 2012b). 588 While we understand the potentially negative biological outcomes associated with 589 manipulation of sea turtle eggs and hatchlings, our research suggests the value of hatcheries 590 extends beyond their biological output. The widespread implementation of hatcheries in low-591 income regions speaks to their persuasive ability to garner local support for sea turtle 592 conservation. Hatchery operations can be linked to human wellbeing via egg purchases from 593 tortugueros for protection, where coastal residents are rewarded for active participation in nest 594 protection and thus become joint owners of conservation successes. Direct payments for 595 conservation outcomes have been shown to be an effective motivator for behavioural change, 596 particularly for initiatives to protect sea turtle nests (Ferraro and Giertsen 2009). For example, if 597 the desired outcome is to protect a hawksbill nest, the hawksbill nest is purchased directly from 598 the "seller," in this case the *tortuguero* that found the nest, for protection. Attempts to increase

599 biodiversity conservation through indirect interventions, such as ecotourism and alternative 600 income generation, that redirect capital and labour away from activities that degrade wildlife, 601 such as sea turtle egg collection, are problematic and rarely produce desired results (see Ferraro 602 2001, Ferraro and Kiss 2002, Kiss 2004). Our informants' adamant claims that offering 603 alternative sources of income to replace the income lost from the collection and sale of eggs 604 would not result in sea turtle egg protection in El Salvador are consistent with these results. 605 Direct payments for conservation, however, often are more cost-effective than regulatory-based 606 initiatives in dispersed nesting environments (Gjertsen and Stevenson 2011), such as hawksbill 607 nesting beaches, and offer a socially just strategy for nest protection that recognizes human need. 608 Moreover, direct payment schemes are considered ethical by members of communities where 609 human population density and poverty are high.

610 In contrast, some experts and groups within the international conservation community 611 recommend nest protection tactics that ignore or invalidate human need as it relates to sea turtles. 612 The Global Strategy for the Conservation of Marine Turtles of the Marine Turtle Specialist 613 Group (1995, p. 14) notes that "where management projects have excluded rural people as agents 614 in conservation, unsustainable management plans have resulted." It suggests developing "marine 615 turtle recovery plans that address and include the political, economic, and cultural conditions of 616 coastal people affected by management actions and promote, where appropriate, the active 617 participation of these communities in marine turtle conservation." In practice, however, the 618 Marine Turtle Specialist Group recommendations exclude *tortugueros*, who are likely the most 619 knowledgeable members of local communities regarding sea turtles, from turtle conservation 620 activities. One recommendation, for example, directs conservationists to conduct beach patrols to 621 deter "poachers" and disguise nests by erasing tracks and smoothing out the area to match its

622	surroundings (Boulon 1999). To emphasize this point, an influential Marine Turtle Specialist
623	Group member stated:
624	
625	To address poaching—I argue that to move the eggs to a new nest cavity 20 feet from its current
626	location works just fine to shut down poachers, they'll never know where to look.
627	
628	Considering tortugueros as almost inanimate objects to be "shut down" like an unwanted
629	machine negates the ties they have to sea turtles and invalidates the context within which they
630	live. Such recommended approaches foster a false conservationist versus tortuguero dualism that
631	promotes direct competition for resources between the two groups. Situating tortugueros as
632	enemies to sea turtles is both a simplistic and inaccurate construction of local reality that fails to
633	acknowledge the underlying contexts in which egg collection occurs. As one informant from Los
634	Cobanós explained:
635	
636	People do not go to the beach just to collect eggs [for the sake of collecting eggs], but rather they
637	go because of economic necessity. You can go out looking for turtles with nothing and come back
638	with enough for bread to feed your children.
639	
640	Advocating that conservation compete with impoverished tortugueros for resources that support
641	local livelihoods is not only ethically questionable, but also can elevate tensions and provoke
642	latent conflict between international conservation organizations and local tortugueros.
643	
644	Connecting international priorities with local realities: hawksbill conservation in El Salvador
645	

The three principal hawksbill nesting sites in El Salvador represent the largest known hawksbill nesting aggregation in the eastern Pacific Ocean (Gaos *et al.* 2010), with roughly 45% of all nesting activity in the region occurring in the Bahía (Figure 1), making it a top priority for conservation interventions (Liles *et al.* 2011). These relatively high numbers of nesting hawksbills offer the unique opportunity to integrate local development into the slow process of hawksbill recovery along the Salvadoran coast.

652 Prior to 2008, hawksbills were considered virtually extirpated in the eastern Pacific 653 Ocean (Cliffton et al. 1982, Nichols 2003, Seminoff et al. 2003). Nearly 100% of hawksbill eggs 654 in the Bahía were collected by tortugueros and consumed locally or sold in local markets. Since 655 2008, however, a diverse team of researchers, conservationists, and tortugueros has been 656 spearheading innovative hawksbill research and conservation initiatives in the Bahía to curb the 657 decline of the species. Because effective coordination among stakeholders is critical to achieving 658 desired outcomes, the group facilitated the formation of the Hawksbill Program, which is 659 comprised of representatives from international and local non-governmental organizations, 660 government entities, and local communities in the Bahía. The democratic framework of the 661 Hawksbill Program provides all stakeholders with voice and decision-making power related to 662 the design and implementation of conservation strategies, which facilitates their alignment with 663 collective priorities for hawksbill recovery and human wellbeing and fosters joint-ownership of conservation outcomes. 664

The integration of coastal communities in conservation initiatives is essential for
effective sea turtle conservation (Nichols *et al.* 2000b). Experts within the international
conservation community, however, often limit the role of coastal communities to superficial
levels, citing questionable decision-making capabilities in management and planning as

justification (Campbell 2000, 2002). Our research suggests the benefits of a fundamentally
different approach, where *tortugueros* are recognized as key stakeholders in hawksbill research
and conservation, whose direct participation in the development and implementation of project
activities is critical to conservation.

673

674 Conclusion

675

676 Marginalized members of low-income regions collect millions of sea turtle eggs each year 677 throughout the world, a number that can only be expected to rise as human numbers continue to 678 increase in these regions. A myopic focus on the biological dimensions of sea turtle nest 679 protection that dismisses the inherent social dimensions of conservation fails to address the 680 livelihood needs of egg collectors, which are rooted in the specific contexts of individual nations. 681 The international conservation community has the power and prestige to shape international 682 policy and to determine funding priorities for sea turtle conservation activities. This can have 683 seriously negative consequences for local conservation efforts that do not align with their 684 priorities, particularly in low-income regions that require context-specific approaches to 685 conservation that are informed by local realities. The divergence of international policy and 686 funding priorities from local realities can dissuade local participation in conservation activities 687 and construct a false dualism that fosters a perception of local egg collectors as the enemy of 688 conservation and escalates latent conflict via direct competition for livelihood resources. In 689 contrast, by connecting international policy and funding priorities to local realities, such as in the 690 case of hawksbill conservation in El Salvador, enables all participants to build on existing 691 synergies to garner local support for conservation that promotes joint ownership in decision-

- 692 making and active participation in all aspects of research and conservation, ultimately leading to
- 693 success in achieving and sustaining socially-just conservation outcomes.
- 694

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696

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709	
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Figure 1. Hawksbill nesting sites (circled) along the coast of El Salvador.