



Photo: Christophe Grenier

The geographic opening of Galapagos

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Introduction

The “geographic opening” of a region describes the deep ecological and/or social transformations of that region caused by its full integration with the globalized world, through numerous transport and communications networks and subsequent flows. This concept was first created to analyze weaknesses in Galapagos conservation efforts (Grenier, 2007) and has since been more broadly used. For example, it is found in the second article of the draft for the new Special Law for Galapagos and was the theme of the international workshop on sustainability of islands hosted by the Charles Darwin Foundation in March 2010. The concept of geographic opening could be useful in advancing both the conservation and socio-economic sustainability of the Galapagos.

This article begins with a discussion of the role of isolation in oceanic islands. It then describes the human history of Galapagos as a process of geographic opening that has been fostered, not limited, by conservation efforts. Next it analyzes how the geographic opening of Galapagos is manifested in the spatial organization of the archipelago, which has led to an ecological and socio-cultural process of “continentalization” of the islands. Finally, it concludes with a proposal for establishing a policy of sustainable conservation for Galapagos that will reduce the geographic opening of the archipelago without removing sources of income for the insular population.

Oceanic islands as natural and geographic regions

The adaptation of organisms to the geographic diversity of the Earth has resulted in the formation of biodiversity. During most of human history, societies have adapted to terrestrial diversity

through cultural diversification and more precisely through geographic diversification processes. Each human society has had a lifestyle in accordance with its ideas, values, technology, and the natural resources of the area it inhabits. Consequently, each society has left footprints on the surface of the earth (or "geo-graphs") specific to their location and culture. The processes of biological and cultural diversification form natural regions ("eco-regions") and geographic regions. A region is an area of medium scale (from hundreds to thousands of km²) that is distinguished by its natural features and/or geography from other spatial entities of similar dimensions.

Oceanic islands are natural regions characterized by long-term ecological isolation (hundreds of thousands to millions of years). The oceanic barrier that isolates islands from continents is not impermeable, but it functions as a filter. Before the arrival of humans, only representatives of a few species were able to colonize these islands, resulting in low biodiversity and disharmonic flora and fauna in relation to that of the nearby continent. Once these organisms established themselves on the islands, they were separated from their populations of origin by the ocean, allowing for divergent evolution and in some cases the eventual formation of endemic species, specifically adapted to these isolated, relatively small regions of low biodiversity.

Due to their isolation, some oceanic islands constitute the last places on Earth to have been populated by humans. Once humans arrived on an oceanic island, its ecological isolation depended upon the geographic isolation of the society that colonized it. In some cases when the first humans settled on islands, they formed geographic regions that were in large part isolated from the rest of the world during historical times. One example of insular isolation is Rapa Nui (Easter Island), which was inhabited by Polynesians for nearly a millennium with very few contacts with the rest of the world. In many oceanic islands, the geographic isolation was not complete. Certain island societies (in Melanesia for example) produced spatial networks that allowed them to maintain contact with other insular societies with travel strictly controlled by the leaders.

From the biological or cultural point of view, oceanic islands illustrate the adaptation of certain organisms or societies to ecological or geographical isolation, a limited area, scarcity of resources, and major differences between the insular environment and the environment from which they came. Oceanic islands give rise to biological and cultural speciation

processes through which species or lifestyles adapt to insular isolation and other environmental limits. It is for this reason that many oceanic islands are considered conservatories of unique natural or cultural occurrences and are of great interest both to biologists as well as anthropologists. Oceanic islands also provide models for understanding the effects of ecological or geographic isolation in continental regions with similar characteristics (Whittaker and Fernandez-Palacios, 2007) and for analyzing current global ecological crises (Bahn and Flenley, 1992; Diamond, 2004).

Since the visit of Darwin and the development of his theory of evolution by natural selection, the Galapagos Islands represent an archetype for the study of biological evolution in conditions of ecological isolation. Galapagos is also unique among oceanic islands as it was the last archipelago in the tropical zone to have its ecological isolation disrupted. It was not until the beginning of the 19th century that the archipelago became a geographic region used and later populated by humans. This prolonged ecological isolation explains the interest that Galapagos generates in the fields of biology, conservation, and tourism. This archipelago allows for study of evolutionary processes in ecosystems that are still close to their natural, pre-human condition. There is no other place on earth where tourists can approach wild animals so closely. However, the recent human colonization of Galapagos has impeded the development of an island culture with a lifestyle adapted to the insular realities of the region, as has occurred in other oceanic archipelagos of the South Pacific.

The human history of Galapagos is the history of its geographic opening

The human history of Galapagos reveals a gradual geographic opening of this region to the rest of the world and coincides with the formation of the Modern World system. A world system connects various regions in different continents or oceans via transportation networks that permit a regular flow of materials (raw materials, products, etc.), people, money, organisms, and ideas. The Modern World system is closely related to the expansion of capitalism beginning in the early 15th century in Western Europe and spreading to the rest of the world. Globalization, an emerging property of the Modern World system, can be seen, in part, as a geographic opening of strategically important regions by powerful geographic actors, including nations, international organizations, and transnational corporations.

In the first centuries of human history in Galapagos, there was a very small geographic opening of the archipelago, although the islands were known to the world due to their presence on maps as early as 1570. The Spanish who discovered Galapagos in the 16th century did not settle in the islands. At the end of the 17th century and beginning of the 18th century, the islands were used as a base of operation by buccaneers who also did not leave permanent footprints, with the notable exception of the introduction of rats. The real disruption of the ecological isolation of Galapagos began in the 19th century, through the connection of the archipelago with Nantucket by whaling fleets of the United States, and then its integration into the national space of Ecuador through colonization and the subsequent introduction of domestic animals. From this point forward, the geographic opening of Galapagos was characterized by exploitation of resources for exportation (in the 19th century, primarily sperm whales, giant tortoises, fur seals, the orchilla lichen, etc.), which resulted in drastic reductions in the populations of some species.

The geographic opening of Galapagos grew throughout the 19th century. After 1870, the Ecuadorian colonization became permanent. The highlands of San Cristóbal and later Isabela were opened to cattle and agriculture (sugarcane and coffee plantations) and their raw materials were exported to the mainland. Western scientific expeditions collected large numbers of specimens of all types, putting even greater pressure on the survival of certain species (Thornton, 1971). This geographic opening did not translate into an improvement of conditions for the insular population. While Galapagos was open to private businesses of specific colonists (Valdizán, Cobos, and Gil, for example) and to foreign scientists, the archipelago became home to laborers from continental Ecuador who were held prisoner in the islands by powerful landowners (Silva, 1992).

In the first half of the 20th century, there was a relative pause in the geographic opening of Galapagos. The haciendas collapsed, giving rise to open but infrequent colonization, in part because the Ecuadorian State continued to have difficulty in connecting its insular territory to the continent. Even so, the process of opening continued. European colonists settled Floreana and Santa Cruz, tuna fishing fleets from California began to frequent the waters of the archipelago, western scientists continued their voyages around the islands, and a limited

number of wealthy tourists identified Galapagos as a destination. It was during this short period of a reduced geographic opening that an island culture began to appear. It arose in a population of diverse origins, isolated from the rest of Ecuador and the world, which survived in large part through self-subsistence. The galapagueño culture that arose thus reflected a lifestyle adapted to the isolation and the scarce resources of the archipelago.

After 1940, the geographic opening of Galapagos increased even more with the establishment of a US military base on Baltra during World War II. During the war, several thousand US troops passed through Baltra, a significant increase in human population in economic terms (the base also generated immigration of labor from the continent) and its impact on the environment (although there has been no research demonstrating introductions with negative impacts during this short period). The presence of the military base proved that the Galapagos Islands—even the more arid ones—could support a large population, if adequately supplied from the continent. In other words, geographic opening with high energy consumption could colonize any environment. The US military base provided a window to the actual current situation in Galapagos.

In the 1950s, the goal of the Ecuadorian government was to fully integrate its insular territory through colonization, according to the geopolitical doctrine of “living frontiers.” At the beginning of this decade, the Ecuadorian Institute for Agrarian Reform and Colonization (IERAC) organized the colonization of the highlands of Santa Cruz. The relative failure of this effort showed that Galapagos could not be colonized through agriculture as had been accomplished in certain sectors of the Amazon.

During this period, western scientists, supported by UNESCO and the IUCN, stepped up their pressure to establish a natural reserve in Galapagos. In 1959, the Ecuadorian government designated 97% of the archipelago as the Galapagos National Park (GNP). The Charles Darwin Foundation, an international, scientific NGO, was established in the same year and through an official agreement with the government was to advise Ecuador on the conservation of Galapagos. However, the creation of a national park would ultimately result in Galapagos becoming a center for world tourism.

The conservation of Galapagos has accelerated the geographic opening of the archipelago

Paradoxically, the creation of the GNP accelerated the geographic opening of Galapagos. The international media drew attention to the park and the work of scientists. This, in turn, attracted tourism and generated economic development in the colonized areas of the archipelago and provided incentive for voluntary migration of Ecuadorians from the continent. This influx of Ecuadorians finally allowed a real national sovereignty on Galapagos, which until this time had been freely open to foreign actors (businessmen, scientists, tourists, etc.). The model of tourism designed in 1966-67, which used boats as hotels, began to function towards the end of the 1960s. At that time, permits were reserved for one large national company and Galapagos colonists. The Ecuadorian government granted Galapagos provincial status in 1973, despite the fact that the islands' population was only 4000. This move permitted the free immigration of Ecuadorian citizens to the archipelago. In 1979, the national government created the National Institute of Galapagos (INGALA) to oversee the development of the insular region. Since that time, the size of the insular population has followed the same ascending curve as the number of visitors to Galapagos: 6700 inhabitants and 17,000 tourists in 1982 and 10,000 residents with 40,000 visitors in 1990. These increases were accompanied by a significant growth in the number of boat permits and capital investments from outside Galapagos. In 1986 an airport was inaugurated in San Cristóbal, opening a second entry port for airplanes to the archipelago.

In the 1990s, the geographic opening of Galapagos grew even more, due in part to the boom in the sea cucumber fishery for export to Asia and a continual increase in the number of tourists traveling to Galapagos from Europe and North America. These activities brought more and more immigrants to the archipelago, where the population grew to 18,000 by 1998, with 60,000 tourists visiting Galapagos that same year. However, the socio-political disruptions related to the sea cucumber fishery led first to participatory management of the Galapagos Marine Reserve (GMR) and later in 1998 to the Special Law for Galapagos (LOREG). On the surface, these measures appear to reflect a policy aimed at reducing the geographic opening of the archipelago: the GMR was extended and its resources reserved for fishermen

from Galapagos and the LOREG established the status of permanent resident and prevented new immigrants from staying in the province beyond the time stipulated by their work contracts. However, it appears that the primary objective of the LOREG was to resolve social conflict in the archipelago and organize a new distribution of the economic benefits of the geographic opening driven by tourism. For that reason, no thought was given to limiting tourism.

LOREG stipulates that 40% of the park entrance fee is to go to the municipalities, the Provincial Council, and INGALA. The GNP also receives 40%, while the remaining 20% is divided between the Navy, the Quarantine System, Management of the GMR, and the National System for Protected Areas. With such income streams, it is logical that these institutions would not be in favor of limiting tourism—their primary source of revenue. LOREG officially named the population centers of the archipelago and protected areas as tourism “destinations” in Galapagos (Article 45). This resulted in the “locally based” tourism sector undergoing a period of rapid growth during the next decade, surpassing the passenger capacity of the tour boat sector (Epler, 2007). Both sectors took advantage of the boom in tourism in Galapagos, which nearly tripled in ten years from 60,000 visitors in 1998 to 173,000 in 2008.

The insular population has continued to grow, reaching approximately 30,000 inhabitants in 2010. Galapagos now has an immigration system very similar to the developed countries of the world. Its economic wealth relative to the continent combined with its immigration restrictions increased its appeal and fostered illegal immigration, which is supported by businesses and residents who take advantage of cheaper and more manageable labor, for example in the commercial sector (see Villareal, this publication) and the construction sector (see Jimbo, this publication) of Puerto Ayora.

However, the human movement is not only in the direction of Galapagos. Eighty-two percent of 120 residents interviewed in 2008 in the ports and highlands of Santa Cruz, San Cristóbal, and Isabela had traveled one or more times to the continent during the previous year (Grenier, 2008). A similar proportion (77%) of shopkeepers in Puerto Ayora makes such trips (Villareal, this publication). A substantial portion of the insular population flies regularly to the continent for a variety of reasons, including health and education. These figures demonstrate a high level of dependence on and vulnerability to the external

world. The insular population continues to push the geographic opening process in Galapagos, constantly demanding greater ease in “leaving” the islands.

The organization of space in Galapagos reflects the geographic opening of the archipelago

The geographic opening of Galapagos can be represented at local, regional, national, and global levels (Figure 1). The regional level is comprised of local spaces (populated islands and protected areas), which are integrated into both national and global space.

Different parts of the world are connected to Galapagos via various pathways, but always through continental Ecuador. The intensity of ecological and social transformations occurring in the archipelago depends upon the volume, intensity, and types of flows that circulate within these networks. An efficient policy to support conservation and social sustainability must act on the connections between Galapagos, continental Ecuador, and the rest of the world, to reduce the flows that enter and leave the archipelago. It is important to note that the local spaces in Galapagos are less related to each other than the archipelago is to the rest of the world. Because of this,

Galapagos development patterns are oriented “to the outside” in ways that affect the organization of the regional space (Figure 2).

The “core” of the archipelago is formed by Santa Cruz-Baltra and the adjacent islands, where two thirds of the population and insular tourism activities occur (Figure 2). This situation arose in the 1970s because of the land/sea route between Baltra (the only airport in Galapagos at the time) and Puerto Ayora, the center of tourism operations and conservation in the archipelago. The road crossing Santa Cruz generated urban expansion and tourism activity in the highlands of the island. This core area of Galapagos has a greater level of connectivity with continental Ecuador than it does with the other islands of the archipelago. Baltra is by far the major airport in the archipelago and is the only fuel supply port, making it the most important hub of tourism operations in Galapagos. Puerto Ayora receives the greatest volume of material coming from the continent via cargo ships and is the only port connected by daily passenger boats with all of the other populated islands of the archipelago. The visitor sites located in the “core” of the archipelago are the most visited of the protected areas for obvious logistical reasons.

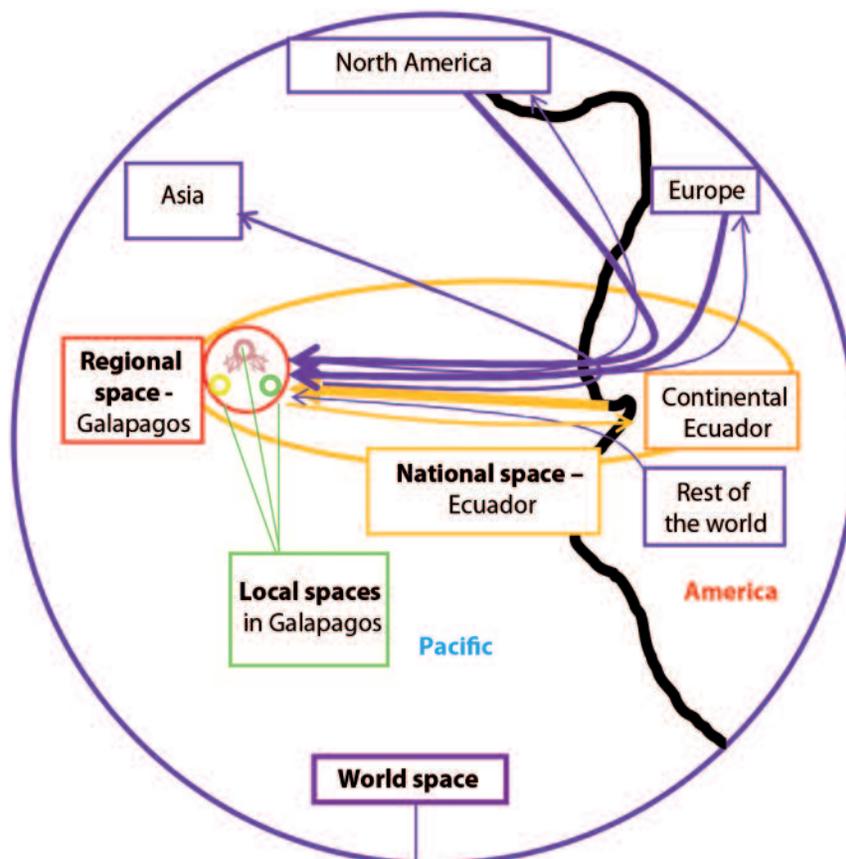


Figure 1. The spaces of Galapagos.

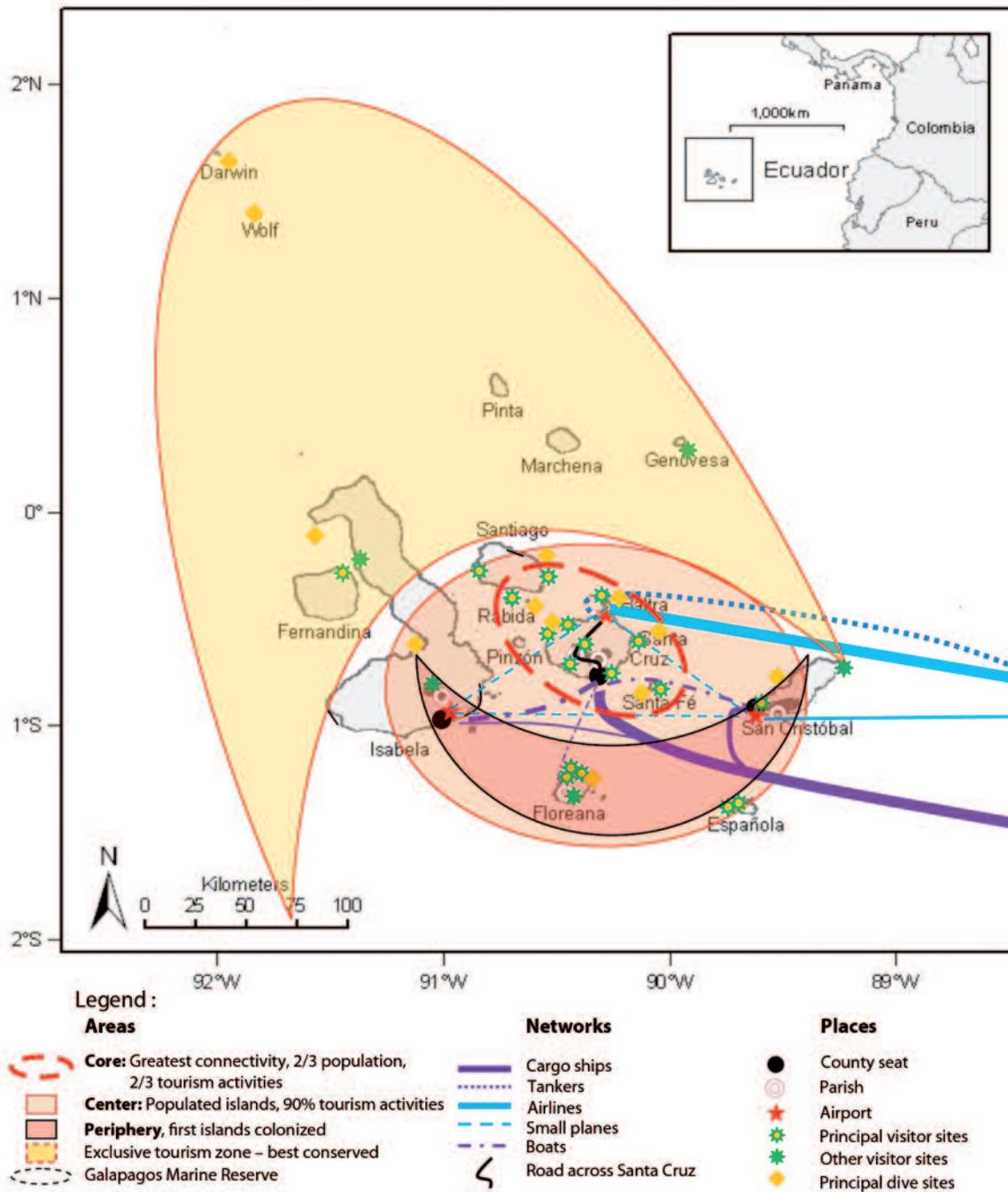


Figure 2. The organization of the regional space of Galapagos.

The central area of Galapagos, beyond the Santa Cruz-Baltra core, includes the three other populated islands. Floreana, the western portion of San Cristóbal, and the southern end of Isabela formed the historical colonized region of the archipelago prior to the development of tourism. The longer human occupation of these islands explains the extensive ecological degradation of their highlands. The fact that Puerto Baquerizo Moreno continues as the provincial capital is an inheritance from the past. The central area includes all of the population of Galapagos and 90% of its tourism activity (all of the most visited GNP sites are found there).

Consequently, it is also the zone with the greatest conservation problems. The level of connectivity of the three less populated islands with the mainland and other islands in the archipelago is much lower than that of the “core area.” The airport in San Cristóbal has only a fourth of the activity as Baltra, and San Cristóbal has no regular connection with its rural parish, Floreana. The airport on Isabela caters only to regional traffic and the island does not have a direct maritime connection to San Cristóbal.

Finally, the uninhabited islands and the uninhabited parts of the populated islands that are farthest from populated centers and the transportation hub

form an area of exclusive tourism and the highest levels of conservation. This area includes much of the north and west of the archipelago (although Punta Pitt on the northeast end of San Cristóbal is also in this group). It is the area with the lowest geographic

opening in Galapagos and is of the greatest scientific interest (for example, Fernandina and Wolf Volcano). It is also home to some of the most important recent conservation projects (Project Isabela and Project Pinta). Few tourist cruises visit these special sites.



Photo 1. In 2010, it is possible to view three commercial planes at the same time in Baltra, although up to six planes arrive per day. Fifteen years ago, six planes arrived each week. Photo: C. Grenier.

The continentalization of the insular ecosystems and lifestyles

The consequences of the geographic opening of the archipelago can be described by the concept of “continentalization.” This term highlights the contradiction between the geographic opening process and ecological isolation of oceanic islands such as Galapagos. It also describes something we can all see: social habits and human landscapes that are very similar to those on the continent. The increase in the use of taxis (see Cléder, this publication) and the invasion of introduced plants in the highlands of the populated islands (see Gardner *et al.*, this publication) are visible examples of the continentalization of Galapagos. This geographic and ecological process has obvious negative consequences for ecosystems, society, and the tourism-based economy in Galapagos.

The introduction of species and their subsequent proliferation in the archipelago have been identified for well over a decade as the principal threat to the conservation of Galapagos (Charles Darwin

Foundation and WWF, 2002) and are directly related to its geographic opening. In other words, the conservation of Galapagos becomes increasingly difficult due to the growing geographic opening of the islands, as the flows entering the archipelago greatly surpass the capacity of the quarantine systems designed to control them.

The continentalization of the archipelago also affects the insular population, though many residents gain benefits from the geographic opening. According to the majority of the inhabitants interviewed, the principal advantage to living in Galapagos is “tranquility.” This is also the opinion of 84% of the shopkeepers in Puerto Ayora (Villarreal, this publication). But the same people complain that Galapagos is losing this tranquility due to “immigrants,” who are considered responsible for the increase in crime. Also, xenophobia against certain ethnic groups (such as the Salasacas) is slowly developing in Galapagos. It is clear that some groups in Galapagos are reproducing socio-cultural communities similar to those on the continent through immigration and personal networks.

Continentalization also impedes the formation of an island culture. The lifestyle of the insular population does not differ much from its urban counterpart in continental Ecuador. For example, galapagueños are continually increasing their use of motorized vehicles and construct their houses with the same materials and with the same styles as their compatriots on the continent. Consequently, the urban landscapes of Galapagos are similar to those on the continent. Continentalization and the resulting relationship of the local population to their environment can also be seen in their leisure activities. For example, according to the local newspaper, *El Colono*, one of the most popular sports in Santa Cruz is cycling, which is done on the asphalted roads. At the same time, 40% of the 150 inhabitants interviewed in Puerto Ayora never or almost never go to the beach and 90% have never visited Media Luna in the highlands (Brouyere, research in progress).

Finally, the continentalization of Galapagos is also resulting in a loss of the tourism resource, especially in populated areas. Other national parks exist where tourists can see wild animals, even close-up. But it is the co-existence of humans with native animals in populated centers that make Galapagos a unique region of the world. The interaction of fishermen with pelicans and sea lions in Pelican Bay and the sea lion beaches in front of the sea-wall of San Cristóbal are the only tourism attractions in the two towns. For 85% of the 1020 international tourists interviewed, the presence of native flora and fauna in the towns of Galapagos is important (Bram, research in progress). Obviously, more traffic, noise, cement, and lights will mean fewer animals in the towns. For 71% of the 150 residents interviewed, this decrease in the number of native animals is notable (Brouyere, research in progress).

Conclusion

In recent years, the GNP and the CDF have viewed conservation and sustainable development of Galapagos within the concept of a social-ecological system (GNP, 2006; Watkins *et al.*, 2007; Tapia *et al.*, 2008) under which the ecological and the social components have the same importance and an equal level of dependence on one another.

In reality, the insular ecosystem is every day more affected by the geographical opening of Galapagos. It will require an increasing level of intervention on the part of humans to maintain the archipelago in a close to natural state. However, social

actors in Galapagos depend less on the insular ecosystem for their lifestyle than they do on imports of all types from continental Ecuador and the flow of tourists and tourism income coming from northern countries. Tourism only makes use of the most emblematic aspects of the insular nature. For example, tourists who visit the highlands of Santa Cruz focus on the giant tortoises and not on the local ecosystem, which has been totally transformed by invasive plants. If natural ecosystems are to survive, greater human involvement is needed. The concept of social-ecological systems does not take into account the disequilibrium that exists between society and nature in Galapagos and many other regions of the world.

A potential path to conservation and sustainability would be to build a social-ecological system in which the insular society truly depends on the ecosystems of the archipelago for its energy and food. But such an approach does not reflect current reality. The concept of a social-ecological system does not appear to be adequate to evaluate and resolve the current situation in Galapagos. Every human being lives in a populated region of the Earth to which the inhabitants identify themselves to greater or lesser degrees. A regional approach seems more relevant in working toward conservation and sustainability.

Using a regional approach provides a means of dividing the surface of the earth by both space and ecosystems. A region is at the same time an ecosystem and a geographic space. A geographic space is a social product, a portion of the surface of the earth organized by distinct social actors who live in and use its resources. Geographic spaces have existed and still exist in Galapagos, each with its own distinct footprints on the natural ecosystems and human landscapes of the archipelago. A conservation policy is sustainable when the different stakeholders in a geographic region leave footprints that do not impact the natural processes of the eco-region. In oceanic islands such as Galapagos, ecological isolation is a fundamental component of those natural processes.

Consequently, the concept of geographic opening must be at the center of an effective sustainable conservation policy for Galapagos. The concept of "geographic region" must be adapted as much as possible, focusing on the types of footprints that humans leave in Galapagos through their activity and attitudes. The rapid growth of the insular economy has



Photo: Christophe Grenier

increased the geographic opening of the archipelago, but has not resulted in real progress for the insular population, which continues to experience basic problems related to health, education, potable water, sewage, etc. In other words, insular economic development has not only had a strong negative impact on the ecology of the archipelago, it has also failed to improve the lives of the insular population. The model of economic development through geographic opening must be changed to a model of sustainable ecology with social progress.

All geographic and natural regions are systems that are open to the rest of the world. This is even more so in regions with high levels of tourism such as Galapagos. Given these circumstances, how is it possible to reduce the geographic opening of the archipelago in a manner that is sustainable for the human population? The challenge is maintaining the necessary level of economic activity for the insular population while reducing the geographic opening of the archipelago. To achieve this, the focus must be on quality not quantity, which means doing more with less. It is also fundamental to start with a complete evaluation and reorganization of tourism, the primary driver in the current and rapidly growing geographic opening of Galapagos.