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Governability assessment of the Galapagos Marine Reserve

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Abstract

The Galapagos Marine Reserve is one of the most recognized marine protected areas in the world, due mainly to its unique natural features. Little is known, however, about its social counterpart. This research aims to explore the Galapagos Marine Reserve governance by following the governability assessment framework, which is based on the interactive governance perspective. We claim that improved governance and incresed governability of this marine protected area, ruled under a co-management mode of governance, cannot be achieved without comprehensive understanding about the Galapagos Marine Reserve's governing system, the systems that are being governed, and their interactions. Semi-structured interviews with a range of stakeholders were conducted as part of the study to illuminate the characteristics of the systems and how they interact. The analysis reveals a high degree of variation between the formal and operative structures of the systems, due largely to the complexity, dynamics, and diversity of the systems, and the multiple scales at which they operate. Further, our findings highlight that governing decisions, and thus the overall governance performance, are influenced by certain quality of the systems (e.g., inefficiency, vulnerability, misrepresentation). Along with the understanding of potential complementarity with other governance modes (e.g., hierarchical), the research identifies that the governability of the Galapagos Marine Reserve can be improved by making governance processes more transparent and by better consideration of the social component in the governing system. In that way, the marine reserve sustainability would also be enhanced.

Keywords: Interactive governance; Governability; Galapagos Islands; System analysis; Social system

Introduction

Different assessments of the performance of the Galapagos Marine Reserve (GMR) reveal that efforts put in monitoring the systems operation, reforming the organizational structure, and modifying practices of resource users and authorities still fail to fully respond to the its needs (Heylings and Bravo, 2007; Hockings et al. 2012; Toral-Granda et al. 2011; Jones, 2013). Threats to the marine ecosystemin the area continue, with several causes of the problem identified, such as illegal fishing, introduction of invasive species, marine pollution by chronic discharges, noise pollution, diving sites and marine-scape damage, biodiversity loss, and unsustainable practices in adjacent marine areas (Parque Nacional Galápagos PNG 2006; Benítez-Capistrósós et al. 2014). While these problems are acknowledged, they have not been properly addressed (WWF, 2003). This situation is considered to be critically limiting GMR's governability

(Parque Nacional Galápagos PNG 2006). In effect, the current state of marine ecosystem in the Galapagos suggests that governing GMRis more difficult than what it seems.

GMR has been governed to achieve managerial-based outcomes (Toral-Granda et al. 2011). One possible reason for this is the lack of recognition that management and governance are not synonymous (Armitage et al. 2012; Chuenpagdee 2011). Perhaps, Ludwig (2001) is right in saying that the management age "is over". Too much efforts have been expended in assessing management effectiveness (Toral-Granda et al. 2011; Hockings et al. 2012), allocation and renewal of fishing permits, monitoring and controlling post-harvest activities, and dealing with other management duties (Hockings et al. 2012). While these 'first-order' governance tasks are important (Bavinck et al. 2005), they do not address the fundamental issues affecting the human and environmental health of the GMR. A shift from resource management to ecosystem governance, with an understanding of human and natural sub-systems on their own and in how they interact, is required (Chuenpagdee 2011).

From a governability perspective (Kooiman et al. 2005, 2008; Bavinck et al. 2013), it has been recognized that the limits to marine protected areas (MPAs) governability can be better understood by a careful examination of its systems. Moreover, Chuenpagdee and Jentoft (2009; 2013) posit that the "overall governance quality" depends first and foremost on the inherent characteristics of the human and natural sub-systems that are being governed and of the governing system. These scholars claim that the MPAs governability is influenced and highly dependent on the nature and quality of the systems interactions. Consequently, by exploring governance of GMR we could benefit of a comprehensive understanding of what are the factors affecting GMR governability.

Some studies addressing GMR governance (FN and WWF 2000, FN and WWF 2001; Charles Darwin Foundation CDF, Galapagos National Park GNP, INGALA 2008, Charles Darwin Foundation CDF, Galapagos National Park GNP and INGALA 2010; Toral-Granda et al. 2011; Hockings et al. 2012) have dealt with the roles and scopes of these bodies, as well as described interests, positions, and conflicts of interest groups associated with the GMR.

Their deficiencies seem to be the lack of attention to the connectivity between the human and natural sub-systems and to their interactions with the governing system (in this case, the Galapagos National Park Service, GNPS). This has resulted in the GMR being managed according to the ability and capacity of the governing bodies, which is necessary but it may not be what those being governed, such as fishers and tourism operators, expect of them (see Song and Chuenpagdee, 2010). Our paper, on the contrary, focuses on the Interactive Governance (Kooiman et al. 2005; Bavinck et al. 2013) as the analytical perspective to address the governance of GMR, by systematically exploring the three systems described by this approach: the governing system, the system-to-be-governed, and their mutual interactions. In order to do so, we posit three research questions: how is GMR governed? What features of GMR's systems are influencing its governability? How can the governability challenges be addressed?

This research contributes to the discourse about governance of marine resources, and governability of MPAs and marine reserves, through the case study of theGMR. Its novelty rests in the application of acomprehensive, flexible and systematic governability analytical framework (Kooiman et al. 2005; Bavinck et al. 2013) that enables the illustration of the systems and their characteristics influencing governability. The premise

of our argument is that GMR governance is challenged by simultaneous and multidimensional factors. For the most part, the natural sub-system has been studied with higher emphasis, whereas the social sub-system has been overlooked and underestimated, and thus issues surrounding it have not been tackled with the same intensity (Snell et al. 1996; Tapia et al. 2009; Santander et al. 2009). Since this paper is about the governability assessment of GMR, the manuscript structure follows the format proposed by this framework to illustrate the systems under analysis and their constituting elements: the natural sub-system-to-be-governed, the social sub-system-to-be-governed, the Governing System and their interactions. Implications of the systems quality in GMR performance and governability are discussed and some conclusions about future implications in GMR governance are presented.

Methods

Several methods were used to collect data and to analyze the systems, including in-depth semi-structured and open-ended interviews with GMR stakeholders, informal conversations with key informants, field observations, attendance of local meetings, and review of secondary data (i.e., published governmental and non-governmental reports and grey literature). Informants included small-scale fishers, tour operator agencies, naturalistic guides, scientists, maritime transportation agencies, and GNPS staff members. They were approached through "snow-ball" sampling technique (Goodman, 1961; Biernacki and Waldorf 1981; Babbie 2001; Hernández-Sampieri et al. 2006) used as a referral process, to contact previously referenced names in order to increase the set of interviews. Further, the "key informant interview" approach (Walmsley, et al. 2005) was used as for gathering insights on subjects of interest within this research's context. Request of participation was made with potential interviewees either in person, by telephone or email. Sampling was theoretical (or purposive) (Mays and Pope, 1995), rather than random or representative (Kerr and Swaffield 2012).

Interviewed respondents were self-identified GMR stakeholders, based on their answer to the initial question about their relation to GMR, either individually or institutionally (i.e.,"What is your/your institution relation to the GMR?"). They were later asked to describe GMR current status. Additionally, they were invited to talk about the major issues happening in GMR at present and their influence in the current status. Finally, they were requested to share their thoughts about potential ways to address or solve those issues.

Following Mangi and Austen (2008) and Hamilton (2012), the interviews with fishers were at landing sites, on piers, or at their homes; whereas other participants were interviewed at their local offices or operating centres. In total, thirty-nine persons were interviewed, including eight tour operators, eight diving centers staff members, two naturalistic guides, eight small-scale fishers, five scientists, five park managers, and three employees of maritime transport companies. Four people declined to participate, due in some cases to their admitted lack of knowledge about the GMR, while in other instances because of their mistrust and discomfort of being interviewed.

The data collection period totalled about six months during three field seasons (2010, 2011, and 2012) and took place mostly throughout the rainy period. The interviews lasted about 50–60 min on average. All interviews were conducted in Spanish, with the written notes subsequently transcribed into English. After transcription from raw data, interviews were coded for content following Braun and Clarke (2006) thematic analysis

approach, which is an analytical process based on segmentation, categorization, and relinking of smaller sets of data before its final interpretation (Grbich 2007). It was used to identify common emerging themes or patterns within data that are important to describe the phenomenon under study. By carefully reading and re-reading the data, we examined, identified, categorized, analyzed, and coded datasets (Constas 1992; Chi, 1997; Nicholas and McDowall 2012; Zinda, 2012).

Coding implied finding common ideas, by examining, identifying, categorizing, and reporting data sets, as an iterative process of inductive line-by-line coding (Constas, 1992; AronsonJ 1994; Chi 1997; Braun and Clarke 2006; Nicholas and McDowall 2012, Zinda, 2012). After reading and marking the text, some significant passages were extracted (Seidman, 2006; Rubin and Rubin, 2005) and coded to conceptualize the ideas related to important aspects of the research (Rubin and Rubin, 2005). Certain judgement was exercised at this point while extracting "significant" segments from transcripts. Consistency in observation, labeling and interpretation was emphasized to increase reliability as suggested by Boyatzis (1998).

Quotes from participants have been used as supporting evidence and include a referential code, written in brackets, that represents the participant number and the date when the interview was conducted. Results from the system analysis are interpreted in terms of governability of the GMR.

Results - the GMR systems

The system-to-be-governed

The natural sub-system

The Galapagos archipelago are volcanic islands located 1000 km. off Ecuador, with a land area of about 8000 km^2, including 19 big islands,107 islets and rocks (Parque Nacional Galápagos PNG 2006; Baine et al. 2007) (Fig. 1). Despite early human presence on the islands (Heyerdahl and Skjölsvold, 1956), its official discovery occurred on 1535 (Latorre, 1999). The GMR fosters unique species of marine flora and fauna, compared to any area of its size worldwide (Bustamante et al. 1999), with almost 60 % of the species endemic to the area (de Groot, 1983; Bustamante et al. 2002; Parque Nacional Galápagos PNG 2006; United Nations Environment Program UNEP 2011). These geophysical and ecological features, along with the high biodiversity, productivity and endemism (Danulat and Edgar, 2002) of Galapagos marine environments, make the islands one of the most diverse and complex marine ecoregions in the world (Olson and Dinerstein, 1998; Olson et al. 2002; Bensted-Smith et al. 2002). The convergence of three major oceanic current systems in this area (i.e., Humboldt-, Panama-, and Equatorial Undercurrent) adds to the overall richness (Edgar et al. 2004; Baine et al. 2007; United Nations Environment Program UNEP 2011), creating three types of marine ecosystems characterizing the GMR, i.e., coastal zone, shallow waters, and deep seas (Banks 2007; Castrejón 2011). The importance of the natural sub-system is well recognized, reflecting in the protection of the 40-miles zone of marine environments around the archipelago under GMR (Fig. 1), after the special law declaration in 1998.

Marine species in the GMR are either resident or transient, depending on the nutrient supply from the ocean currents, temperature, and current strength (Galápagos Conservation Trust 2013). Their distribution is uneven with high concentrations of marine taxa (e.g., sharks, stingrays, and sea turtles) in pelagic zones of deep waters

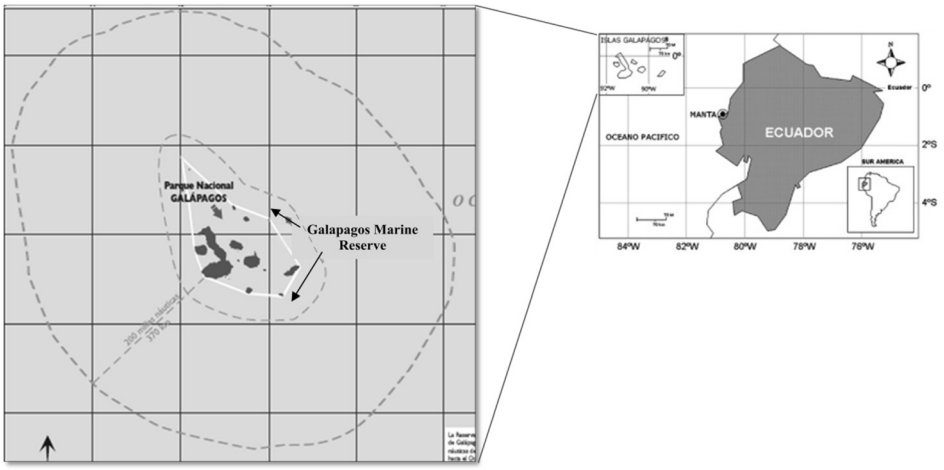

Fig. 1 GMR natural system (Modified from ECOLAP and MAE, 2007)

depression and sea mounts around Isabela, Fernandina, and Wolf (Hearn et al. 2010; Galápagos Conservation Trust 2013). These marine species vary in their importance to different sectors, and in terms of how well they are managed, as shown in Table 1. These features of the natural sub-system of the Galapagos create governability challenges, resulting, for instance, in some species being better managed than others.

The social sub-system

Permanent human occupation in Galapagos dates from 1832, when the archipelago was officially annexed to Ecuador's territory. At that time, given the position of Galapagos as an strategic point within inter-oceanic maritime routes between Central and South American toward Asia, Polynesia, and Australia (Luna-Tobar 1997), the islands were object of considerable geopolitical interest by imperial maritime powers (Celata and Sanna, 2010). By then, the Ecuadorian State faced pressure to claim the islands as territory under its national sovereignty. Additionally, during the WWII until late 1960s, a U.S. Navy Base operates in Baltra Island (Grenier 2002; Finley 2009). Currently, Galapagos Islands are one of the twenty-four Ecuadorian provinces and host over 30,000 inhabitants, both in urban and rural settings (Instituto Nacional de Estadísticas y Censos INEC 2010). This population originated from the first large migratory movement, that thrived in the early 1990s, as a consequence of the sea cucumber fishery explotion (Ospina and Falconí, 2007; Grenier 2007a).

Currently, there are at least 1100 fishers holding permits to fish in Galapagos, locally known as PARMA license (Parque Nacional Galapagos PNG 2012; Palacios and Schuhbauer, 2012). Of these, only between 400–470 are commercially active (Palacios and Schuhbauer, 2012; Schuhbauer and Koch 2013). The tourism sector includes tour agencies, diving centers, and naturalistic guide operations. Maritime transportation has dozens of speedboats (Denkinger et al. 2013), providing inter-island transportation services. The islands also host a number of scientists, although there is no official record of their number. Finally, the GMR management staff represents a sizeble sector of the island population, distributed between the headquarters in Santa Cruz, two technical units in San Cristobal and Isabela, and a technical office

Table 1 Key marine species for fishing and tourism sectors of Galapagos and their management and ecological status

Taxa	Scientific name	English name	Status
Invertebrates	*Isostichopus fuscus*[a]	Sea cucumber	Managed[b, c]
	Panulirus penicillatus[a] and *P. gracilis*[a]	Spiny lobster	
	Scyllarides astori[a]	Slipper lobster	
Fishes	*Carcharhinus galapagensis*[d]	Galapagos shark	Vulnerable[b,e,c,f]
	Triaenodon obesus[d]	Requiem shark	
	Sphyrna lewini[d]	Hammerhead shark	
	Mycteroperca olfax[a]	Galapagos cod	
	Rhincodon typus[d]	Whale-shark	
	Thunnus obesus[a]	Pacific bigeye tuna	
	Acanthocybium solandri[a]	Wahoo	
	T.albacares[a,c]	Yellowfin tuna	Nd
Reptiles	*Testudine* sp. [d]	Giant tortoise	Managed
	Conolophus subcristatus [d]	Land iguana	Nd
	Amblyrhynchus cristatus [d]	Marine iguana	Vulnerable[g]
	Chelonia mydas agassizii [d]	Green sea turtles	Endangered[g]
	Lepidochelys olivacea [d]	Olive-ridley turtle	
	Dermochelys coriacea [d]	Leatherback turtle	Critically Endangered[g]
	Eretmochelys imbricata [d]	Hawksbill turtle	
Birds	*Sula nebouxii* [d]; *S. sula*[d]	Blue-&red-footed booby	Nd
	Phoebastria irrorata [d]	Waved albatross	Vulnerable[g]
	Larus fuliginosa[d]	Lava gull	
	Spheniscus mendiculus [d]	Galapagos penguin	Endangered[g, c]
	Phalacrocorax harrisi [d]	Flightless cormorant	
	Pterodroma phaeopygia[d]	Galapagos petrel	Critically Endangered[g]
Mammals	*Zalophus wollebaeki* [d]	Galapagos sea lion	Vulnerable[g]
	Arctocephalus galapagoensis [d]	Galapagos fur seal	
	Physeter macrocephalus[d]	Sperm whale	
	Megaptera novaeangliae[d]	Humpback whale	
	Balaenoptera musculus[d]	Blue Whale	Endangered[g]

[a]Species with economic interest for the local small-scale fisheriessector (Danulat and Edgar, 2002; Castrejón 2011)
[b]Edgar et al. 2004
[c]Luna et al. 2012
[d]Species with interest for tourism sector (Quiroga 2009 unpublished)
[e]Castrejón, 2011
[f]Jobstvogt, 2010 unpublished; nd (no data)
[g]Edgar et al. 2008

in Floreana (Parque Nacional Galapagos PNG 2014). Information about the key sectors that the study focused on are presented in Table 2.

The diversity, complexity and dynamics observed in the social sub-system of the GMR are to be expected given the characteristics of the natural sub-system. Small-scale fishers in Galapagos, target several pelagic and demersal species. Reports show that 25 % of the total catch correspond to the Misty grouper (*Epinephelus mystacinus*); 16 % to the Galapagos sail-fin grouper (*Mycteroperca olfax*); 7 % to the Wahoo *(Acanthocibium solandri)*; and 16 % to the Yellow- and Black-tailed mullet (*Mugil galapagensis* and *Xenomugil thoburni*), and to the Yellow-fin tuna (*Thunnus albacares*)

Table 2 Demographic information of the key interest groups

Sector	Island			Active
	Santa Cruz	San Cristobal	Isabela	
Small-scale fishers	262[a]	520[a]	241[a]	400[b]- 470[c] (1,035[d]-1,216[c] officially registered)
Tourism Operators[e]	53	25	9	87
GNPS personnel				238[f]-334[g]
Tourism boats' permits				89[d]- 90[e]

[a]Fishers associated with cooperatives (Source: Castrejón 2011). [b]Schuhbauer and Koch (2013); [c]Palacios and Schuhbauer (2012); [d]Parque Nacional Galapagos (PNG) (2012);[e]Tourism Ministry (2011); [f]Rozzi R et al. (2010); [g]Parque Nacional Galapagos (PNG) (2014). Numbers in the "active" column includes Floreana records

altogether. Less common species made 20 % of the total catch including theMottled scorpionfish (*Pontinus clemensi*), the Whitespotted sand bass (*Paralabrax albomaculatus*), the Almaco jack (*Seriola rivoliana*), the Ocean whitefish (*Caulolatilus princeps*), and the Dog snapper (*Lutjanus novemfasciatus*). Finally, 16 % were represented by other species (Molina et al. 2004). The sea cucumber (*Isostichopus fuscus*) fishery in 2004 involved 874 fishers and 446 boats (Hearn et al. 2004a),whereas the spiny lobster (*Panulirus penicillatus* and *P. gracilis*) fishery in the same year included 657 fishers and 309 boats (Hearn et al. 2004b).

Fishers in Galapagos apply diverse fishing practices and gears with varied effectiveness. For example more than 70 % of the catches, mostly demersal species, are from *empate* (pasive gear with line and hooks); whereas 16 % are obtained with the *señuelo* or *pluma* (active gear of line with hook) including mainly pelagic species, and 11 % of catches correspond to gillnets and mostly include coastal-pelagic species (Molina et al. 2004). Sea cucumber and spiny lobster fishery are almost exclusively restricted to diving-collection practices (Table 3). Catches were once exclusively used for local consumption, but demand for salt-dried (cured) filets of the Galapagos-sail fin grouper triggered higher catches and increased exportation since the late 1980s.

Maritime tourism is another key aspect of the GMR social sub-system. It is conducted by local, national, and international agencies and operates at different scales. The larger businesses are ship-based cruises, while sailboats, daily-tour boats and transportation ships operate on a smaller scale. Additionally, a deluxe-type of tourism is represented by "mega yachts," five to ten of which arrive in Galapagos each year.

Other groups and individuals form a constellation of interest groups in the GMR. Officially, there are *ca.* 220 civil society and governmental groups in the area related to conservation, farming, sports, elderly people, religious, trade, and volunteerism (Watkins and Martinez, 2008). Some of them have been present in Galapagos for more than five decades, e.g., Charles Darwin Research Station, whereas others have been recently created (especially religious associations and volunteer agencies). Among them, conservation and volunteer-related groups are directly connected to the GMR.

The complexity and dynamics of the social sub-system of the GMR are amplified by the disparity in contributions from each sector to the local economy and by the unequal allotment of funds within the interest groups. This unevenness generates tension and represents potential source for conflicts. One example is the influential role that the tourism sector plays locally, compared to other sectors, due to the significant amount of money circulating around it. Of about US$ 73.22 million in

Table 3 Gears and boats used in finfish fisheries

Fishing boats		Fishing method	Frequencyofuse [a]	% of total landing caught with this gear [a]
Pangas[b]	3,8 – 8,3 m. long, open wood boats; 10–85 HP engines	Empate[c]	Very high	71
Fibras[1]	5- 9,6 m fast fiberglass boats; 25–200 HP engines	*Señuelo/pluma* (Lure)	High	16
		Hawaiian spear	Medium	2
Boats	8 – 17,5 m. long wooden boats; 30–210 HP engines	Beach seine	Medium	11
		Chinchorro (Shore seine)	Low	2
		Hook and line	Low	2
		Diving (compresor)	High	*ca.* 100 %

Source: modified from von Gaegern (2009 unpublished); Castrejón (2008 unpublished)
[a]Molina et al. (2004); Hearn et al. 2004a, b
[b]These two type of boats compose almost 85.5 % of the registered licenses in GMR (Castrejón, 2008)
[c]Called "*línea de mano*" or "*cordel*" (Nicolaides et al. 2002); is a simple handline fishing gear (von Gaern, 2009) using a line with hooks joined at different levels in a vertical disposition

Gross Island Product in 2005, more than 65 % came from tourism and tourism-related activities (e.g., equipment rental, locally and mainland-based cruiseship), with an average income of US$ 85 million per year (Epler 2007; Taylor et al. 2009). Additional earnings came from fishing and fishing-related business (8 %), commerce (8 %), agriculture and livestock (5 %), and services (e.g., restaurants, bars) (7 %),with the rest coming from transportation, household resources extraction and processing (e.g., water), and other activities (Epler, 2007). In this context, fisheries contributed to Galapagos economy with an average income of US$2-7million per year (Hearn et al. 2006), with the highest amount during sea cucumber season of 2005 when US$6 million were earned from this activity alone (Portilla 2005 unpublished, United Nations Environment Program UNEP 2013, Taylor et al. 2009). Furthermore, management (in 2001) and scientific sectors (between 2002–2006) have contributed to the local economy with US$5.3 millions (from GNPS entrance fees) and with US$11 millions (from national and international donors), respectively (González and Tapia 2005; BID 2006; Ospina 2006; WWF-USAID 2006; Castrejón et al. 2014).

With respect to funding allocation, between 1999–2005, 63 % of the total national and international funding was invested in biodiversity conservation in Galapagos, whereas only 37 % was alloted to human development (Salcedo-Andrade, 2008). The National Park authority (Dirección Parque Nacional Galápagos DPNG 2014) reports the distribution of the funds within Galapagos bodies as follows: GNPS (45 %), Autonomous Local Municipalities (25 %), Government Council (20 %), Navy (5 %), and the National Agency for Health and Harmlessness in Agricultural and Cattle-harvesting activities (AGROCALIDAD) (5 %).

Such disparity generated sectoral conflicts, particularly with small-scale fisheries who felt that they were taken advantage of by the way funds were raised and allocated, as expressed by one interviewee.

> "They [conservation and research bodies] hide behind the small-scale fisheries sector to get funds. They invite us to participate, offer us coffee and spend thousands of dollars that were donated in name of the fishing sector" (P25, 26.05.11).

The social sub-system is further convoluted by scale issues associated with the lack of well-defined boundaries. For instance, the categories "residents" and "non-residents"used by government officials, according to the local rules, do not align with how local people recognize each other, which is based on the time of their arrival to the islands, as suggested below.

> "[T]he population [is divided]into groups or segments, in order of arrival to the islands: the first settlers, the intermediate settlers, the new migrants. They [the first settlers] were at the beginning, the first opponent to the delimitation and formation of the protected area as GNP. Those who most support the conservation of the islands [at present] descend from them. The second are the *colonos* interested in doing business and earning money. They are business people who were little by little involved in the islands, and in the long run, through marriages with locals or children being born here, became "locals" also attached to the islands. The third group is the new migrants. They never had real attachment to the place; they regret having arrived here, and want to be back [tothe mainland] but cannot due to lack of money […]. They have not adapted to this placeand always intend to have a mainland lifestyle" (P05, 21.07.10).

This distinction plays a role in the perception that *Galapagueños*[1] and non-*Galapagueños* have of each other, which is likely a reflection of their vision about the sustainability of the islands.

On the whole, the above characteristics (i.e., complexity, diversity, dynamics and scale) of the natural and social sub-systems of Galapagos create challenges to the governance of the GMR, and contribute to lessen the overall system governability. While not much can be done to change some of the more inherent characteristics, certain governing interventions may result in changing some aspects of these systems, making them more governable. Whether and how this will happen will depend on the features and capacity of the governing system, as later discussed.

The governing system

The GMR is governed by a co-management system, which is novel in Ecuadorian standards. It represents a shift from a traditional hierarchical approach toward a horizontal management model, operating under three key principles: participation, adaptive management, and precautionary principle (Baine et al. 2007; Heylings and Bravo, 2007). The two managerial bodies created in order to facilitate the co-management model are the Participative Management Board (PMB) and the Inter-institutional Management Authority (IMA). Both provided ground for the different interest groups in the GMR to legally participate in decision and policy making (Heylings and Bravo, 2007; Castrejon 2008).

The PMB (locally known as "*La Junta*") is the local executive forum for advice and consultation about concerns regarding the GMR. It comprises of representatives from the local small-scale fisheries sector, the Galapagos Chamber of Tourism, the

Naturalistic Guides Association, the Science and Education sector (initially represented by the Charles Darwin Research Station) and the management sector (represented by the GNPS serving as the executive arm of the GMR). Inside the PMB, the GNPS represents the executive arm of the GMR at implementing the management plan (Heylings and Bravo, 2002; Parque Nacional Galápagos PNG 2006; Baine et al. 2007). It is within the PMB that nterest groups can submit proposals about issues that require deliberations and consensus.

The IMA is a ministerial forum of decision making, based on Ecuador's mainland. It is formed by the Ministries of Environment (acting as President), Agriculture-Cattle-Aquaculture-and-Fisheries, Tourism, and Defence. Additionally, it invites representatives of the Ecuadorian NGOs Network (CEDENMA) and local sectors (i.e., the small-scale fisheries and the Galapagos Chamber of Tourism). Furthermore, it includes the Charles Darwin Research Station (acting as Technical Advisor) and the GNPS (acting as Technical Secretariat for the Environment Ministry) (see Fig. 2).

In cases where consensus is not achieved at the PMB level, the proposal is still forwarded to IMA for resolution, accomplished through a majority voting system. The IMA resolution becomes binding and must be executed by the GNPS and/or its advisor(s). Additionally, when urgent actions are needed, GNPS can take decisions by direct resolutions independently from both boards (Parque Nacional Galápagos PNG 2006; Baine et al. 2007).

One of the key management instruments employed by the governing system is zoning of the protected area with differentiated activities allowed within it (e.g.,tourism, small-scale fisheries, scientific research, management, and maritime transportation). This zoning system describes three main areas: multiple-use zone, limited-use zone, and harbor-zones. Our study found, however, that despite the consensus about the zoning, disagreements regarding its implementation still exist.

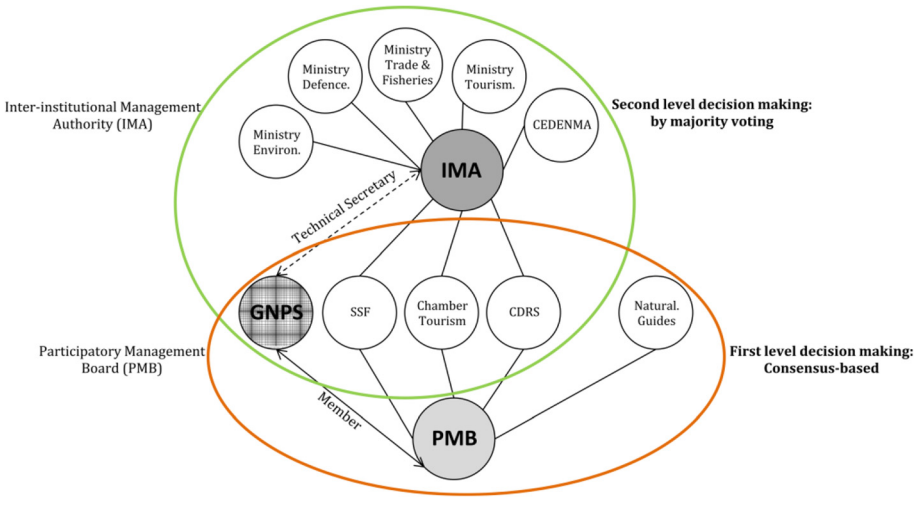

Fig. 2 GMR's Governing System (Source: modified from Parque Nacional Galápagos PNG 2006; Heylings and Bravo, 2007; Baine et al. 2007)

"They [GNPS] control the fishing sector chasing us [fishers]....the tourism sector has always had advantages over us [small-scale fisheries sector]. If we use a fishing site, then they [GNPS] come, displace us and give that site to the tourism sector. They [the tourism sector] are more powerful than us…"(P26, 07.06.11).

"They [fishers] come to the diving sites and use the place to eviscerate their catches. This annoys us because they *'alborotan'* [whip] the sharks [up]...."(P35, 06.02.12).

These disagreements reflect the complex relationship between the interest groups in the GMR. For instance, sectors with representatives in the PMB are likely able to influence decisions at that level. Similarly, those with economic wealth and those with scientific knowledge are seen to have a stronghold in what goes on in the area.

"Scientists, with their studies [the research done by them] and with their preparation, they are the ones who are able to give their opinion" (P31, 23.03.12).

"Here, decisions are taken by NGOs, what they want… that is what is decided" (P21, 22.03.12).

"Business owners from tourism and fisheries sector [boat owners] are those with high influence. Even more, some of the boat owners are based on Guayaquil or Manta" (P35, 09.04.12).

The co-management horizontal mode shaping the governing system of the GMR has undoubtedly created multiple opportunities for the social sub-system to take part in decision and policy making processes. However, despite its recognized value, there still are limitations of this management mode at improving the overall governability of the systems. Whereas it has managed to control and limit fishers' access to some marine resources, there is no evidence about what this governing system has done to set limits for the tourism activity. In fact, little progress has been achieved by the governing system in mitigating the push and pull effect of tourism over migration and the consequences derived from it.

The governing system is formally described as participatory in nature, under the co-management scheme. Our analysis shows, however, that in practice it follows a rather hierarchical characteristic. As shown in our study, while the co-management arrangement is effective in bringing traditionally opposed sectors (e.g., conservation, small-scale fisheries, and tourism) to the same decision-making table, operationally, the participatory quality of the governing system is questioned. This sentiment is expressed by several people interviewed in the study.

"Everybody says that it [the participatory process] works, but, does it really work? or at the end of the day is everything done as [one] person dictates?" (P23, 20.05.10).

"The first and last word is taken by the GNPS. They meet, they decide, accept and publish everything before we are aware of it. They tell things to us only when

everything is done. They do not take us into account…we are not part of the decisions" (P31, 13.06.11).

"To take decisions, nobody asks for opinion. The [decision making] groups are only made by their own with the GNPS and private institutions" (P3, 01.02.12).

This perceived failure is related to three key aspects of marine resource governance, according to Jentoft (2000), Mikalsen and Jentoft (2001), and Buanes et al. (2004), i.e., legitimacy, power and urgency. In the GMR, legitimacy of some of the users' representatives in the governing body is contested. Furthermore, those being represented claim that leaders taking part indecision and policy making on their behalf are not fully entitled by their own sectors, but are instead enabled by their power and influence at higher levels (Marder and Arcos, 1985). Still, power within the PMB and IMA, are characterized by levels of influence unequally distributed among the different actors, often resulting in the marginalization of the less powerful of the sectors represented there. And urgency, considered as the degree to which stakeholder claims call for immediate attention (Buanes et al. 2004), which in GMR is perceived to be defined by the interest of the most powerful actors within the PMB and IMA.

"The problem is the bad administration of the small-scale fisheries sector…Those who are the 'heads' [the fishers cooperative's representatives] only care about their own benefit …or their friends or relatives" (P26, 07.06.11).

"There is not a good representation of the fishers by the administrators [fisher's leaders]. They do not have accountability Nobody knows how much they earn, how much they spend, where they invest the money….Only when the people [fishers] get fed up, they [fisher's leaders] are requested to render accounts. And because they are not able to do that, they are kicked out….but there are no changes, it is always the same" (P26, 07.06.11).

"Another interesting factor is the legitimacy. What is legitimacy? What is legitimate or illegitimate? Legitimacy is the perception of the world. The basics here are the multiplicity of interests that are in play. What the actors are interested in, determines the form, level, intensity and trend in the participation. The determinant issue is what motivates their interest? How is the interest used? Is this interest legitimate or illegitimate? Is there a dominant interest?… If there is interest, there is participation" (P01, 22.07.10).

In sum, the co-governance arrangement of the PMB facilitates local discussion about important issues affecting local stakeholders while IMA provides additional avenues for decision-making. The multi-level governance structure, with the majority of actor groups involved in both local and national governance, offers some advantages and disadvantages. For instance, issues can be dealt with locally and timely, but actors can also influence decisions at the national level, if they find local-level decision unsatisfactory. Various governing interactions take place within the governing system, which

may foster or impede governability, depending on their nature and quality, as further discussed.

The governing interactions

The interactions understood as "associated infrastructures" (Anderies et al. 2004) are characterized by the rapports taking place between and among the GS and the SG's sub-systems (Kooiman 1993; 2003). In GMRthe interactions are diverse, dynamic, and complex. In general terms, interactions between the GS and the two SG sub-systems are influenced by two conditions: the excellent knowledge of the natural subsystem and the deficient quantity and quality of the social subsystem understanding. The reason for this is the overestimation of the former against the underestimation of the latter. For instance, the GI, at decision and policy making between GS and natural SG, have been dominated by good quality and quantity of information regarding habitats health, marine resources status, and threats. Opposedly, the GI between GS and SG-social subsystem are almost restricted to the compliance and enforcement of the *LOREG*, via law observance, enforcement, and prosecution.

Additionally, some GI mechanisms taking place in GMR coincide with those illustrated by Song and Chuenpagdee (2010): participation (e.g., fishers taking part of priority issues identification at PMB); communication (e.g., through information published by research institutions); collaboration (e.g., by co-executed projects between GNPS and CDRS staff); and adaptation (e.g., by fishing quotas and/or ban establishment).

Discussion

Previous governance assessments of GMR (Heylings and Bravo, 2007) described the legally-based multi-stakeholder co-management regime currently responsible for all decisions on marine resources management within the reserve. They evaluated GMR governance based on quantitative and qualitative criteria provided by rankings given to issues addressed along the participatory processes. Furthermore, Castrejón et al. (2014) analyzed two local institutions (i.e., Galapagos National Park Service and Charles Darwin Foundation) as the key drivers of fishery science in Galapagos, illustrating the different periods in this scientific development. Finally, Jones (2013)tackled governance and management effectiveness by illustrating diverse strategies to achieve the outcomes (e.g., incentives) and some important issues occurring within the GMR area. Adding to this body of literature, our research takes the GMR governance analysis to another level,with the interactive governance and governability lenses. We illustrate this with the discussion below, framed in the context of the research questions, i.e., how GMR is governed, and the features of the GMR's systems that influence its governability.

Formal vs. operative nature of the GMR

Disparity between formal and operative nature of the GMR is found in all systems (Fig. 3). Consequently, it can be argued that GMR is governed differently from what the theory calls and what the practice unfolds. While the natural sub-system claims relative "pristine" condition as its formal description, the state of the social sub-system is practically unknown. From the governing system perspective, the natural sub-

	System-to-be-governed		Governing system
	Natural system	Social system	
Formal	Territorial-provincial space	Sectors / bottom-up	Participatory
Operative	Zoning	Networks / top-down	Hierarchical

Fig. 3 Formal and operative features of GMR's systems

system is formally managed as a territorial sea. Yet, in practice, a zoning system is used. On the social side, the human activities are formally described to be circumscribed to the sectors functioning with a bottom-up approach whereas operationally, they perform network-based features within top-down attributes (Dirección Parque Nacional Galápagos DPNG 2014).

The inherent attributes of the governing system and the systems that are being governed –in their formal and operative shapes–are compromising the governance quality of the GMR (Dirección Parque Nacional Galápagos DPNG 2014). For the most part, the technical solutions employed by the governing system based largely on the natural scientific knowledge have insufficiently addressed the challenges related to either the environmental sustainability or society's wellbeing (Jameson et al. 2002; Quiroga, 2009). One illustration of this is in fisheries where rules and regulations provided by the operative hierarchical governing system do not take into account the dependency of fishing people on the marine resources. In other words, the 'network-based' social sub-system requires a different governing system that is not zoning-based, which is what applies to the natural sub-system.

In addition, historically, prosperity in Galapagos came from small-scale fisheries but increased with tourism development, commerce and building construction. The formally described participatory governing system has emphasized fishing and fisheries as its main target. However, it has rarely acknowledged the implications of the extensive dependency of the local economy on tourism and its vulnerability to globalized mechanisms such as international markets, state-safety policies, and risk perception (Baine et al. 2007; Beck, 2011). Instead, this governance mode supports tourism, which as a network-based business of hierarchical nature, is closer to global geopolitics, economic trend, and to Ecuadorian national politics than to the sustainable practices needed in GMR.

It should be noted that in Galapagos, the dynamics of both industries are influenced by local and national fish markets and also tourism global demand, as direct exogenous influential factors. This globalized force has decreased the archipelago isolation and opened doors to the outside world (Grenier, 2002, 2007a,b; 2009; 2010). Naturally, globalization brings with it more complexity and dynamics, which may affect the system governability. The governability of the GMR would be deeply linked to how these global- or locally-based factors influence all the GMR systems.

Features influencing GMR governability

On a positive side, it could be argued that the currrent co-management governing mode contributes to the GMR stability, permanence, continuity, and credibility. Additionally, it can be seen as fostering participation of a great diversity of institutions and actors associated with a wide range of activities, origins, competences, and functions, each with different level of involvement and commitment. Finally, the double role that

some of the governance actors play within the PMB and the IMA (e.g., GNPS, small-scale fisheries, tourism, and science as shown in the overlapping area in Fig. 2) broadens their possibilities to influence decision and policy making. Nevertheless, the co-management system faces certain challenges. For instance, the members' participation is influenced by legal, ethic, and moral attributes, which are not necesarilly voided of competing interests, power position, and economic influence. Consequently, the governing processes depend on where, how,and by whom marine resources are used, managed, and governed, as well as whether they are based on short-term or long-term interests.

On the negative side, there are some factors affecting governability of the GMR. One is the misalignment observed between the formal and operative features of the governing system and of the natural and social sub-systems-to-be-governed. In fact, the GMR governability is likely to be diminished when the participatory governing system operates hierarchically by dictating rules, compromising therefore ethical and moral realms of the social sub-sytem. For example, two of the three principles that provide the basis for the GMR creation, i.e., participation and adaptive management, are not fully followed, with the exclusion or restriction of access of local users to some marine resources (Baine et al. 2007; Heylings and Bravo, 2007). Fairness and justice question arises when local users are obliged to used damaged areas, whereas the more pristine environments are kept for foreign divers or exclusively reserved for wealthy people visiting the area as tourists.

Additionally, the governance of the natural sub-system based on the imposition of regulations to only one segment of the social sub-system (i.e., fisheries) has been claimed not only to diminish the resilience of local fishers, but also to threaten the basic right of humans to access to a decent livelihood. Evidence of this is the occupation displacement when the first and second generation of Galapagos fishers could no longer stay in the fisheries. Neither could their children and other younger generations. Instead of fishing, some of them become nature guides or switch to other primary activities (e.g., agriculture), to services sector (e.g., tourism, transport, logistics), and even to administrative positions (e.g., politics, bureaucratic roles). Unfortunately, they do not always succeed.

Moreover, the interactions between GS and SG-natural and social sub-systems are not effective partly because the overwhelming existing knowledge about the natural sub-system versus the incomplete understanding of its social cunterpart. Consequently, GI are eventually built over knowledge gaps, addressing social dimensions as if they would be nature-based issues. That approach clearly reduces the governability of the system, and its governance quality, which in Watkins and Cruz (2007:4) words are due to the tendecy to "base decisions over assumptions and perceptions instead on solid information".

Furthermore, the territorial-provincial quality of the natural sub-systems contradicts the intention to conserve them. The dual status of "the province-protected area model" (Salcedo-Andrade 2008) and the overlapping scopes of the bodies involved in the GMR governance (e.g., institutions of the PMB, IMA, and local municipalities), are certainly uneven. Galapagos is a Special Territory but still holds features of other Ecuadorian provinces. Thiscontradiction escalates the dilemma between keeping the benefits provided by an expanding economy, or maintaining the aesthetic gains of an

unspoiled nature (Guha 2005). Failing in addressing these issues dangerously conspires against the GMR governance in the long run.

Consequently, human-related issues (e.g., food security) that could be not evident as challenging the GMR governance are present, due to the governing system implementation (i.e., the zoning system). For example, regardless of the limited access of local fishers to fishing grounds, the local demand for fish (e.g., by restaurants, hotels, and cruise ships) will remain and will be likely supplied by external sources, either from the mainland or from abroad. An example was provided by an interviewee about octopus imported from the mainland for local consumption in Galapagos and being re-exported back to the mainland, with the label of "Galapagos' octopus". This situation implies that prices of fish products would increase, with access to fish by local residents being reduced. Possible consequences of this would be malnutrition and mental health issues, including the emergence of feelings of unhapiness, exclusion, and marginalization. As seen in many places, the 'weak and unhappy' social sub-system could easily generate governability problems in the long-run (Axelrod 1994; Blount and Pitchon, 2007). On the contrary, tourism has only slightly been recognized as an "indirect" driver (Dirección Parque Nacional Galápagos DPNG 2014) for the effects on Galapagos environment, which disregards the real effect of this industry on the islands sustainability.

We argue that threats on the GMR cause stress simultaneously on both, natural- and social sub-systems. More emphasis is required then to understand the latter and incorporate such knowledge in decisions and policy-making about the GMR. The study also highlights the need to recognize that neither co-management nor hierarchical governance models, on their own, provide solutions to the GMR conflicts. Additionally co-management has demonstrated not to be the panacea but instead only one governing mode that needs to be adapted to the GMR system's own qualities and context. If this outcome is achieved, the systems would likely be more governable, their governance would improve, and the system's "long-term robustness" (Anderies et al. 2004) would increase. The co-existence of this co-governance mode with another (e.g., hierarchical governance) within the same nation-state (e.g., GMR and Ecuador mainland) does not taint the essence of the horizontal governance approach maintained in Galapagos.

Indeed, the Ecuadorian National Constitution under the "*Buen vivir*[2]" (or good way of living) paradigm, invites as the existence of harmonizing mechanisms to improve well-being and sustainability of social and natural sub-systems at a larger national (or regional) scale. A positive sign that GMR authorities may be keen to follow this recommendation is the shift experienced on the protected areas management approach presented by the new Galapagos Management Plan (Dirección Parque Nacional Galápagos DPNG 2014). For the first time in its history, Galapagos has a unified management instrument for both terrestrial and marine protected areas. This initiative, despite its still dominating managerial-based focus, responds to a national vocation (and regional trend in Latin American countries) to give a sense of unity and comprehensiveness to the state-ruled institutions (e.g., Galapagos Protected Areas) within their corresponding nation-states.

Conclusions

While the GMR governing system has shown to be stable, it is rather complex and inefficient due to the differences between its formal and operative design. Additionally,

the system-to-be-governed includes two sub-systems, which have received differently attention. On the one hand, the natural sub-system-to-be-governed has been shown to be diverse, dynamic, well monitored but vulnerable to the stress triggered by tourism and migration. On the other hand, the social sub-system-to-be-governed is under-represented within the governing system. In that regard, the quality of the participatory process is contested, low legitimacy is an issue, along with concerns about strong influence of power at decision and policy making. Finally, the lack of compliance, disappointment, and dissatisfaction from resource users greatly contribute to limiting the governing interactions and making them ineffective.

Recognizing that governability is the overall governance quality, and that it depends, first and foremost, on the characteristics of the system that is being governed, on the capacity of the governing system, and on the quality of their interactions (Song and Chuenpagdee, 2010; Bavinck and Kooiman, 2013; Bavinck et al. 2013), our research shows that GMR governability is reduced. The mismatch identified between what is needed by the natural sub-system (ecosystem health),what is expected by the social sub-system (social wellbeing), and what the governing bodies expect to accomplish (e.g., the six basic objectives of the Galapagos management programs, Dirección Parque Nacional Galápagos DPNG 2014:117) conspire against the improvement of the quality of these systems interactions. In that regard, on the one hand the decisions,policies, and assessment of the governing capacity are mislead. On the other hand, the passive resistance of the social sub-system at ignoring, infringing or violating the GMR's regulations, complicate governance of GMR.

Addressing these shortcomings would require enhanced transparency and improved participation. But at the end, increasing GMR governability must also involve addressing simultaneous and multidimensional factors like ongoing social problems (e.g., criminality, teenage pregnancy, drugs abuse). Their solution must have the same urgency as those regarding fishing quotas and tourism permits, recognizing that neither political indifference nor environmental fundamentalism will solve the challenges to the GMR governability.

Endnotes

[1]Demonym for people born in Galapagos.

[2]*Buen Vivir* (or Sumak Kawsay in Quichua language) is defined as "*the culture of life*". This notion was inserted in Ecuador's (2008) Constitution as the superior aim to be achieved by the State and by the entire society. It is based in an Andean tradition that qualifies a "good way of living" which is not lead by an ethics of unlimited progress, competition, or as a strategy to "life better". Instead, it is guided by a cosmological vision central to the philosophy of life held by indigenous societies in Andean South America. It is certainly not a construction manual for a better world. It presents itself as an opportunity to collectively design new forms of living with a remarkable and profound collective spirit. Been arisen from traditionally marginalized groups, and with a holistic point of view, the *Buen Vivir* is enabled by a diversity of factors characterizing human actions (e.g., knowledge, codes of ethical and spiritual behavior toward the environment, human values, and visions, among others). It is subject to a permanent process of construction and reproduction. In the words of the Brazilian theologian Boff: "[T]he *Buen Vivir* points to an ethic of that which is enough for the whole community,

not just for the individual. This notion implies an integrating holistic vision of the human being, immersed in the great earthly community, including, besides humans, the air, water, soil, mountains, trees, and animals; it must be in profound community with *Pachamama* (Our Mother Earth), with the energies of the Universe, and with God." (Houtart 2011; Acosta 2012).

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
MJBP and RC formulated research questions and conceived study design. MJBP collected and analyzed primary and secondary data, and prepared initial drafts. Writing of the manuscript took a collaborative effort as well as the revision of the manuscript in response to reviewers' comments. All authors read and approved the final manuscript.

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