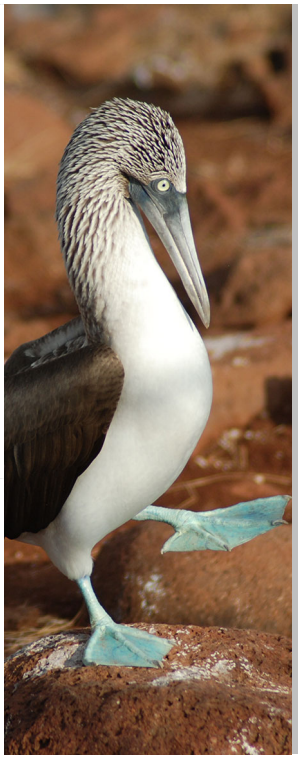

TOURIST USE AND IMPACT MONITORING IN THE GALÁPAGOS: AN EVOLVING PROGRAMME WITH LESSONS LEARNED

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ABSTRACT
Timely and relevant monitoring of tourist use and impacts is increasingly important for the adaptive management of protected area tourism. However, programmes initially set up for monitoring need to swiftly respond and adjust to emerging trends and patterns in visitation and concomitant conservation and community ramifications. Few published papers have shared successes, failures and challenges of specific tourist monitoring programmes in protected areas. This paper addresses this gap by summarising the multi-stage development of the tourist use and impact monitoring programme in the iconic Galápagos National Park and sharing the major lessons learned. From the 1960s to the present, we identified four major stages of monitoring programme development driven by a variety of forces, from the early research on tourist impacts on wildlife to the current monitoring programme that involves significant public participation and technology applications in implementing indicators. This summary should be of value to other protected areas, especially those that are accommodating fast-growing tourism, building monitoring programmes or contemplating adjustments to their programmes due to changing management challenges, information needs or capacity for monitoring implementation

Key words: Galápagos National Park; tourism; visitor sites; visitor impacts; monitoring program; indicators; SIMAVIS

INTRODUCTION
Tourism is a potentially powerful tool for biodiversity conservation in protected areas and beyond. Besides tourism's contributions to conservation finances and the local economy, transformative visitor experiences in protected areas may cultivate pro-environmental behaviours and concomitant public support for conservation (Hvenegaard & Dearden, 1998; Halpenny, 2010). Indeed, tourism is an integral component in the UN's 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns in support of multiple 2030 Sustainable Development Goals (UNEP, 2020). However, there are concerns about whether tourism's positive impacts are offset by its contributions to greenhouse gas emissions (Gössling, 2002) and its effects on landscapes and biodiversity (Newsome et al., 2012; CBD, 2016). These concerns are acute in iconic protected areas where unsustainable growth of tourism is a reality, sometimes further compounded by unsustainable population growth and subsequent resource shortages (Pizzitutti et al., 2017).

Timely and relevant data are essential to account for tourism's net impacts. Current global and national guidelines all emphasise the integral role of monitoring in the effective management of visitors and tourism in protected areas toward sustainability and desired outcomes (CBD, 2015; Leung et al., 2018; IVUMC, 2019). Effective monitoring programmes allow managers to detect trends and early warning signs while

evaluating the efficacy of management actions (Miller et al., 2012). Such programmes are particularly valuable if they are affordable and sustainable over time. In this paper, we present a case study of the Galápagos Islands with a focus on the environmental pressures associated with tourist use and activities. With the terms 'monitoring' or 'monitoring programme', we refer to systematic data collection on: 1) the characteristics of tourism visitation, such as the amount and distribution of use and tourists' behaviour, and 2) the natural resource conditions at or near tourist sites where the use pressure is considered to potentially compromise the resource conditions.

No long-term monitoring programme can be done right the first time; it is inevitably a learning and adaptive process through which the initial monitoring indicators and protocols are refined with new information and lessons learned from implementation (Lindenmayer & Likens, 2009). Tourist use and impact monitoring is no exception. In Yosemite National Park, for example, a 5-year pilot monitoring programme was designed to explore and evaluate indicators for final selection for long-term implementation (YNP, 2010). Even after this, some adjustments were still necessary due to changes in impact issues, management concerns and staff capacity (YNP, 2020). Few published papers have evaluated or reflected on the successes, failures and challenges of tourist monitoring programmes in protected areas. These experiences would be valuable for protected area managers to set realistic expectations and proactively address challenges, as there are increasing calls for consistent monitoring as a key best practice for managing protected area tourism (CBD, 2015; Leung et al., 2018).

With respect to the evolutionary nature of things, no place is more fitting than the Galápagos Islands, Ecuador (Quiroga & Sevilla, 2017). Evolution and natural selection over long time scales have been well studied in this archipelago, but less is known about the management and monitoring of tourism. This paper aims to illustrate the evolution of tourism monitoring activities in the Galápagos' protected areas. We review

Endemic wildlife and their interactions with tourists in multiple visitor sites, and a visitor education sign on the wildlife distance rule, in the Galápagos protected areas © Yu-Fai Leung

past and present monitoring efforts while highlighting the challenges, lessons learned and future needs to sustain and integrate monitoring efforts into decision-making processes. We believe that this example may facilitate dialogue among protected area managers elsewhere as they are conceiving or designing monitoring programmes for the first time, having to adjust current monitoring programmes or building capacity to sustain monitoring efforts over time. This dialogue is particularly crucial for iconic protected areas or UNESCO World Heritage Sites where fragile natural resources are increasingly threatened by unsustainable tourism growth.

THE GALÁPAGOS CONTEXT

The Galápagos archipelago possesses some of the world's most unique and endemic fauna and flora due to its isolation and active volcanism. Most of the archipelago's landscapes and ecosystems are protected in one or multiple forms. The Galápagos Islands were declared a National Park (GNP) in 1959, which was inscribed into the world's first UNESCO World Heritage Site in 1978. A total of 7,995 sq. km of terrestrial ecosystems, about 97 per cent of the archipelago's land area, are protected while the Galápagos Marine Reserve, declared in 1998, adds about 133,000 sq. km of marine ecosystems (Figure 1).

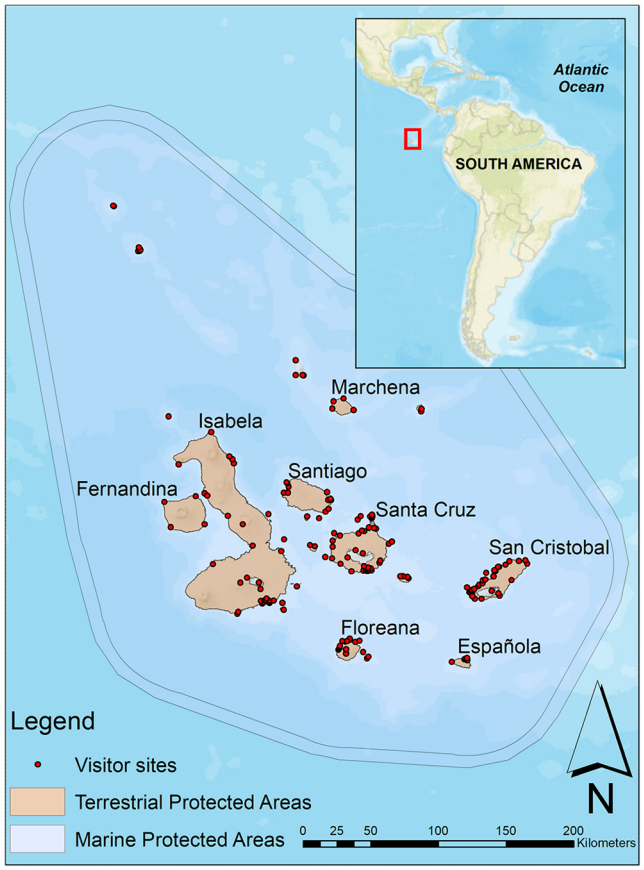


Figure 1. Visitor sites of the Galápagos National Park and Marine Reserve

In the Galápagos Islands, tourism started in the late 1960s with only two flights per week, mainly charters for the Lindblad Company operating two cruise ships, and only very few small island-based vessels were available for charter (Epler, 2007). In the 2010–2019 period, the Galápagos Islands recorded a total of 2.2 million visitors with steady growth rates of 5–9 per cent per decade since 1980 (Figure 2). Concerns of overtourism in the Galápagos Islands have been repeatedly raised, and such concerns have been substantiated by different evaluations and scenario analyses (Pizzitutti et al., 2017; Lethier & Bueno, 2018; Mestanza-Ramon et al., 2020). In fact, discussions about caps on tourist numbers are not new for the GNP as several specific caps have been proposed over time (Cifuentes, 1992). However, as Galápagos residents and the national economy depend significantly on tourism incomes, none of the proposed tourist caps was successfully implemented by the government, although the discourse has motivated the development of different management strategies intended to minimise impacts (McFarland & Cifuentes, 1996).

The Galápagos Islands comprise a total of 85 terrestrial and 98 marine visitor sites (Figure 1). To manage the terrestrial sites, the GNP has established a specific tourism zoning system with six different categories. These tourism categories vary from easily accessible recreation sites with infrastructure and services, to wild nature sites where access is possible only after several days of navigation with minimal infrastructure and no service beyond landing docks and trail markings. Using this zoning rationale, the GNP organises tour activities by modalities that determine itineraries (i.e., where to go and when) and activities (i.e., what to do) allowable for visitor sites in different zones. In total, there are six major tour modalities organised by different itineraries that range from daily visits to 15-day cruises. These itineraries are currently assigned to 162 tour operators which run big and small operations with vessels from 10 to 100 passengers.

In the Galápagos Islands, around 700 specially trained and certified guides provide guiding services to tourists as freelancers or through tour operator companies. It is not an overstatement that besides their educational role, these tour guides are essential custodians of the GNP not only by ensuring tourists' compliance to the GNP rules, but also by collecting data for GNP's tourist

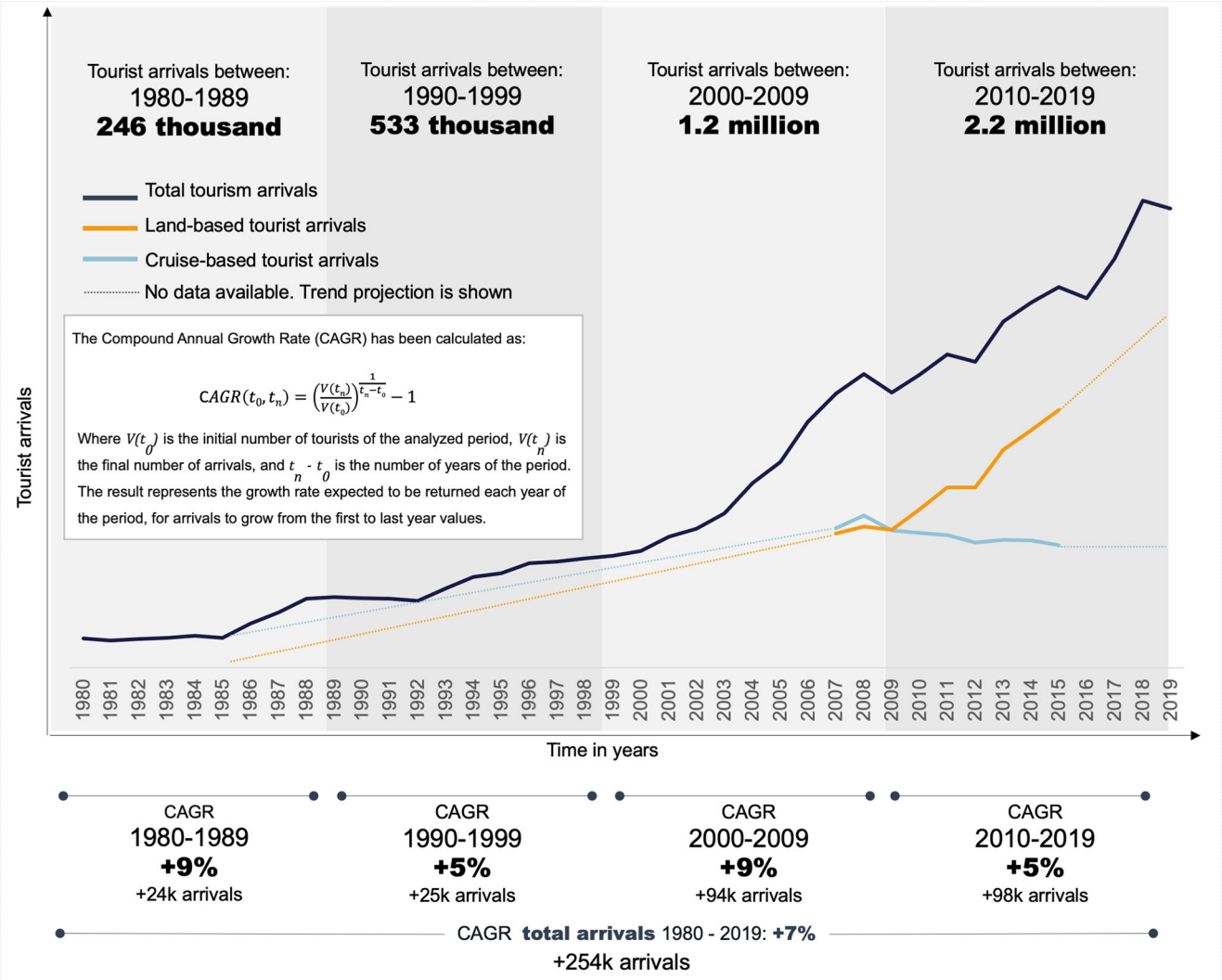


Figure 2. Tourist arrivals to the Galápagos Islands between 1980 and 2019, with Aggregation and Compound Annual Growth Rates (CAGR) shown for each decade

A certified park ranger presenting the geological history of the Galápagos Islands to his tourist group on the Bartolomé Island © Yu-Fai Leung

monitoring programme (Observatorio de Turismo de Galápagos, 2019).

Since tourism started in the archipelago, it has represented an important and often contentious matter for the Galápagos protected area authorities and the key stakeholder groups[1] (Pecot & Ricaurte-Quijano, 2019). This triggered the development and adoption of an array of visitor management frameworks and monitoring actions. However, managers at the GNP, as in many other protected areas, found it challenging to integrate monitoring tasks into the management routine, or to tap into the park's extensive scientific programme for precise data to meet managerial needs. To date, these challenges persist while the GNP struggles to adapt its management efforts to the continual growth of tourism. The following section summarises these efforts and illustrates how the Galápagos' monitoring programme has adapted to fast-changing management conditions.

TOURIST USE AND IMPACT MONITORING: THE EVOLUTIONARY STAGES

1960–1989: Early research as a foundation for management and monitoring

Since the Galápagos Islands were first conceived as an exotic tourism destination, scientists were attracted to the archipelago for its ample research opportunities. In 1966, an international group of consultants proposed the first strategy for park and tourism management (Grimwood & Snow, 1966). At this first stage, scientists proposed and conducted the first investigations of tourism's potential negative impacts on Galápagos wildlife (Figure 3). For example, Charles Darwin Foundation[2] staff ornithologists supervised a series of student thesis projects to assess tourists' impacts on seabird breeding[3] (McFarland & Tindle, 1976). Another study conducted by WWF in 1974 examined elevated tourist-caused stress through heart-rate increase in four seabird species: Frigate Birds (*Fregata magnificens*), Blue-footed Boobies (*Sula nebouxii*), Waved Albatross (*Phoebastria irrorata*) and Swallow-tailed Gulls (*Creagrus furcatus*) (Jungius & Hirsch, 1979).

As one co-author (Reck) observed, the establishment of trail-perpendicular transects in the eighties to monitor tourism-induced long-term population changes failed because the local abundance of seabirds suffered extreme natural fluctuations and no short-term tourism impact could be associated. There was no enthusiasm to invest in long-term data gathering without the possibility of short-term publications (Reck, 2017). However, as far as tourism monitoring is concerned, these early studies helped build the foundation of subsequent monitoring efforts with baseline information on specific species or visitor sites against which future conditions could be compared.

1990–2000: The first tourism monitoring efforts

As tourism was growing and diversifying in the Galápagos, the interest in learning more about the negative impacts of the tourism activities on wildlife also increased. Examples of investigations developed during this period include: 1) a study on the short-term behavioural responses of three nesting birds – Masked Booby (*Sula dactylatra*), Blue-footed Booby (*S. nebouxii*) and Red-footed Booby (*S. sula*) (Burger & Gochfeld, 1993), and 2) the study of physiological responses of Marine Iguanas (*Amblyrhynchus cristatus*) to stress caused by tourism (Romero & Wikelski, 2002).

Although these studies reported mixed results on the ecological significance of tourism impacts, they confirmed the effectiveness of previously established visitor rules and guidelines, which had been integrated by tour guides into their interpretative and educational activities. A subsequent observed reduction of direct impacts, such as the extent of informal trails and the deterioration of formal trails at visitor sites attended by guides, was attributable to these efforts. These studies also contributed to comprehensive descriptions of the ecosystems in different visitor sites, setting the foundation for zoning and the establishment of management objectives to address conservation and management needs appropriately. Consequently, the carrying capacity framework proposed by Cifuentes (1992) was revised (Cayot et al., 1996), and more site specific rules and daily caps were proposed, and the

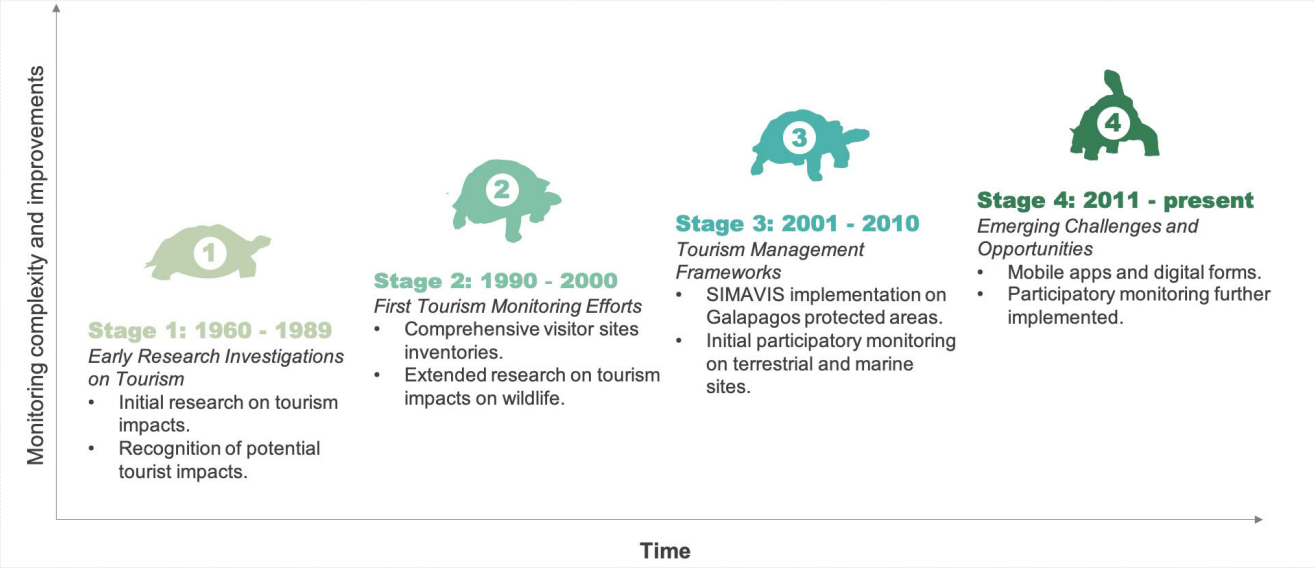


Figure 3. The development of tourist use and impact monitoring in Galápagos protected areas

Limits of Acceptable Change (LAC) framework was mentioned for the first time (Stankey et al., 1985).

Despite the contributions, research studies in this stage primarily followed elaborate procedures and protocols. Managers were not typically engaged in data collection or analysis/reporting processes. Furthermore, financial constraints and the specific academic skills required to conduct these studies prevented managers from translating the research procedures into routine monitoring practices in the Galápagos. The apparent reduction of tourism impacts also led to a lower priority of such studies among researchers at the time.

2001–2010: Tourism use and impact monitoring as a part of management frameworks

Along with the implementation of management frameworks in the Galápagos, tourism monitoring began to take shape as an intentional and continuous process (Naranjo & Izurieta, 2015). This resulted in the first monitoring programme piloted by the national park between 2000 and 2004 (GNP, 2006). This preliminary programme, however, was not tied to the Limits of Acceptable Change (Stankey et al., 1985) or any other management framework and consequently, it had little influence on management decision making.

Cruise-based tourism did not increase significantly during this decade, but local-based activities started to expand, resulting in more intensive use of recreation sites near the ports (Mestanza-Ramon et al., 2020). Rapid increase in tourism was exacerbated by deficient application of tourist carrying capacity values, prompting the GNP's fear that the present tourism management scheme was ill prepared for the soaring pressure even though it was considered efficient so far. Such concerns and circumstances prompted the development and systematic implementation of the Visitor Management System of the Galápagos (SIMAVIS in Spanish) in 2008 (Reck et al., 2015).

SIMAVIS is an adaptive management framework designed to replace fixed carrying capacity concepts but recognise those effective management techniques adopted by GNP so far. It was built on similar visitor management frameworks such as the Limits of Acceptable Changes (LAC), Recreation Opportunity Spectrum (ROS) and Visitor Experience and Resource Protection (VERP) developed in the United States (McCool et al., 2007; Leung et al., 2018). The SIMAVIS framework was adapted to the particular management conditions of isolated areas in which the use of visitor sites, distributed as a network in the archipelago, is determined by the type of terrestrial and marine activities and the type of tourism modality that give access to different sites according to specific itineraries (Reck et al., 2010 and 2015).

Essentially, SIMAVIS integrates and addresses six key elements regarding tourism in the Galápagos protected areas: zoning, acceptable number of visitors, itineraries, management strategies at visitor sites, tourism monitoring, and communication and interpretation. The monitoring rationale proposed by SIMAVIS drew on a group of quantifiable ecological, physical, social and managerial indicators. It also established the desirable conditions and the limit of acceptable changes for each zone and visitor site (Reck et al., 2008 and 2010).

Monitoring procedures, mainly for terrestrial visitor sites, incorporated a participatory approach supported by the protected area staff, academia, NGOs and tour guides, with the aim of reinforcing communication and enhancing participation among stakeholders, particularly tour guides. Monitoring of soil erosion, visitor-created informal trails, tourism congestion at specific sites, acceptable visitor capacity and visitor behaviour were implemented, giving important insights into the management of tourism in the Galápagos (Reck et al., 2010). Consequently, the monitoring results triggered the revision of itineraries under different tourism modalities and the adoption of compulsory management measures by the GNP managers.

In regard to marine tourism monitoring, one project related to the tourist use of marine environments is the most notable. Following the creation of the Galápagos Marine Reserve in 1998, the Charles Darwin Foundation initiated several studies of marine tourism, particularly at diving sites (Danulat et al., 2003). In 2006, the four-country INCOFISH monitoring plan was developed and implemented for assessing the impacts of marine tourism in the Galápagos Islands. Throughout this five-year project, different marine indicators for tourism monitoring were tested. The project fostered innovations in tourism monitoring in marine settings and contributed to important baselines on marine tourist use in the Galápagos, especially diving activities (Cubero-Pardo et al., 2007; González-Pérez & Cubero-Pardo, 2010).

Despite these advances, not all tourism monitoring procedures were sustained over time in both marine and terrestrial visitor sites due to logistical, technical or funding constraints. Furthermore, data analyses were not systematically performed due to limited staff time and capacity. These limitations underscored the need

for the SIMAVIS monitoring protocols to continue to adapt to the new challenges.

2011 to the present: The emerging challenges and opportunities for monitoring

During this contemporary period, tourism in the Galápagos has been undergoing significant transformation, not only in terms of further increases in arrivals, but also changes in visitors' profiles, expectations and interests. In contrast with conventional cruise visitors, a new profile of tourists showed more interest in travelling independently, with shorter lengths of stay, a preference to spend more time on sites located near the towns, and most importantly, their enjoyment of nature was unrelated to solitude. These emerging tourists' interests are creating significant management challenges, especially congestion and crowding in sites located near the ports. Such substantive changes imposed another challenge in an era in which efficient data collection and timely reporting of tourist use and impact are crucial. In response, the most remarkable innovation was the improvements introduced to the traditional Guides' Monitoring Report. This report, traditionally in a paper and handwritten format, was transitioned into the digitally-based 'Galápagos Guide Monitoring Network' (GGMN) initiative, which constitutes the most significant milestone expanding tour guides' participation in reporting activities through the use of technology (Box 1 for details).

Box 1: The use of technology in the Galápagos monitoring

Launched in 2017, the Galápagos Guide Monitoring Network (GGMN) is an online tool that supports the monitoring needs of SIMAVIS. Developed by the GNP with technical support from Observatorio de Turismo de Galápagos, the Charles Darwin Foundation, and financial and technical support from WWF Ecuador, the GGMN engages around 400 tour guides in monitoring using technology and mobile apps. This tool has dramatically increased the guides' monitoring efforts, including the number of observations and reporting (multiple observations at different visitor sites) (Figure B1).

The GGMN offers three main improvements:
1) It is 'observation centred' → It motivates guides to report observations regarding relevant tourism and conservation issues,
2) It allows visual records → photos can be uploaded to support text descriptions of specific impact issues or field encounters, and
3) It facilitates communication → the online form enables guides and the GNP authority to send feedback to each other.
The GGMN affords GNP managers full access to 1,500+ observations from most visitor sites annually, leading to: a) early threat alerts, such as an emerging invasive species, b) detection of trends, such as number of accidents, and c) historical and year-round data that help inform management actions. More details at: http://observatoriogalapagos.gob.ec/reporteguias

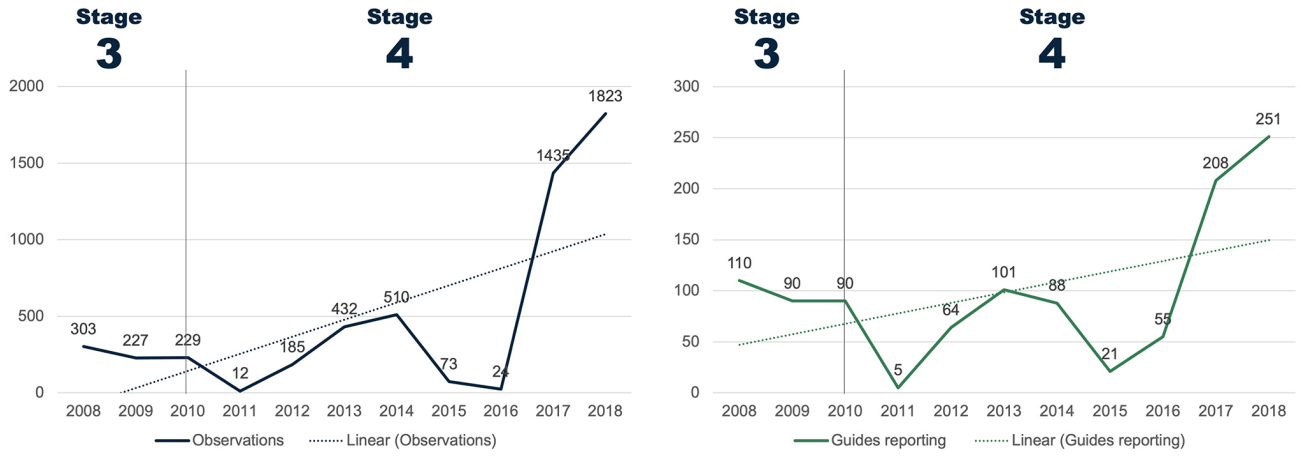


Figure B1. The number of Galápagos tour guides' observations (left) and reporting (right) annually between 2008 and 2018 (See Figure 3 and the text for the description of stages)

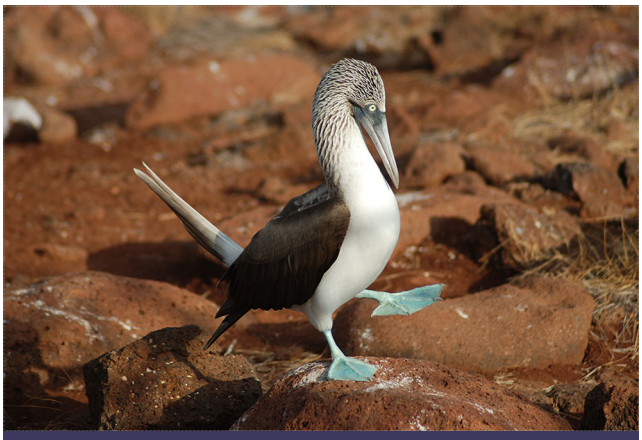
As the GGMN consolidated, new approaches for monitoring underwater tourism also appeared. From 2015 to 2019, the GNP in collaboration with different stakeholders carried out the DIVESTAT project – a participatory tourism monitoring effort aiming to improve understanding of divers, their profiles, underwater behaviour and impacts on the Galápagos Marine Reserve (WWF Ecuador, 2017). Supported by diving guides, DIVESTAT monitoring results have been important not only to gain a better understanding of diving tourists, but also to emphasise awareness and educational opportunities. This project is being expanded to include data collection by snorkelers, to establish a protocol of good practices and to augment ecological monitoring already carried out by the guides.

Following the GGMN enhancements, another major adjustment of Galápagos tourist monitoring took place when a comprehensive review of the entire SIMAVIS monitoring programme was conducted in 2017. This review led to a number of programme recommendations:

- Examine the appropriateness of monitoring procedures in order to meet the current management challenges;
- Redesign protocols and procedures for specific indicators to make them achievable;
- Propose, select and apply indicators according to zoning and site management objectives;
- Motivate participation of other stakeholders in the monitoring programme, especially tour guides; and
- Improve data collection and systematisation activities to inform decision-making processes in a timely manner.

As a result, a more participatory monitoring programme enabled by mobile technology was developed and adopted, including revised monitoring rationales, indicators, protocols and procedures (Reck et al., 2017). The revised monitoring protocols were intended to meet the urgent and fast-changing management conditions for the Galápagos protected areas by engaging managers, guides, the community, academics and volunteers. Essentially, this new protocol encourages the active contribution of different stakeholders who act as monitors of the Galápagos all year and at almost all visitor sites. Features of the ranger monitoring report tools, based on the positive results of the ongoing GGMN, were further enhanced and optimised.

Through the use of these online tools, the new ranger monitoring report is able to generate early warning



Blue-footed Booby (*Sula nebouxii*) Seymour Island, Galápagos
© Marc Hockings

alerts to inform GNP managers so they can prioritise monitoring efforts based on specific needs and objectives in order to strategically allocate resources, time, personnel and money to make monitoring more efficient. The use of mobile technology and online tools also alleviated past constraints in regard to data collection and systematisation. Consequently, the generation of timely information for managers is now possible. Furthermore, technology triggered the commitment of tour guides and rangers who felt motivated as they are contributing to decision-making and management actions. However, significant constraints still exist that limit the potential of this method to date. These include the lack of funding, the need for continued training of personnel, and limited access to technology and devices.

As most of the past GNP tourism monitoring efforts were focused on biophysical and management indicators, little attention had been paid to social indicators such as tourist satisfaction, community well-being, and cultural and educational benefits. With congestion and crowding conditions becoming more common, assessing the extent and effect of these social interactions has become crucial. In the last two years, a survey methodology has been implemented to evaluate tourist satisfaction and cultural ecosystem services provided by visitor sites near the ports at the islands of Santa Cruz and San Cristobal. Information collected includes satisfaction indicators related to the natural attributes of the site, activities carried out, the role of tour guides, number of visitors, management measures in place, and infrastructure (Cardenas et al., 2019).

Some of the social monitoring results have been incorporated into management strategies and actions for the most crowded visitor sites. One example is Las

Grietas in Santa Cruz, a series of three elongated, almost rectangular pools that cut through towering lava cliffs. During the summer and holiday season, up to 600 –700 tourists were recorded per day on this small visitor site and almost one fifth of the tourists surveyed indicated that they felt overcrowded. To overcome this long-term concern which is supported by the data, the GNP is implementing a group reservation system combined with fixed scheduling for tour operators to control the maximum use levels. Other strategies include ranger patrols and educational campaigns to increase tourists' rule compliance. Building on this first step, the GNP is planning to expand monitoring of the social dimensions of visitor use experience at this and other visitor sites for the long term.

DISCUSSION AND CONCLUSIONS

As one of the world's most iconic protected areas facing the overtourism challenge, the experiences of the GNP monitoring programme are valuable for managers in other popular protected areas and World Heritage sites who are considering whether monitoring could help, or how a monitoring programme could be designed given the capacity and constraints of the protected area and its stakeholders. We have traced the challenges and adaptation of the tourist use and impact monitoring programme in the GNP from when tourism growth first became a concern among scientists and managers. The cascade from one stage to another was triggered by the recognition of information needs to support management decisions under emerging tourism dynamics.

The four-stage development of the Galápagos' monitoring programme shares some similarities with monitoring programmes in other protected areas, even though the actual timeline is different. For example, early concerns about increasing visitation and resource impacts led to individual impact studies in Yosemite during the 1970s (Marion et al., 2016). Conducted primarily by protected area scientists, these early studies generated baseline data and initial knowledge about different impacts. As visitor management frameworks were implemented, isolated monitoring practices were weaved into framework-based monitoring efforts (Bacon et al., 2006). Lessons learned from the long-term monitoring programme of the Great Barrier Reef Marine Park, Australia, also resonate with the Galápagos experience with respect to the incremental maturation of the monitoring programme, utilising participatory monitoring options, and the consideration of innovative methods (Day, 2008).

While incorporating a participatory monitoring approach and technology also occurred in other protected areas such as Yosemite and the Great Barrier Reef, the broad range of stakeholders involved in Galápagos' monitoring is quite unique. Versatile monitoring tools, such as online forms, mobile apps and citizen science initiatives are triggering the participation of even more stakeholders including community residents and tourists. This broad-based participatory monitoring strategy offers an inclusive and flexible platform to generate information that directly benefits management, as compared to more conventional citizen -science models driven by scientists and research questions. On the other hand, participation also helps instill a sense of stewardship as it provides a tangible platform for environmental education, awareness and capacity building. Such participation helps achieve the continuity of the monitoring efforts while emphasising the important role of rangers, tour operators, guides and researchers.

However, significant barriers to implementation need to be overcome by the GNP if the current monitoring partnership is to sustain and achieve further successes. Capacity building, including continual training and support, access to technology, financial and technical support from NGOs, universities, guides and volunteers, are all key elements for sustaining the monitoring process. The question remains: How can we bring all stakeholders to the same table? How can we address all the information needs of the GNP simultaneously? Opening communication channels, like public reporting events, web pages and printed reports to the local community, has been a strategy of the GNP to show transparency and accountability in the monitoring processes and a way to encourage stakeholders' participation and support. We have learned that creating alliances among stakeholders and motivating public engagement in monitoring are critical elements for maintaining support for conservation actions and management of protected areas in the Galápagos Islands. This likely applies to other protected areas too.

In designing a monitoring programme with stakeholders' participation, we have learned that it is important to take an incremental approach with a small number of managerially relevant and simple-to-measure indicators, so that data can be generated efficiently and the utility of monitoring data in management decision making can be communicated. This positive feedback helps demonstrate to the participating stakeholders the value of monitoring and their contribution to it, thereby building trust and motivating them to engage in other monitoring indicators that may require more training. As our example shows, the use of mobile apps helped facilitate monitoring participation and data reporting by tour guides.

As illustrated in this paper, periodic reviews of monitoring programmes and indicators can be valuable exercises as use characteristics, impact issues, technologies and community capacity in support of monitoring may change over time, prompting new monitoring needs and opportunities. In the GNP, the integration of different ecological and social indicator monitoring efforts, developed by researchers and the GNP collaborators, is still a challenge. Another important challenge is to strengthen the connection of science programmes in the Galápagos Islands with the monitoring needs of the GNP so that resources and knowledge could be shared.

The GNP experience of the SIMAVIS framework also reveals that monitoring programmes are useful to management only if they are customised to the local environment, challenges, needs and capacity, even though the adaptive management logic is comparable to well publicised management frameworks in developed countries (McCool et al., 2007; Leung et al., 2018; IVUMC, 2020). Twelve years after SIMAVIS's implementation, the learning process still continues with indicators being conceived and customised for new visitor sites or new tourist use issues. Regional collaborative networks that share similar ecosystem and tourism characteristics can facilitate such learning. For example, the capacity building activities and technical exchange gained under the Eastern Tropical Pacific Marine Corridor initiative (http://cmarpacifico.org/web-cmar/quienes-somos/que-es-el-cmar/), of which the Galápagos Islands is a part, has been valuable in identifying common and replicable approaches for tourism monitoring in areas facing similar challenges.

The 2020 COVID-19 pandemic provided an opportunity to strengthen alliances through the monitoring of critical changes in Galápagos' visitor sites. All Ecuadorian protected areas are experiencing changes due to the sudden partial or complete closures resulting from national lockdowns. In the case of the Galápagos, a coordinated effort among park rangers, researchers and tour guides was quickly put in place to start monitoring of ecological resources and tourist infrastructure such as wildlife and trails at prioritised visitor sites. This speedy response benefitted from the 2017 monitoring protocols that were already in operation. There is a need to evaluate how natural environments and local communities respond to a drastic change in visitation. Results from this special monitoring can be used as a proxy to help understand the baselines of ecosystem indicators without tourist activities and how they may change once tourists return to the islands. The pandemic may therefore have created an ideal natural experiment that will provide crucial information for adaptive tourism management of Galápagos protected areas.

As the world and its protected area system is moving into the post-pandemic era, the Galápagos protected areas must harness this unparalleled opportunity to re-imagine their sustainable future in which the conservation and community development roles of tourism should be strengthened, while its growing burdens on the ecology and local residents should be alleviated. Consequently, tourism use and impact monitoring in the GNP will once again 'evolve' into the next stage with novel indicators and participatory approaches that reflect the new desired futures, evaluating whether the integration of tourism with conservation and community is indeed achievable at the world's first World Heritage Site.

ENDNOTES

1 In the Galápagos context, stakeholders include tour guides, tour operators, NGOs, local communities and academia.
2 The Charles Darwin Foundation is an international NGO created in 1959 to advise the Government of Ecuador on research and conservation measures in the Galápagos Islands.
3 Summarised in the 1975-–1976 WWF Report.

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Günter Reck is a Professor and the Director of the ECOLAP-USFQ, Ecuador. Being a fisheries biologist, he became a naturalist guide to Galápagos nearly fifty years ago. With his perspective of sustainable resource use, after his marine research, he started to develop a particular interest in techniques of impact management in non-extractive activities such as tourism in protected areas. He was particularly attracted to LAC and ROS and their multiple modifications and adaptations. SIMAVIS then became the basis of many visitor management proposals in protected areas of the region.

Keyla Castro is an Ecotourism Engineer responsible for the management of visitor sites of Galápagos National Park and Marine Reserve, Ecuador. She has collaborated as a volunteer and participated in the project review of the Visitor Management System (SIMAVIS) of the Protected Areas of Galápagos developed by ECOLAP-USFQ. In her current job, she develops management proposals for improving the monitoring protocols with an emphasis on land-based tourism; and the fulfilment of the objectives to promote the conservation of the protected areas of Galápagos.

Verónica Santamaría is the Director of Public Areas of the Galápagos National Park and Marine Reserve, Ecuador. She received a master's degree in sustainable development. Her professional experience has been linked mainly to the development of tourist activities in the Galápagos, and for more than three years in the Directorate of the Galápagos National Park. For her, it is very important to be able to analyse the changes and impacts that tourist activity could generate on the ecosystems of the Galápagos through permanent monitoring actions that support timely management decisions.

Susana Cárdenas is a Professor and Associate Director of ECOLAP-USFQ, Ecuador. Her research focuses on integrating ecology, economics and environmental policy to promote the sustainable development and management of key conservation areas. One of her main research interests is to measure and understand tourism impacts in the socio-ecological systems of the Galápagos Islands where she has worked for the last 20 years. In the last 3 years, she has been involved in developing and carrying out specific research projects related to measuring tourism impact indicators in wildlife, environmental quality and the social dimensions of the Galápagos, by working closely with GNP researchers, tour guides and local students.

Yu-Fai Leung is a Professor in the Department of Parks, Recreation and Tourism Management at North Carolina State University, USA. His research focuses on the effective monitoring and management of visitor use and impacts in global protected areas, including Antarctica. He served as the chief editor of the 2018 IUCN Best Practice Guidelines on tourism and visitor management in protected areas. He has been engaged with the Galápagos Tourist Use and Monitoring Program since 2017 when he served as an external programme reviewer. He is collaborating with ECOLAP-USFQ and Galápagos National Park colleagues in developing and evaluating new or refined indicators in support of the park's current monitoring programme.

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RESUMEN

El monitoreo oportuno y pertinente del uso y los impactos de las actividades turísticas es cada vez más importante para la gestión adaptativa del turismo en las áreas protegidas. Sin embargo, los programas establecidos inicialmente para el monitoreo deben responder y ajustarse con rapidez a las tendencias y prácticas emergentes relacionadas con las visitas y las consiguientes ramificaciones comunitarias y de conservación. Existen pocos documentos en los que se detallan los éxitos, fracasos y desafíos de programas específicos de monitoreo de las actividades turísticas en las áreas protegidas. En el presente documento se aborda esta brecha recogiendo el desarrollo por etapas del programa de monitoreo sobre el uso e impacto del turismo en el emblemático Parque Nacional Galápagos y compartiendo las principales lecciones extraídas. Desde el decenio de 1960 hasta el presente, hemos identificado cuatro etapas principales de desarrollo del programa de monitoreo impulsado por diversos factores, desde las primeras investigaciones sobre los impactos del turismo en la fauna silvestre hasta el actual programa de monitoreo que supone una importante participación pública y aplicaciones tecnológicas en la implementación de indicadores. Este resumen podría ser de importancia para otras áreas protegidas, especialmente aquellas que están acogiendo un turismo de rápido crecimiento, construyendo programas de monitoreo o contemplando ajustes a sus programas en razón de los nuevos retos en materia de gestión, las necesidades de información o la capacidad para seguir de cerca la implementación.

RÉSUMÉ

Un suivi opportun et pertinent de l'utilisation et des impacts touristiques est de plus en plus important pour la gestion adaptative du tourisme dans les aires protégées. Cependant, les programmes initialement mis en place pour le suivi doivent réagir et s'adapter rapidement aux tendances et schémas émergents en matière de visites et aux ramifications concomitantes de conservation et de communauté. Peu d'articles publiés ont partagé les réussites, les échecs et les défis des programmes spécifiques de surveillance touristique dans les aires protégées. Nous tentons de combler cette lacune en résumant le développement en plusieurs étapes du programme de suivi de l'usage et de l'impact touristique dans le parc national emblématique des Galápagos et en partageant les principales leçons qui peuvent en être tirées. Des années 1960 à nos jours, nous avons identifié quatre étapes majeures dans le développement du programme de suivi, stimulées par une variété de forces, depuis les premières recherches sur les impacts touristiques sur la faune jusqu'au programme actuel qui implique une participation importante du public et des applications technologiques dans la mise en œuvre des indicateurs. Ce résumé devrait être utile à d'autres aires protégées, en particulier celles qui accueillent un tourisme à croissance rapide, et qui élaborent des programmes de suivi ou envisagent d'ajuster leurs programmes en raison de l'évolution des défis de gestion, des besoins d'information ou de la capacité de suivi de leur mise en œuvre.