Darwin Initiative: Final Report

*To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)*

Darwin Project Information

Project reference	22-014
Project title	Maximizing Benefits of Marine Reserves and Fisheries Management in Belize
Host country(ies)	Belize
Contract holder institution	Wildlife Conservation Society
Partner institution(s)	Belize Fisheries Department, Environmental Defense Fund, The Nature Conservancy, University of Miami
Darwin grant value	£273,150
Start/end dates of project	1 April 2015 – 31 March 2018
Project leader's name	Nicole Auil Gomez
Project website/blog/Twitter	www.belizewcs.org
Report author(s) and date	Ralna Lewis, Alexander Tewfik, Julio Maaz, Gianelie Cuellar, and Nicole Auil Gomez, June 2018

1 Project Rationale

Belize is located on the Caribbean coast of northern Central America at 17°15′ north of the equator and 88°45′ west of the Prime Meridian on the Yucatán Peninsula. The two focal sites of this project are the Glover's Reef Marine Reserve (GRMR) and the South Water Caye Marine Reserve (SWCMR). These two marine protected areas are off the southern half of Belize's coast, with the former being an atoll outside of the barrier reef (45 kilometres east of the mainland at UTM coordinates 415257 East, 1859219 North), and the latter being within the reef lagoon at UTM 337800 East, 1851500 North (Fig. 1).

This project had a national focus, which looked at expanding no-take or replenishment zones to represent at least 10% of Belize's territorial sea. Additionally, project activities were executed at GRMR and SWCMR, which together comprise 22% of the country's total marine area under protection. Both GRMR and SWCMR, which are recognized for their exceptional marine ecosystems, including important oceanic mangroves, extensive seagrass meadows, and some of the most remarkable coral reefs in the Western Caribbean, also serve as valuable habitats for commercially important finfish species, lobster, and queen conch. These areas serve as traditional fishing grounds for residents of local fishing communities including Dangriga Town, Hopkins Village, and Sarteneja Village.

Passing Belize in 1848, Charles Darwin wrote that he had seen the "most remarkable reef in the West Indies." The Belize Barrier Reef, now a World Heritage Site, encompasses a wide range of habitat types and is home to 500 fish species, 134 bird species, 3 species of endangered sea turtles, and much more. This remarkable reef ecosystem, however, is under threat from overfishing.

Although Belize is well known for its network of marine reserves, only 3% of its marine territory is legally protected from fishing (designated as “no-take”). This area is too small to ensure replenishment of resources, protection of biodiversity and resilience to climate change. Outside of these no-take zones, fisheries such as lobster and conch that provide food and income for local communities are threatened by growing pressure from increasing numbers of fishers and illegal fishing. The open-access system has led to overfishing of species that are functionally critical to the health of coral reef ecosystems (such as parrotfish, an important grazer) and threatened the sustainability of local livelihoods. As a result, both the conservation and fishing communities expressed interest in developing a rights-based management approach that ensures the sustainable use of marine resources.

Consequently, this project consisted of two mutually reinforcing approaches that would work toward improving biodiversity protection and sustainable livelihoods across the Belize Barrier Reef: (1) a rights-based, Managed Access (MA) program that uses licensing to facilitate sustainable fishing and (2) the designation of certain marine areas as no-take zones that function to replenish commercial species and overall biodiversity in surrounding areas. To ensure success of both project components, an innovative enforcement program, the Spatial Monitoring and Reporting Tool (SMART) was used to inform intelligence-based enforcement effort at GRMR and SWCMR.

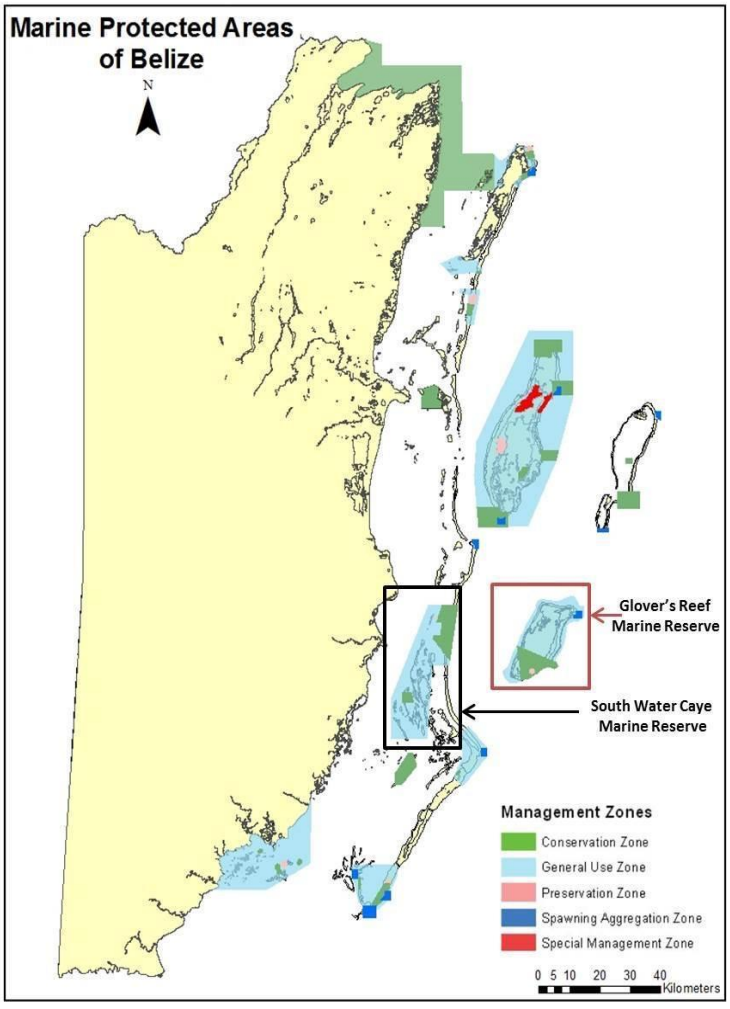

Figure 1. Belize's Network of Marine Protected Areas Including Glover's Reef Marine Reserve and South Water Caye Marine Reserve

It is quite evident that the economic security of coastal small-scale fishers in Belize has been increasingly threatened over the years due to a significant growth in the number of fishers, resulting in overfishing and increasing impact to other marine resources, causing an overall deterioration in reef ecosystem health, resulting in an unsustainable fisheries sector and fishers’ livelihoods. This

project sought to address the current levels of fishing through the MA program and the expansion of no-take zones across Belize's territorial sea, supported by dependent (catch data) and independent monitoring (LAMP) activities and the use of SMART to inform enforcement efforts across Belize's marine protected areas system.

Furthermore, Belize's small-scale fisheries sector supports 2700 fishers directly and 15,000 persons indirectly. A recent report stated that between 2005 and 2011 the number of fishers in Belize increased by 22%, but total lobster and conch catches increased by only 8%. Results from past socioeconomic assessments conducted by WCS with fishers from SWCMR and GRMR indicated that for the most part fishers' living standards remained constant, meaning that fishers were able to attain basic household items. As such, this project aimed to alleviate pressure on the marine resources that fishers depend on by managing access to these resources, so that they are not overexploited. Additionally, no-take zones would facilitate in a net migration of fish to the fished areas, thereby helping to sustain the fisheries. By reducing pressure on critical coral reef resources, the MA programs and no-take zones will help reduce poverty in two critical ways: (1) Catch-per-unit-effort (CPUE) would stabilize for each local fisher, leading to stable income from catch such as lobster and conch, and (2) The stability and sustainability of marine resources that fishers depend on would be strengthened, ensuring more reliable income and less vulnerability for fishers into the future.

2 Project Partnerships

The partners for this project included the Belize Fisheries Department, Environmental Defense Fund (EDF), The Nature Conservancy (TNC), and Dr. Elizabeth Babcock of the University of Miami. This project focused on filling gaps in the current management of Belize's small-scale fisheries sector by strengthening WCS's existing work. Given the role of the Fisheries Department and the fact that EDF and TNC's programme of work in Belize, like that of WCS, also looks at securing Belize's small-scale fisheries sector, these partnership were well established, and these partners will continue to work with WCS beyond the life of this project.

WCS and partners collaboratively planned and executed initiatives in this project. In particular, the national working groups, which included the National Replenishment Zones Expansion Steering Committee (NRZE-SC) and the Managed Access Working Group (MAWG), served as the monitoring and decision-making body for activities executed in this project.

Given the mandate of the Belize Fisheries Department, they were involved in assisting with the planning and execution of all project components since they were aimed at strengthening Belize's fisheries framework. Furthermore, the Fisheries Administrator served as a liaison with relevant policy makers, in particular the Minister of State for the Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development, and Climate Change, Hon. Dr. Omar Figueroa. Her role was key in ensuring policy makers were kept abreast of project activities and accomplishments and securing their support for the execution of activities.

The Nature Conservancy provided technical expertise in mapping and modelling activities in order to determine the most suitable areas for no-take zones based on conservation and socioeconomic targets. They led the mapping and technical analyses to determine the most effective network of no-take areas.

The Environmental Defense Fund provided the technical expertise for the ongoing development of the MA program in Belize, helping to guide the design and implementation of various critical project components, including licensing, governance, monitoring, data collection, and determining sustainable catch limits.

Dr. Elizabeth Babcock of the University of Miami supported WCS's science work by conducting analyses and modelling exercises of commercial species and logbook data.

The partners involved in implementing this project provided complementary skill sets, which were necessary for the implementation of the project. This has served well in executing project activities ensuring best use of resources and avoiding duplication of efforts. Furthermore, partners such as

TNC and EDF were able to identify and secure additional sources of funding to implement their work, which contributed to the overall outcome of this project.

3 Project Achievements

3.1 Outputs

Output 1	For GRMR and SWCMR, sustainable fishing regulations are implemented through no-take zones and license-based MA programs that employ total allowable catch (TAC) quotas.
Output 2	Spatial Monitoring and Reporting Tool (SMART) is implemented in order to improve targeted enforcement efforts aimed at reducing illegal, unreported, and unregulated fishing.
Output 3	Benefits of no-take zones and MA programs on coral reef ecosystems and resource-based livelihoods are better understood, strengthening adaptive management and community support.
Output 4	With the widespread support of fishing communities and the general public, new or expanded no-take zones are established in Belize's network of marine reserves.

Output 1: For GRMR and SWCMR, sustainable fishing regulations are implemented through no-take zones and license-based MA programs that employ total allowable catch (TAC) quotas.

The MA program has evolved into the national fishing licencing and monitoring system within the Fisheries Department. This system has naturally strengthened management in GRMR, particularly as it relates to compliance; fishers are abiding by the licensing obligations including the timely submission of their catch log books to the GRMR staff. The licensing system requires the submittal of catch logs by the captains of each vessel, detailing the catch of each fisher on board the vessel per trip. In 2017, 100% of fishers within the GRMR submitted logbooks. As MA continues to evolve, there have been slight increases in the number of licenses issued at GRMR, this in part is due to sons of fishers who utilize GRMR coming of age and applying for a license to fish in the area. These new entrants into the GRMR were duly vetted and approved by the MA committee for GRMR, which is made up of fisher representatives from fishing communities including Sarteneja, Belize City, Dangriga, and Hopkins. They continue to meet on a regular basis to review all licenses issued and provide recommendation on new applications ensuring fair and transparent management of the area.

However, due to weak management presence at SWCMR, the roll-out of MA at SWCMR has been slow. As a result, the submission of catch logbooks by fishers is low due to a lack of follow-up by management. Since June of this year, on-site management has changed and WCS has committed to assist the new reserve staff with the implementation of MA at SWCMR.

Total Allowable Catch for lobster and conch was not be established given some problems with logbook data. In addition, previous calculations of TAC for lobster and conch have yielded very wide-ranging results with very limited confidence. In addition, since the Belize Fisheries Department does not manage catch of any resource by specific fishing areas (MAs) or reserves, MA-specific TACs cannot be implemented. However, in an effort to contribute significantly to the sustainability of fisheries resources, lobster (MA areas 2, 3, 8) maturity studies as well as conch maturity and length-based finfish data analysis from GRMR were completed (Annex 7.1 and Annex 7.2). WCS has opted to use its monthly catch data that is collected from fishers who utilize GRMR, as well as lobster data from the National Fisherman's cooperative in Belize City, to conduct these analyses. In an effort to inform the management of lobster, the primary commercial species for Belize, whole lobsters harvested during the period June 2016 to February 2017 (the full season) were examined to determine sex-specific sizes of maturity. External indicators of maturity examined (two for each sex) indicated that all estimates of size-at-50%-maturity, which would be a minimum of 85 mm carapace

for females, were above the current national minimum size of 76 mm carapace length indicating that the existing regulation is promoting the harvesting of immature lobsters. Conch maturity was examined using conch captured in the shell during the period January 2015 – December 2016. Our results indicate that size-at-50% maturity is 10 mm lip thickness with a corresponding 190 g market clean meat mass. The current regulations specific for the fishing of conch does not refer to a minimum lip thickness; it does however provide a minimum shell length of 176 mm, which does not relate to maturity and a meat mass of 85 g.

Additionally, using information on the species composition and length-frequencies of fish caught in the spear, and hook and line fisheries of GRMR changes in single-species and ecosystem sustainability indicators between 2004-2010 and 2011-2017 were evaluated. In general, our analyses show that many species are subject to unsustainable levels of fishing, and some would benefit from size limits to protect the harvesting of immature individuals (Annex 7.3). These results follow previous analysis of the spear fishery in 2013 where recommendations for size limits were also made. At present, and despite the existence of a no-take area at GRMR, unsustainable fishing practises continue due to existing fisheries regulations and some non-compliant fishers. It is felt that most fishers with operate within a well-conceived set of regulations with support from enforcement assets. These findings have been presented to the Fisheries Department and will be passed on to the Chief Executive Office of the Ministry of Fisheries, Forestry, the Environment, Sustainable Development, and Climate Change.

Output 2: Spatial Monitoring and Reporting Tool (SMART) is implemented in order to improve targeted enforcement efforts aimed at reducing illegal, unreported, and unregulated fishing.

In January 2018, Hon. Dr. Omar Figueroa, Minister of State for the Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development, and Climate Change officially endorsed the adoption of SMART for intelligence-based and cost-effective enforcement of Belize's protected areas system. Hon. Dr. Omar Figueroa said, "*My Ministry recognizes the value of SMART as a management tool, especially now since we must make the best use of our resources and seek effective and efficient delivery of our mandate. It gives me great pleasure to say that today my Ministry is endorsing SMART for use at the national level by the Fisheries and Forest Department and I also encourage our NGO partners to make the best use of the technology.*"

SMART is being utilized at most MPAs to track enforcement effort with the exception of a few areas (Table 1). The pending areas have been trained in the use of SMART, however have not acquired all the necessary equipment to be able to implement SMART at their sites. They have been working to secure the resources necessary for implementation. The challenge has been to keep the stations equipped with running devices to be able to collect data year round. Additionally, the lack of full internet coverage across the Belize seascape has limited the real-time uploading of data to SMART Connect from all sites. However, as part of their reporting requirements, rangers access internet on a regular at their respective stations in order to synchronize their SMART patrol data to the Belize Fisheries Department on a monthly basis using the SMART Connect. All active patrols are currently concentrated around existing replenishment zones and in central Belize, revealing a gap in patrol along the coast and between some protected areas. The Compliance and Conservation Unit of the Fisheries Department is assessing how best to fill this gap.

Organization/Department	Marine Protected Area/Fishing Area	Status of SMART Implementation
Sarteneja Alliance for Conservation and Development	Corozal bay Wildlife Sanctuary	Complete
Belize Audubon Society	Lighthouse Reef and Blue Hole	Complete
Southern Environmental Association	Gladden Spit & Silk Cayes Marine Reserve Laughing Bird National Park	Complete

Toledo Institute for Development and Environment	Port Honduras Marine Reserve	Complete
Turneffe Atoll and Sustainability Association	Turneffe Atoll Marine Reserve	Complete
Belize Fisheries Department	Central Belize	Complete
	Caye Caulker Marine Reserve	Partial
	Glovers Reef Marine	Complete
	Bacalar Chico Marine Reserve	Pending
	Hol Chan Marine Reserve	Pending
	Southern Belize	Pending
	Sapodilla Cayes Marine Reserve	Pending
	South Water Caye Marine Reserve	Pending

Table 1. Status of Implementation of SMART at Marine Protected Areas Across Belize

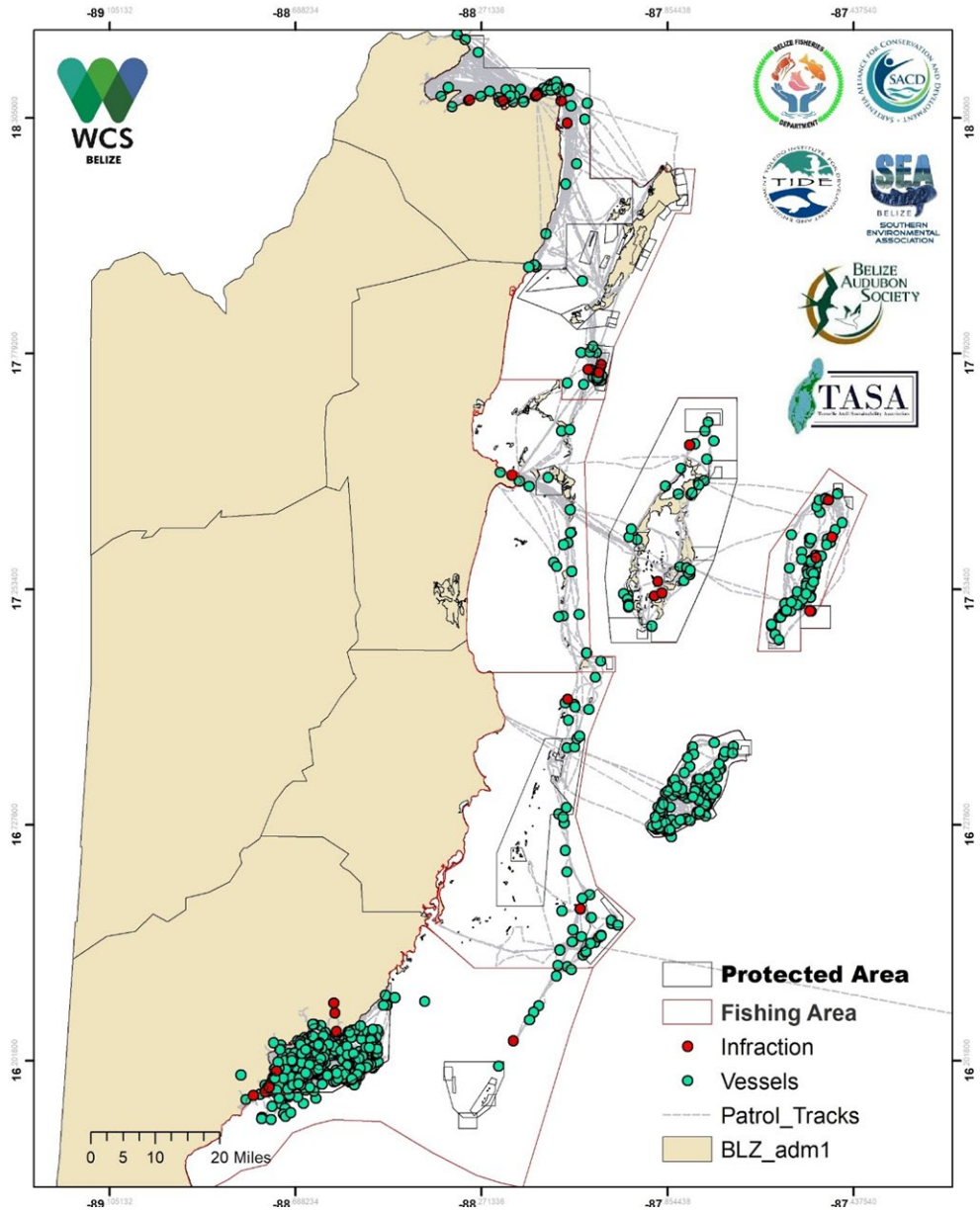

Figure 2. Map of Marine Protected Areas Actively Using SMART to Track Enforcement and Inform Management Efforts

Output 3: Benefits of no-take zones and MA programs on coral reef ecosystems and resource-based livelihoods are better understood, strengthening adaptive management and community support.

As reported in the previous annual report, a 7-year data collection period ranging from 2007 – 2013 consisting of both individual visual surveys (Long-term Atoll Monitoring Program) and fisheries-dependent catch data from GRMR were analysed to examine changes in population of an ecologically representative suite of focal species (Annex 7.6). Most small-scale fisheries targets showed an increase in density, biomass, or size within the replenishment zone area of GRMR, and stable or increasing catch rates beyond the replenishment zone boundary. However, recent (post 2014) detailed examinations of conch, lobster and finfish population structure and maturity data reveal problems with existing regulations despite the resilient nature of many of the fisheries resources at GRMR. Our recommendations of minimum sizes, the basis of any fisheries management plan, will need to be implemented to secure biodiversity and livelihoods at GRMR.

However, the socioeconomic survey (Annex 7.5) conducted during this project indicates that fishers household income have remained constant throughout the project enabling them construct their homes, provide basic healthcare for themselves and their families, and educate their children. Household income has remained consistent despite continued increases in fuel prices and the services provided to fishers. This is indicative of the benefit of fishing at site such as GRMR, were replenishments zones have been shown to result in increasing density, biomass, or size and stable or increasing catch rates beyond the replenishment zones for commercially important species. Fishing is the primary source of income for GRMR fishers. In 2017, 89 % of the fishers interviewed indicated that fishing represents 80 -100% of their incomes as compared to 70% in 2012 an indication that the license holders for GRMR are traditional fishers.

Output 4: With the widespread support of fishing communities and the general public, new or expanded no-take zones are established in Belize's network of marine reserves.

WCS has made great strides in verifying the coordinates for the deep-sea areas proposed and accepted by stakeholders and the government through a ground truthing exercise. Some of the Phase 2 targets will be met with the joint legal designation of areas included in the Marine Conservation and Climate Adaptation Project (MCCAP) and National Replenishment Zones Expansion (NRZE) project, exceeding the country's original goal of protecting 10% of its territorial waters as replenishment zones. A total of 17% of Belize's territorial sea will be established as strictly protected areas (Figure 3, Table 2). A Cabinet Paper has been drafted by WCS, EDF, FD, and TNC, which the Ministry of Fisheries, Forestry and Sustainable Development will send for Cabinet approval, along with an Enforcement Plan (Annex 7.7) developed by WCS, Belize Coast Guard, and Belize Fisheries Department. Looking ahead, plans are focused on establishing management of these new sites, financing the enforcement plan, and supporting economic alternatives for users. WCS now sits on the Maritime Security Conference, an integral partner needed for the effective enforcement of Phase 1 of the NRZE.

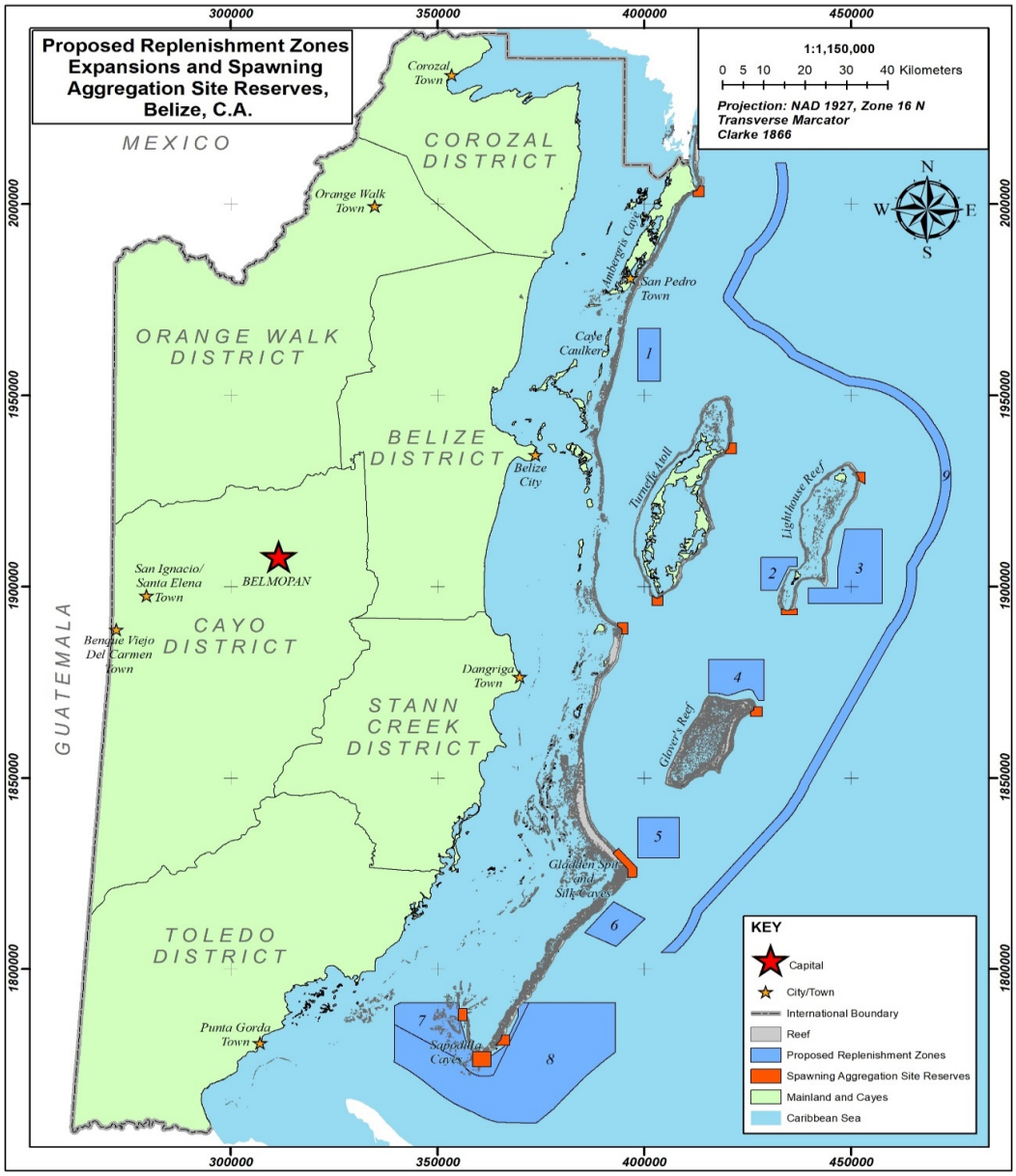

Figure 3. Proposed No-Take Areas for Phase 1 of the National Replenishment Zones Expansion Project

Zone ID	Area (Hectares)	Area in Internal Waters	Area in Territorial Sea	Area in EEZ	Percent of Internal Waters	Percent of Territorial Sea	Percent of EEZ
1	7,541.50	6,644.40	897.10	0.00	0.05	0.01	0.00
2	5,336.60	5,336.60	0.00	0.00	0.43	0.00	0.00
3	23,011.30	769.50	22,241.70	0.00	0.06	3.47	0.00
4	12,034.10	11,759.20	274.70	0.00	0.94	0,04	0.00
5	10,639.30	4,033.20	6,606.10	0.00	0.32	1.03	0.00
6	8,665.00	0.00	8,665.00	0.00	0.00	1.35	0.00
7A	20,742.10	14,327.80	6,414.30	0.00	1.14	1.00	0.00

7B	1,141.90	107.40	1,034.50	0.00	0.01	0.16	0.00
8	92,656.00	0.00	8,539.70	84,116.30	0.68	0.00	0.57
9	62,167.80	0.00	62,167.80	0.00	0.00	9.70	0.00
Total	**243,935.60**	**42,978.10**	**116,840.90**	**84,116.30**	**4.11**	**16.89**	**0.57**

Table 2. Calculated Area of Each Replenishment Zone and Percentage of Belize's Territorial Sea Limits

However, as indicated in the logframe (indicator 4.2), obtaining Cabinet's approval for the legal designation of the 10% increase in no-take areas across Belize's territorial sea has proven difficult. The Fisheries Department, NRZESC, and fishers have supported the proposed expansion; the government is also supportive, as was highlighted publicly in a speech given by Minister responsible for Fisheries, Dr. Omar Figueroa at the UN Oceans Conference in June 2017, committing to expanding Belize's no-take zones from 3% to 10% of territorial waters by 2020. However, getting full buy-in for the initiative for the expansion has been challenging. This was not an assumption identified in the original logframe as we had perceived that obtaining support from the Ministry and from fishers would have been the major challenge to overcome, and that with the support of the Ministry Cabinet would have endorsed the initiative. The Chief Executive Officer for the Ministry of Fisheries is currently meeting with the CEOs from the respective ministries to ascertain what are the areas of concern and to determine how best to move forward with the expansion.

3.2 Outcome

Our project did not fully achieve the project Outcome "Sustainable fisheries management increases catch-per-unit-effort and income, strengthens ecosystem health, and provides a model for expansion of no-take zones and managed access programs in marine reserves across Belize." The lack of a legislative instrument inscribing the replenishment zone expansion has been the shortcoming. However, having completed the entire technical and socioeconomic components, we shall continue to work with the government to achieve the legislation.

3.3 Impact: achievement of positive impact on biodiversity and poverty alleviation

This project's higher-level impact was to have Belize's marine reserves and coastal fisheries sustainably managed, significantly reducing negative environmental impacts, creating socioeconomic benefits for coastal fishing communities, and demonstrating a scalable model for Caribbean reef ecosystems.

The team worked towards strengthening the management of Belize's marine area and small-scale fisheries sector in an effort to create realized benefits for its users. The implementation of project activities such as the strengthening of Managed Access at GRMR and its implementation at SWCMR, supported by improved enforcements through the national adoption of the Spatial Monitoring and Reporting Tool (SMART), in conjunction with a plan for the national expansion of no-take zones are contributing towards the higher-level impact of the project. Collectively, these measures focussed on creating a sustainable small-scale fisheries sector in Belize that secures Belize's marine area and the livelihoods of fishers. The process and outcomes have been shared internationally by WCS and partners at several events, including the UN Oceans Conference held in New York in June 2017.

Moreover, this project focussed on securing the livelihoods of fishers and thus the wellbeing of their families. As indicated in the logframe (indicator 3.3), the socioeconomic survey revealed that fishers who use GRMR have maintained their economic benefits over the last three years (Annex 7.4). Given the current economic situation in Belize coupled with continuous increases in fuel, fishers have been able to purchase basic household items, maintain access to healthcare, and educate their children. This is an initial indication that the long-term benefits of small-scale fisheries can be secured through the implementation of Managed Access, the Spatial Monitoring and Reporting Tool (SMART), as well as the expansion of no-take zones, all working towards securing the livelihoods of fishers and the wellbeing of their dependents.

4 Contribution to Darwin Initiative Programme Objectives

4.1 Contribution to Global Goals for Sustainable Development (SDGs)

This project looked at addressing Sustainable Development Goal 14, “Life Below Water”, through conservation and sustainable use of the oceans, seas and marine resources for sustainable development. In particular, Target 14.5, which aims at the conservation of at least 10% of coastal and marine areas, consistent with national and international law and based on best available scientific information.

4.2 Project support to the Conventions or Treaties (CBD, CITES, Nagoya Protocol, ITPGRFA)

This project will assist Belize in meeting its commitment under the Convention on Biological Diversity (CBD) to designate at least 10% of its marine territory under full protection (Aichi Targets 11 and 14). Through the participation of fishers and the implementation of a managed access program, this project will contribute to sustainable fisheries management as well as better awareness and understanding of the importance of biodiversity conservation to securing livelihoods (Aichi Targets 1, 4 and 6). By expanding protected areas and improving management of fishing, this project will reduce stress on the Belize coral reef system, contributing to better overall reef ecosystem health (Aichi Target 10) and, in turn, to improved livelihoods and well-being of fishing communities (Aichi Target 14). Furthermore, with the expected improved health of coral reefs, the project will also contribute to increased resilience of this ecosystem to climate change (Aichi Target 15).

4.3 Project support to poverty alleviation

The project indirectly addressed human development and wellbeing by working towards securing Belize’s small-scale fisheries sector. Fishers and their families from Sarteneja, Dangriga, Hopkins are the key targets in regards to poverty alleviation. Our support to the local fishing associations in those three main coastal communities has provided them with direct funding support for projects, such as a revival of pig rearing in the Sarteneja community, which benefited 33 persons (12 women and 21 men) directly and fishing gear investment in the Hopkins community, which benefited 20 persons. In addition, WCS has assisted these groups in preparing strong proposals for their capacity building or supplemental livelihoods, such as scuba diving and seaweed farm training of 15 persons in Dangriga, and tour guide training in Sarteneja. This project has engaged local community members through formal fishing associations, with the support of Darwin Initiative. WCS was able to leverage additional support to them for capacity building and project development, including a direct donation of US$20,000 from the blue moon fund to Sarteneja Fisher Association. In 2015-2016, fishers association in Dangriga and Sarteneja were able to access $US110,000, for economic diversification projects through the support of WCS in project development. This support has benefited the Sarteneja women’s group and a new youth group.

4.4 Gender equality

The Sarteneja Fishermen Association (SFA), in late 2016, assisted in the formation of a women’s group that is focused on the creation of jewellery made from the spines and fins of the invasive lionfish as a source of income. This is an indirect benefit from our support to the community focused on women, and came about as a part of our community development work. Furthermore, SFA has created a revolving development fund of US$7,000 for this group of 11 women, for them to use for small business opportunities. Through the support of WCS, SFA also engaged the women's group in the pig-rearing project, benefitting 12 women from the group. The women’s group have also received equipment for them to do bake sales. In addition, SFA enrolled fishers, including their female dependents in a Tour Guide Training Course in July of 2017, with funding from the GEF Small Grants Programme.
SFA also secured funding for a project to create a youth environmental group, for which members will be trained in marine conservation and stand to benefit from educational scholarships, book donations, and technical and leadership training. Furthermore, WCS’s community meetings include fishers and their spouses.

In Year 3 and 4 of the project WCS along with its partner, the staff for the Marine Conservation and Climate Adaptation Project (MCCAP) organized a Women in Fisheries Forum in June during Fisherfolk Month. The first Women in Fisheries Forum (Annex 7.8) was geared towards promoting the achievement of gender equality and equity in the allocation of resources, rights, status and responsibilities between women and men. Consequently, the participants were presented with the results of a study, which looked at the perception of women in fishing communities with regards to gender equality in general; and specifically, within the fisheries sector. Based on the outcome of the study, an Action Plan was developed, which looked at mainstreaming gender in the daily activities of Government Departments, NGO's and Projects. The main objective of the Women in Fisheries Forum 2 was to socialize the FAO's Voluntary Guidelines for Securing Small-Scale Fisheries in the Context of Food Security and Poverty Eradication and to share progress on the Gender Action Plan conceived at the last meeting.

4.5 Programme indicators

- **Did the project lead to greater representation of local poor people in management structures of biodiversity?**

  The integral component of the Managed Access system is the equal participation of fishers, regardless of financial status, in the development and implementation processes.
- **Were any management plans for biodiversity developed?**

  While not funded by this project but additional funding from the Oak Foundation, a management plan was developed for the GRMR 2018-2022.

- **Were these formally accepted?**

  The Plan has not been finalized for presentation to the Fisheries Department for formal acceptance.

- **Were they participatory in nature or were they 'top-down'? How well represented are the local poor including women, in any proposed management structures?**

  The Plan's development was developed with a consultant leading several planning and verification workshops with WCS, the GRMR Advisory Committee and other stakeholders, including the local fishers. The women represented were landowners and Fisheries Department personnel.
- **Were there any positive gains in household (HH) income as a result of this project?**

  Household (HH) income remained relatively stable as compared to results in prior socioeconomic surveys conducted.
- **How many HHs saw an increase in their HH income?**

  There was no increase in household income, this remained stable throughout the project.
- **How much did their HH income increase (e.g. x% above baseline, x% above national average)? How was this measured?**

  Not applicable

4.6 Transfer of knowledge

No formal qualifications were attained through this project. A series of SMART training were given, which sought to increase the enforcement capacity of enforcement officer. This project allowed us to carry out direct capacity building through training in SMART and SMART Connect to the Fisheries Department and four marine protected areas comanagers across the country. The training recipients were all Belizean and consisted of men and women (roughly 7% females). The Fisheries Department staff adopted the use of SMART as part of its Conservation Compliance Units in Belize City and Punta Gorda for all fisheries related enforcement. Staff from a range of NGOs who manage Belize's sanctuaries, parks, and reserves are in the implementation phase of SMART, these includes: The Sarteneja Alliance for Conservation and Development, which manages the Corozal Bay Wildlife Sanctuary, the Belize

Audubon Society, which manages the Blue Hole Natural Monument and the Lighthouse Reef Natural Monuments; the Turneffe Atoll Sustainability Association, which manages the Turneffe Atoll Marine Reserve, the Southern Environmental Association, which manages Gladden Spit and Silk Caye Marine Reserve and the Laughing Bird National Park, and the Toledo Institute for Development and Environment, which manages Port Honduras Marine Reserve.
Furthermore, due to WCS's very good reputation in conservation compliance, WCS's Sustainable Fisheries Technical Coordinator Mr. Julio Maaz was asked by the Belize Coast Guard to join the National Maritime Security Conference, made up of government agencies with some responsibility for maritime security, and now three NGOs.

5 Sustainability and Legacy

It is expected that work will continue regarding the strengthening of the MA program and the utilization of SMART given its national roll-out and official endorsement by the Minister. Given that the cartographic legal descriptions have been drafted for the no-take zone expansion WCS along with the project partners, primarily the Fisheries Department will continue to work with the Government of Belize ensuring the eventual legal designation of the expansion.

Staff involved in executing this project will remain as part of the WCS Belize team. No physical assets were purchased with project funds.

6 Lessons learned

A major strength for this project was the quality and complementarity of partners involved in executing the project activities. As described earlier, the partners provided complementary skill sets and funding, which facilitated the implementation of project activities. A major hurdle for this project has been obtaining government support for the legal designation of the no-take zone expansion. Our efforts were focussed more on developing the necessary documentation needed for the expansion and obtaining the support of the respective Minister with the intent that the Ministry would have been able to push forward the no-take zone expansion. As it relates to the socioeconomic work, we discontinued using monetary values since fishers were misrepresenting their annual/monthly income. We were able to see this from the data they submitted in their catch logbooks. Unfortunately, in 2017, the Belize Fisheries Department did not enter the catch logbook data yet and WCS is no longer receiving the logbooks.

Consequently, to meet our outputs in a more timely manner, we should have considered engaging all Ministers in the project at its onset, linking the project objective to that of the country's Growth and Sustainable Development Strategy, highlighting how this project directly works towards strengthening the economic and social development.

Consequently, for projects such as these it is important to remember that conservation is often viewed by policy makers as being in direct competition with allowing citizens to utilize or extract resources and in the short-term preventing those who depend on these resources to earn a living. Being able to communicate with policy makers the overall benefit of implementing such projects at their onset would be beneficial in ensuring project activities are fully executed and legally endorsed.

As a result, there were several key lessons learnt from executing this project. Firstly, the use of TACs to verify the indicator of increase in CPUE was unsuitable. The description of the TAC is a management decision. We still believe it is more effective to modify existing fisheries regulations with biologically relevant size limits and other harvest controls (seasons, replenishment zones, and landing whole fish - no fillets) that can be easily monitored at limited landing sites nationally. WCS completed maturity assessments for lobster and conch, and have preliminary analyses for finfish, as described in Output 1. We anticipate policy amendments based on these finding, achieving the same management benefit to the fisheries, and keeping the managerial and enforcement systems simple, and in line with long-term management customs.

Furthermore, while working closely with the managing authority on strategic processes and technical assessment has been beneficial for producing end products, prioritizing, as it relates to policy reform, setting endpoints is unrealistic as the legislative passage is prioritized by Cabinet.

6.1 Monitoring and evaluation

As described above the se of Total Allowable Catch (TACs) to verify the indicator of increase in CPUE was determined to be an unsuitable indicator for the project and as a result, WCS decided it was more effective to modify existing fisheries regulations with biologically relevant size limits and other harvest controls.

Additionally, in 2016 our project underwent a midterm review by LTS International, so we received an advantage of having the process of discussing the project implementation with each other, independent reviewers, and our partners and stakeholders. We received the report in March, and incorporated recommendations as applicable, for Year 3 of the project.

6.2 Actions taken in response to annual report reviews

As noted above, the feedback received for the independent onsite evaluation as well as comments regarding the first annual report, our main adjustment has been moving away from establishing TACs and focussing on modifying existing fisheries regulations pertains to biological size limits and other harvest controls. The feedbacks and comments were reviewed internally and shared with partners as we worked to towards implementing the remaining project activities.

7 Darwin identity

The Darwin Initiative has been duly acknowledged as a donor at all public engagements, press conferences, and in print material. In January 2018, a ceremony was held where Hon. Dr. Omar Figueroa, Minister of State in the Ministry of Agriculture, Fisheries, Forestry, the Environment, Sustainable Development, and Climate Change officially endorsed the adoption of SMART for intelligence-based and cost-effective enforcement of Belize's protected areas system. The Darwin Initiative and UK Government were publicly acknowledged as a donor at this event, in press releases, WCS Belize Facebook page, and news interviews. In addition, all print-based products, including publications developed with funding from this project have clearly acknowledge the Darwin Initiative and UK Government as a donor.

The Darwin Initiative funding formed part of a larger programme of work being implemented in Belize. The activities funded through this project served as a complement to ongoing sustainable fisheries initiatives the WCS programme is implementing in Belize.

The Darwin initiative is known among the NGO community and other donor recipients.

8 Finance and administration

8.1 Project expenditure

Project spend (indicative) since last annual report	2017/18 Grant (£)	2017/18 Total actual Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			0%	
Consultancy costs			0%	
Overhead Costs			0%	
Travel and subsistence			0%	
Operating Costs			0%	
Capital items (see below)			-	
Others (see below)			0%	
TOTAL				

Staff employed (Name and position)	Cost (£)
Nicole Auil Gomez	
Alexander Tewfik	
Ralna Lewis	
Julio Maaz	
Virgina Burns	
Sandra Zelaya	
Gianelie Mai	
TOTAL	

Capital items – description	Capital items – cost (£)
N/A	
TOTAL	

Other items – description	Other items – cost (£)
Office Supplies for BZE Office Supplies & Materials for Monitoring & Enforcement Bank Charges & Fees Publications	
TOTAL	

8.2 Additional funds or in-kind contributions secured

Source of funding for project lifetime	Total (£)
OAK Foundation	
Summit Foundation	
TOTAL	

Source of funding for additional work after project lifetime	Total (£)
WCS MPA Fund	

TOTAL	

8.3 Value for Money

The financial contribution from Darwin Initiative has allowed WCS to execute the activities of this project, as well as leverage other direct sources of funding to achieve more beyond the scope of this project. For example, this project facilitated WCS's marine research activities, in particular the field data collection component as well as the technical expertise of a fisheries modeler Dr. Babcock, who worked very closely with our Marine Conservation Scientist - also funded in part by this project - that subsequently led to several peer-reviewed publications. The publication "Benefits of a replenishment zone revealed through trends in focal species at Glover's Atoll, Belize" is an invaluable result of the work and funding that has been accomplished through this project. Additionally, the *Punta Fuego* radio drama described many of the research successes that showed the benefits of replenishment zones, and the Managed Access system, as funded through this project.

Annex 1 **Annex 1 Project's original (or most recently approved) logframe, including indicators, means of verification and assumptions.**

Note: Insert your full logframe. If your logframe was changed since your Stage 2 application and was approved by a Change Request the newest approved version should be inserted here, otherwise insert the Stage 2 logframe.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Belize's marine reserves and coastal fisheries are sustainably managed, significantly reducing negative environmental impacts, creating socioeconomic benefits for coastal fishing communities, and demonstrating a scalable model for Caribbean reef ecosystems.			
Outcome: Sustainable fisheries management increases catch-per-unit-effort and income, strengthens ecosystem health, and provides a model for expansion of no-take zones and managed access programs in marine reserves across Belize.	1. By 2018, fishery-dependent data from GRMR indicates an increase in CPUE to at least 7.5 conch/hour and 1.5 lobsters/hour, compared, compared to a current baseline of 6.5 conch/hour and 1.3 lobsters/hour. 2. By 2018, fishery-independent surveys at GRMR of conch, lobster, selected species of finfish including parrotfish, Diadema, as well as coral cover, show improvement against established baselines: Mean conch density of 70 conch/ha against a baseline of 60 conch/ha. Mean lobster density of 32 lobster/ha against a baseline of 28 lobster/ha Mean biomass of parrotfish of 12kg/ha against a baseline of 10kg/ha Mean Diadema density of 0.08 urchins/m2 against a baseline of 0.06 urchins/m2 3. By 2018, annual socioeconomic surveys of 135 fisher families around GRMR show a 3% increase in average fishing-related income from £3,234 to £3,534/fisher/year. 4. By 2018, the WCS-facilitated NRZE Steering Committee has successfully increased the designation of no-take areas from 3% to 7% of the territorial sea of Belize, achieving significant progress towards the national goal of 10% by the end of 2018.	1. Reports on number of MA licenses issued, total lobster and conch catches in relation to total TAC, reports on CPUE and total catch and total value. 2. WCS survey reports on densities of conch, lobster, selected species of finfish including parrotfish, Diadema, and percentage cover of coral and algae. 3. Annual socioeconomic survey reports tracking trends in quality of life of fishers. 4. National working group minutes, reports and communiqués. 5. Reports on number of MA licenses issued, logbook data.	1. The political will to establish additional replenishment zones exists. WCS is actively involved at the community level and the political level, and there is indication that Belizeans support further development and expansion of the activities currently piloted at GRMR and to be developed at SWCMR. 2. The Fisheries Department continues to support the rights-based, or MA, program. WCS works in close collaboration with the Fisheries Department, which has supported the development of MA programs and plans to expand this approach as a national strategy for marine resource management. 3. The fishers are willing to participate in the MA program and support the no-take expansion. Fishing communities have expressed their desire for programs that reduce overfishing that has caused a decline in key marine species and has led to reduced income. 4. The export prices for lobster and conch remain at a stable level. The revenue from these two major fisheries is based to a large extent on exports by the fishing cooperatives, mainly to the US market. These prices will influence how much fisher income will

	5. By the end of the project, the SWCMR MA program will be in year 3 of licensing with 80% of fishers submitting their catch data logbooks.		change during the lifetime of the project. 5. There are no natural disasters, such as hurricanes and el Niños, during the project period that will affect the coral reefs and near-shore fisheries. Even in light of a major storm event, WCS is committed to working on managed access and no-take expansion in these geographies and Belize in the short- and long-term.
Outputs: **1**. For GRMR and SWCMR, sustainable fishing regulations are implemented through no-take zones and license-based MA programs that employ total allowable catch (TAC) quotas.	1.1 The number of annually-issued MA licenses for GRMR remains stable at the current rate of about 130/year. 1.2 At least 95% of MA licensed fishers in GRMR are completing and submitting their catch logbooks each year. 1.3 At SWCMR, where licenses have not been issued yet, the number issued annually will decrease by at least 5% between year 1 and year 3. 1.4 The annual catch of lobster and conch for each reserve remain within the level required by their respective TACs. 1.5 Participation at MA Committee Meetings and Annual Fisher Forums is at least 70% of licensed fishers, demonstrating active interest and participation in the program.	1.1Record of licenses issued at GRMR 1.2 Logbook catch database and analysis reports 1.3 Record of licenses issued at SWCMR 1.4 Logbook analysis reports; scientific publications and technical reports detailing development of TACs 1.5 Minutes of meetings of National MA Working Group and MA committees; reports of Annual Fishers Forums including list of participants and presentations	1. The Fisheries Department continues to share data on licenses issued, the catch logbooks and on enforcement. 2. The Managed Access program remains a central policy of the Fisheries Department and its expansion to additional areas proceeds as planned. 3. The Fisheries Department implements and enforces a total allowable catch for the lobster and conch fisheries. 4. The Ministry of Fisheries and fishers support the expansion of the no-take, or replenishment areas to meet the target of 10% of the territorial sea.
2. Spatial Monitoring and Reporting Tool (SMART) is implemented in order to improve targeted enforcement efforts aimed at reducing illegal, unreported, and unregulated fishing.	2.1 By end of year 1, 100% of patrols at GRMR and SWCMR by the Fisheries Department are carried out using Spatial Monitoring and Reporting Tool (SMART). 2.2 Infraction rate in GRMR declines from 4% to 3% by the end of the project. 2.3 Infraction rate in SWCMR declines from 5% to 3% by the end of the project. 2.4 Maps produced on patrol activity, fishing activity, and hotspots of illegal activity.	2.1 Surveillance and enforcement (SMART) reports describing patrol activities and results 2.2 GRMR annual reports 2.3 SWCMR annual reports 2.4 Reports which include maps produced	1. The Fisheries Department continues to share data on licenses issued, the catch logbooks and on enforcement. 2. The Managed Access program remains a central policy of the Fisheries Department and its expansion to additional areas proceeds as planned. 3. The Fisheries Department implements and enforces a total allowable catch for the lobster and conch fisheries. 4. The Ministry of Fisheries and fishers support the

			expansion of the no-take, or replenishment areas to meet the target of 10% of the territorial sea.
3. Benefits of no-take zones and MA programs on coral reef ecosystems and resource-based livelihoods are better understood, strengthening adaptive management and community support.	3.1 Reports on trends in CPUE and fisher income produced annually and distributed at Annual Fisher Forums at GRMR and SWCMR, demonstrating benefits to community members. 3.2 Each year, results of logbooks and independent sample datasets are analysed and used for new TAC models, allowing for us to adaptively manage the regulations. 3.3 Two peer-reviewed scientific papers on the lobster and conch depletion models and performance of the no-take area of GRMR will be submitted for publication by the end of year three.	3.1 Annual reports on CPUE and fisher income 3.2 Reports on catch data and independent data analysis 3.3 Scientific article manuscripts	1. The Fisheries Department continues to share data on licenses issued, the catch logbooks and on enforcement. 2. The Managed Access program remains a central policy of the Fisheries Department and its expansion to additional areas proceeds as planned. 3. The Fisheries Department implements and enforces a total allowable catch for the lobster and conch fisheries. 4. The Ministry of Fisheries and fishers support the expansion of the no-take, or replenishment areas to meet the target of 10% of the territorial sea.
4. With the widespread support of fishing communities and the general public, new or expanded no-take zones are established in Belize's network of marine reserves.	4.1 No-take zones and their benefits are supported by at least 50% of survey respondents. 4.2 Fifteen meetings of National Replenishment Zones Expansion Project Steering Committee are coordinated and held. 4.3 Statutory instruments designating at least 7% of territorial sea as no-take zones are passed by the end of the project (with the ultimate goal of 10% by the end of 2018).	4.1 Survey results 4.2 Minutes of meetings of the Steering Committee 4.3 Government gazette with statutory instruments	1. The Fisheries Department continues to share data on licenses issued, the catch logbooks and on enforcement. 2. The Managed Access program remains a central policy of the Fisheries Department and its expansion to additional areas proceeds as planned. 3. The Fisheries Department implements and enforces a total allowable catch for the lobster and conch fisheries. 4. The Ministry of Fisheries and fishers support the expansion of the no-take, or replenishment areas to meet the target of 10% of the territorial sea.

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

1.1 Assist authorities with data collection and analysis for development of TAC for conch and lobster for SWCMR.

1.2 Monitor trends in number of MA licenses issued annually at GRMR and SWCMR to understand how licensing criteria impact the number of fishers in each reserve.

1.3 Assist the Fisheries Department with entering catch data from fishers and monitor total catch per reserve, evaluating against established TACs.

1.4 Collect independent sample of catch data monthly in both reserves to serve as benchmark for quality control, allowing for the evaluation of the accuracy of fisher logbook data.

1.5 Conduct regular meetings of the MA Committees and Annual Fisher Forums to ensure that fishers are kept up-to-date on program progress and have an opportunity to discuss their concerns.

2.1 Train Fisheries Department and NGO personnel who help co-manage marine reserves in the use of SMART software and procedures, including use of the new applet for tablet use, in order to record and track enforcement effort and illegal activities.

2.2 Collaborate with reserve enforcement staff in developing SMART reports to determine infraction rates.

2.3 Use SMART results to identify types and hotspots of illegal activity in order to design more effective and efficient patrols that reduce distance travel and fuel used.

2.4 Use SMART to map fishing activity throughout the reserves in order to better understand fishing patterns.

2.5 Convene workshop to review implementation of national SMART rollout and conduct training in analysis of data.

3.1 Analyse both logbook and independent sample datasets for conch and lobster, including mean size, population structure, and CPUE, and use results to update TAC models each season.

3.2 Using well-established protocols, monitor and report on a suite of coral reef ecosystem health indicators (including several focusing on critical herbivores like parrotfish).

3.3 Conduct annual socioeconomic surveys of MA licensed fishers in collaboration with the Fisheries Department.

3.4 Monitor perceptions among fishers of the necessity and effectiveness of enforcement program.

3.5 In collaboration with partners, prepare and disseminate information on results with participating fishers in order to foster dialogue and continued support.

4.1 Conduct national survey to evaluate level of understanding and support for no-take areas and their benefits.

4.2 Facilitate regular bi-monthly meetings of the Steering Committee for the National Replenishment Zones Expansion program, and its associated Technical and Communications Sub Committees.

4.3 Conduct quarterly meetings of the Reserve Advisory Committees and discuss potential new expanded zones (proposed by WCS and TNC) with stakeholders at these forums.

4.4 Develop outreach material in coordination with TNC and the Fisheries Department to inform stakeholders of the biodiversity and fisheries benefits of no-take areas that incorporate results from GRMR analyses.

Annex 2 Annex 2 Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements
Impact: Insert **agreed** project Impact statement Belize's marine reserves and coastal fisheries are sustainably managed, significantly reducing negative environmental impacts, creating socioeconomic benefits for coastal fishing communities, and demonstrating a scalable model for Caribbean reef ecosystems.		Report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity e.g. steps towards sustainable use or equitable sharing of costs or benefits
Outcome Insert **agreed** project Outcome statement Sustainable fisheries management increases catch-per-unit-effort and income, strengthens ecosystem health, and provides a model for expansion of no-take zones and managed access programs in marine reserves across Belize.	Insert **agreed** Outcome level indicators 1. By 2018, fishery-dependent data from GRMR indicates an increase in CPUE to at least 7.5 conch/hour and 1.5 lobsters/hour, compared, compared to a current baseline of 6.5 conch/hour and 1.3 lobsters/hour. 2. By 2018, fishery-independent surveys at GRMR of conch, lobster, selected species of finfish including parrotfish, Diadema, as well as coral cover, show improvement against established baselines: Mean conch density of 70 conch/ha against a baseline of 60 conch/ha. Mean lobster density of 32 lobster/ha against a baseline of 28 lobster/ha Mean biomass of parrotfish of 12kg/ha against a baseline of 10kg/ha Mean Diadema density of 0.08 urchins/m2 against a baseline of 0.06 urchins/m2 3. By 2018, annual socioeconomic surveys of 135 fisher families around GRMR show a 3% increase in average fishing-related income from £3,234 to £3,534/fisher/year. 4. By 2018, the WCS-facilitated NRZE Steering	Report on progress towards achieving the project purpose, i.e. the sum of the outputs and assumptions 1. The 2016 – 2017 catch data collection indicated that the mean CPUE for conch was 13.7 (+/- 1.2) conch/fisher-hr. and compares favourably to a mean of 12.8 conch/fisher-hr. in the previous season and lobster catch-per-unit effort (CPUE, lobster/fisher-hour) averaged 2.7 (+/- 0.3 se), a large increase over the previous season (2014 - 2015) 1.6 (+/- 0.4 se) (Annex 7.9). 2. Fishery-independent surveys at GRMR (Annex 7.6) shows an improvement in density for conch, lobster, and selected species of finfish including large parrotfish. However, densities of Diadema urchins remain low and follows regional trends. Details on conch trends in conch and lobster density continue to be examined and are focused on locating areas where mature individuals live and engage in reproductive behaviours that support future recruitment to the fishery. 3. The 2018 socioeconomic survey conducted revealed that GRMR fisher incomes remained constant over time. The survey results revealed that fishers that use GRMR are able to attain basic

	Committee has successfully increased the designation of no-take areas from 3% to 7% of the territorial sea of Belize, achieving significant progress towards the national goal of 10% by the end of 2018. 5. By the end of the project, the SWCMR MA program will be in year 3 of licensing with 80% of fishers submitting their catch data logbooks.	household items. The majority of fishers own their homes, which have services, and furnishings including potable water, electricity, refrigerators, televisions, telephones and washing machines. 4. WCS with the NRZESC made significant progress in finalizing the cartographical descriptions for the statutory instruments for the phase 1 expansion of no-take areas these have not been legally designated. Unfortunately, there has been some concerns from the Ministry of Foreign Affairs, as such, the Belize Fisheries Department is working along with the Ministry of Foreign Affairs in order to achieve their endorsement for the expansion. 5. The MA program has been rolled out at SWCMR. A MA committee for the area was established, which meets on a regular basis to discuss matters regarding: (1) licensing requirements, (2) application for new entrants, and (3) enforcement effort. However, compliance with requirements for MA has been low due to poor management presence in the area. With a recent change in manager this situation is expected to improve.
Output 1. Insert **agreed** Outputs with Activities relevant to that output in lines below For GRMR and SWCMR, sustainable fishing regulations are implemented through no-take zones and license-based MA programs that employ total allowable catch (TAC) quotas.	Insert **agreed** output level indicators) 1.1 The number of annually-issued MA licenses for GRMR remains stable at the current rate of about 130/year. 1.2 At least 95% of MA licensed fishers in GRMR are completing and submitting their catch logbooks each year. 1.3 At SWCMR, where licenses have not been issued yet, the number issued annually will decrease by at least 5% between year 1 and year 3. 1.4 The annual catch of lobster and conch for each reserve remain within the level required by	Report general progress and appropriateness of indicators, and reference where evidence is provided e.g. *Evidence provided in section 3.2 of report and Annex X* 1.1 The total number of MA licensed for GRMR has remained rather consistent over time. In 2017 a total of 126 license were issued, there was a slight increase in 2018, with 158 licenses being issued. This in part is due to the fact that the sons of existing GRMR fishers who are now 18 years old have received a license to fish in the area. 1.2 100% of the catch logbooks are submitted on a timely basis by fishers. 1.3 MA was rolled out at SWCMR in 2016 and since

	their respective TACs. 1.5 Participation at MA Committee Meetings and Annual Fisher Forums is at least 70% of licensed fishers, demonstrating active interest and participation in the program.	then a MA committee was established for the area. As MA is evolving, the numbers of fishers licensed for the area has increase from 976 in 2016 to 1100 in 2017 and has reduce in 2018 to 998. An increase of 1.02% 1.4 As explained in Output 1 TACs were not established for lobster and conch. 1.5 Three fisher forums were held during the life of this project, one for members of the GRMR MAC (Annex 7.10) including two specifically for women, held during Fisherfolk Month 2017 and 2018 (Annex 7. 7). The first Women in Fisheries Forum was geared towards promoting the achievement of gender equality and equity in the allocation of resources, rights, status and responsibilities between women and men. The main objective of the Women in Fisheries Forum 2 was to socialize the FAO's Voluntary Guidelines for Securing Small-Scale Fisheries in the Context of Food Security and Poverty Eradication and to share progress on the Gender Action Plan conceived at the last meeting.
Activity 1.1 Insert activities relevant to this output Assist authorities with data collection and analysis for development of TAC for conch and lobster for SWCMR.		Report completed or progress on activities that contribute toward achieving this Output 1.1 WCS completed maturity studies for lobster and conch. Whole lobsters harvested between June 2016 to February 2017 (the full season) were examined to determine sex-specific sizes of maturity. External indicators of maturity examined (two for each sex) indicated that all estimates of size-at-50%-maturity, a minimum of 85 mm carapace for females, were above the present national minimum size of 76 mm carapace length (Annex 7.1 and Annex 7.2). Conch maturity was examined using fisher captured conch in the shell (Jan 2015 - Dec 2016), conch normally being landed as meat only, in order to relate meat mass to shell length and shell lip thickness (well

	known to correlate with maturity). Our results indicate that size-at-50% maturity is 10 mm lip thickness with a corresponding 190 g market clean meat mass. Present regulations have no lip minimum, a shell length of 176 mm which does not relate to maturity and a meat mass of 85 g.
Activity 1.2 Monitor trends in number of MA licenses issued annually at GRMR and SWCMR to understand how licensing criteria impact the number of fishers in each reserve.	1.2 WCS continues to function as a member of the MA working group and MA committees for GRMR and SWCMR respectively. The number of MA licensed fishers for GRMR and SWCMR have remained stable over time. There was an increase in number for GRMR as some fishers have opted to change their fishing as the MA program is being rolled out nationally.
Activity 1.3 Assist the Fisheries Department with entering catch data from fishers and monitor total catch per reserve, evaluating against established TACs.	1.3 Since 2017, WCS has passed over responsibility of entering the catch data from fishers' catch log books to the Fisheries Department.
Activity 1.4 Collect independent sample of catch data monthly in both reserves to serve as benchmark for quality control, allowing for the evaluation of the accuracy of fisher logbook data.	1.4 WCS continues to collect catch data on a monthly basis from fishers utilizing GRMR and SWCMR. The 2016 - 2017 Catch Data Report (Annex 7.9) for GRMR revealed that lobster catch-per-unit effort (CPUE, lobster/fisher-hour) averaged 2.7 (+/- 0.3 se), a large increase over the previous season 1.6 (+/- 0.4 se) and mean CPUE for conch was 13.7 (+/- 1.2) conch/fisher-hr. and compares favourably to a mean of 12.8 conch/fisher-hr. in the previous season. The 2016 – 2917 Catch Data Report for SWCMR revealed that lobster catch-per-unit effort (5.9 lobster/fisher-hour) was substantially higher than the previous two seasons, 2.7 and 1.6 and mean CPUE for conch was surprisingly high at 25.6 (+/- 6.1) conch/fisher-hr. and much higher than the previous two seasons and is likely do to inaccurate reporting of effort (hours), and a relatively small data set.
Activity 1.5 Conduct regular meetings of the MA Committees and Annual Fisher Forums to ensure that fishers are kept up-to-date on program progress and have an opportunity	1.5 7 GRMR MA Committee meetings, 14 meetings of the Managed Access Technical Committee, and 12 meetings of the National MA Working Group were

to discuss their concerns.		held during the life of the project. Minutes were recorded for all and information exchanged between these groups by shared members, including those from WCS and EDF. The 2 Fisher Forms addressed topics from MA and MPA management
Output 2. Insert **agreed** Output Spatial Monitoring and Reporting Tool (SMART) is implemented in order to improve targeted enforcement efforts aimed at reducing illegal, unreported, and unregulated fishing.	Insert **agreed** Output level indicators 2.1 By end of year 1, 100% of patrols at GRMR and SWCMR by the Fisheries Department are carried out using Spatial Monitoring and Reporting Tool (SMART). 2.2 Infraction rate in GRMR declines from 4% to 3% by the end of the project. 2.3 Infraction rate in SWCMR declines from 5% to 3% by the end of the project. 2.4 Maps produced on patrol activity, fishing activity, and hotspots of illegal activity.	Report general progress and appropriateness of indicator 2.1 Patrols conducted for GRMR were carried out using SMART to track and document patrol efforts. As for SWCMR, there were issues encountered as 3 devices were intentionally damaged and the reserve manager refused to use SMART to track and document patrol efforts. This negligence of duties along with other factors lead to the dismissal of the reserve manager. As a result, WCS is re-engaging the staff for SWCMR to conduct SMART trainings. 2.2 Infractions at GRMR have declined. There were only two documented infraction in 2017 (Annex 7.10). 2.3It was not possible to make an accurate estimation of infraction decline in SWCMR because of the unstable management presence. 2.4 Maps have been generated for 2017 as a part of the reporting requirements for the GRMR staff.
Activity 2.1. Train Fisheries Department and NGO personnel who help co-manage marine reserves in the use of SMART software and procedures, including use of the new applet for tablet use, in order to record and track enforcement effort and illegal activities.		2.1 A series of trainings were conducted with staff from the Fisheries Department and NGO personnel. SMART Connect training was conducted with enforcement officers and reserve managers, consequently all MPAs are utilizing SMART Connect. Rangers are collecting patrol data while in the field, which is then transmitted to the BFD using the SMART Connect server. SMART reporting is being utilized by BAS, SACD, SEA, TASA, and TIDE to inform fuel allocation and monitor usage, conducting intelligence-based patrols, and quantify enforcement

		support given by Belize National Coast Guard to NGOs.
Activity 2.2. Collaborate with reserve enforcement staff in developing SMART reports to determine infraction rates.		2.2 Reserve enforcement staff have received SMART training pertaining to generating reports detailing number of patrols conducted, activity observed, and number of infractions. This data has been used by reserve managers to track infraction rates for their marine reserve in an effort to determine the effectiveness of their level of effort in deterring illegal fishing activities.
Activity 2.3. Use SMART results to identify types and hotspots of illegal activity in order to design more effective and efficient patrols that reduce distance travel and fuel used.		2.3 SMART reports are indicating the occurrence of illegal transboundary fishing in the northern and southern region of Belize. This information will be utilized to inform enforcement needs at the national level.
Activity 2.4. Use SMART to map fishing activity throughout the reserves in order to better understand fishing patterns.		2.4 A map has been generated however because of the inconsistency of data collection it is still not able to map the fishing ground by activity.
Activity 2.5. Convene workshop to review implementation of national SMART rollout and conduct training in analysis of data.		2.5 SMART Connect has been integrated with the Government of Belize's data management system. Rangers from government managed MPAs and those co-managed by NGOs are able to transmit in field data collected through SMART to the SMART Connect server, which is accessed by the BFD.
Output 3. Benefits of no-take zones and MA programs on coral reef ecosystems and resource-based livelihoods are better understood, strengthening adaptive management and community support.		
Activity 3.1. Analyse both logbook and independent sample datasets for conch and lobster, including mean size, population structure, and CPUE, and use results to update		3.1 The Glover's Reef logbook data have been entered and analyzed for the 2011-2016 fishing seasons, providing estimates of total catch. Although

TAC models each season.	the Fisheries Department has not yet established a TAC, results of a depletion model analysis of lobster and conch for these years show that catches in the lobster fishery are probably sustainable, while for conch, catches are highly variable between years. Also, the estimated total abundance from the depletion model is low, and densities remain low, implying that the population is probably overfished and would benefit from lower catches. The investigation of indices of maturity for both conch (e.g. shell lip thickness minimum in place of shell length) and lobster (e.g. revised carapace minimum) will also improve sustainability in conjunction with depletion models.
Activity 3.2. Using well-established protocols, monitor and report on a suite of coral reef ecosystem health indicators (including several focusing on critical herbivores like parrotfish).	3.2 As reported in the previous annual report, a 7-year period (2007 - 2013) of both individual visual surveys (Long-term Atoll Monitoring Program) and fisheries-dependent catch data from GRMR were analysed to examine changes in population of an ecologically representative suite of focal species (Annex 7.4). Most small-scale fisheries targets showed an increase in density, biomass, or size within the replenishment zone area of GRMR, and stable or increasing catch rates beyond the replenishment zone boundary. However, more recent (post 2014) and more detailed examinations of conch, lobster and finfish population structure and maturity data reveal problems with existing regulations despite the resilient nature of many of the fisheries resources at GRMR. Our recommendations of minimum sizes, the basis of any fisheries management plan, will need to be implemented as soon as possible to secure biodiversity and livelihoods at GRMR.
Activity 3.3. Conduct annual socioeconomic surveys of MA licensed fishers in collaboration with the Fisheries Department.	3.3 Socioeconomic surveys were conducted with users of GRMR. Results indicates that household income has remained consistent throughout the project. This can be attributed to an ever-increasing cost of fuel in the country, which then affects the cost

	of goods and services provided to fishers.
Activity 3.4. Monitor perceptions among fishers of the necessity and effectiveness of enforcement program.	3.4 The recent socioeconomic survey conducted revealed a decline from 70 % in 2015 to 60% in 2017 regarding fishers perception of the effectiveness of the enforcement program. Most fishers indicated that there is a need for increased enforcement in the area, especially at night and that enforcement should be consistent, fair, and thorough.
Activity 3.5. In collaboration with partners, prepare and disseminate information on results with participating fishers in order to foster dialogue and continued support.	3.5 A fishers' forum was planned for June of 2017 to share information with Fishers however, it was postponed due to fishers availability. WCS will share the information in 2018 with fishers through boat–to-boat interactions.
Output 4. With the widespread support of fishing communities and the general public, new or expanded no-take zones are established in Belize's network of marine reserves.	
Activity 4.1. Conduct national survey to evaluate level of understanding and support for no-take areas and their benefits.	4.1 The national survey (Annex 7.12) conducted at the end of second season of Punta Fuego (PF) indicated that national listenership to PF among fishers was 41% at midline and this increased to 53% at post survey. In addition, the percentage of "regular" listeners who listened to 50% or more of the episodes increased from 25% to 28% for season 2. Moreover, there was a strong listenership effect on increasing knowledge among audience members around some of the issues addressed through the program regarding identifying no-take zones and understanding the benefits of no-take zones.
Activity 4.2. Facilitate regular bi-monthly meetings of the Steering Committee for the National Replenishment Zones Expansion program, and its associated Technical and Communications Sub Committees.	4.2 Regular meetings (Annex 7.13) are held for the NRZE steering committee in an effort to guide the national expansion of replenishment zones across Belize's territorial seas. The steering committee have

	assisted in finalising the areas of expansion, the legal description for the expansion have been drafted and is currently awaiting endorsement from the Cabinet.
Activity 4.3. Conduct quarterly meetings of the Reserve Advisory Committees and discuss potential new expanded zones (proposed by WCS and TNC) with stakeholders at these forums.	4.3 Quarterly meetings are held for the GRMR (Annex 7.14) and SWCMR (Annex 7.15) Advisory Committees to discuss management of the reserves.
Activity 4.4. Develop outreach material in coordination with TNC and the Fisheries Department to inform stakeholders of the biodiversity and fisheries benefits of no-take areas that incorporate results from GRMR analyses.	4.4 Two successful and international award-winning seasons of *Punta Fuego* and *Talking Fuego*, and 2 Punta Fuego Roadshows were used to inform stakeholders of the biodiversity and fisheries benefits of no-take zones.

Annex 3 Standard Measures

Code	Description	Total	Nationality	Gender	Title or Focus	Language	Comments
Training Measures							
6a	Number of people receiving other forms of short-term education/training (e.g., not categories 1-5 above)	95	Belizean	Female and Male	SMART / SMART Connect	English	
6b	Number of training weeks not leading to formal qualification	4					
7	Number of types of training materials produced for use by host country(s) (describe training materials)	2	Belizean		SMART Training Manual for Rangers, SMART Training Manual for Managers		

Research Measures		Total	Nationality	Gender	Title	Language	Comments/ Weblink if available
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (ies)	2			Glover's Reef Marine Reserve Management Plan Replenishment Zone Enforcement	English	Participatory process integrating data gathered from this project

					Strategy		
10	Number of formal documents produced to assist work related to species identification, classification and recording.	None					
11a	Number of papers published or accepted for publication in peer reviewed journals	3	Various (see Annex 5)	Female and Male	See Annex 5	English	See Annex 5
11b	Number of papers published or accepted for publication elsewhere	2+?	Various (see Annex 5)				
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	5	Belizean	Male	SMART Connect	English	
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	1	Belizean	Female and Male	Fisher Licensing Database	English	
13a	Number of species reference collections established and handed over to host country(s)	None					
13b	Number of species reference collections enhanced and handed over to host country(s)	None					

Dissemination Measures		**Total**	**Nationality**	**Gender**	**Theme**	**Language**	**Comments**
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	1	Belizean	Female and Male	WCS Science and Research Activities	English	Presentation of all science related report 2016-2017 to the Fisheries Department staff
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.						

Physical Measures		Total	Comments
20	Estimated value (£s) of physical assets handed over to host country(s)	None	No physical assets were purchased under this project.
21	Number of permanent educational, training, research facilities or organisation established		
22	Number of permanent field plots established		Please describe

Financial Measures		Total	Nationality	Gender	Theme	Language	Comments
23	Value of additional resources raised from other sources (e.g., in addition to Darwin funding) for project work	£73,985					

Annex 3 **Annex 4 Aichi Targets**

Please note which of the Aichi targets your project has contributed to.

Please record only the **main targets** to which your project has contributed. It is recognised that most Darwin projects make a smaller contribution to many other targets in their work. You will not be evaluated more favourably if you tick multiple boxes.

	Aichi Target	Tick if applicable to your project
1	People are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	√
2	Biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.	
3	Incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.	
4	Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.	
5	The rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	
6	All fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	√
7	Areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	
8	Pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	
9	Invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	
10	The multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.	
11	At least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	
12	The extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and	

	sustained.	
13	The genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	
14	Ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.	
15	Ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	
16	The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.	
17	Each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	
18	The traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.	
19	Knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.	
20	The mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.	

Annex 5 Publications

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Nationality of lead author	Nationality of institution of lead author	Gender of lead author	Publishers (name, city)	Available from (e.g. web link, contact address etc)
Journal	*An indicator-based adaptive management framework and its development for data-limited fisheries in Belize* Gavin McDonald Bill Harford Alejandro Arrivillaga Elizabeth A. Babcock Ramon Carcamo James Foley Rod Fujita Todd Gedamke Janet Gibson Kendra Karr Julie Robinson Jono Wilson 2017	American	American	Male	Journal of Marine Policy, Elsevier	Available from lead author
Journal	*Management strategy evaluation of a multi-indicator adaptive*	Canadian	American	Male	Bulletin of Marine Science, Universi	Available from lead author

	framework for data-limited fisheries management Harford, W. J. T. Gedamke E.A. Babcock R. Carcamo G. McDonald J.R. Wilson 2017				ty of Miami	
Conference Proceedings	*The existence of queen conch mega-spawner refuges at Glover's Reef Atoll, Belize* Alexander Tewfik 2016	Canadian	Belizean	Male	Gulf and Caribbean Fisheries Institute	GCFI website http://www.gcfi.org/Conferences/69th/Book_of_Abstracts_en/index.html
Journal	*Benefits of a replenishment zone revealed through trends in focal species at Glover's Atoll, Belize* Alexander Tewfik Elizabeth A. Babcock Janet Gibson Virginia R. Burns Perez, Samantha Strindberg	Canadian	Belizean	Male	Marine Ecology Progress Series	Available from lead author at

	2017					
Conference Proceedings	*Examining Caribbean spiny lobster size at maturity using external reproductive-related structures in Belize* Alexander Tewfik Elizabeth Babcock 2017	Canadian	Belizean	Male	Gulf and Caribbean Fisheries	GCFI website http://www.gcfi.org/Conferences/70th/Book_of_Abstracts_en/index.html
Journal	*Fish community and single-species indicators provide evidence of unsustainable practices in a multi-gear reef fishery* Elizabeth A. Babcock, Alexander Tewfik, Virginia Burns-Perez 2018 (accepted, proofs pending)	American	American	Female	Fisheries Research	Available from lead author at
Conference Proceedings	*Punta Fuego: Entertainment-Education Radio Drama*	Belizean	American	Female	International Marine Protected Areas Confere	Not Available

	Promotes Marine Conservation in Belize's Fishing Communities				nce	
Conference Proceedings Panel Discussion	*A Global SMART Approach to Improving the Effectiveness of MPAs SMART Marine Belize*	Belizean	American	Female	International Marine Protected Areas Conference	Not Available

Annex 4 **Annex 6 Darwin Contacts**

To assist us with future evaluation work and feedback on your report, please provide details for the main project contacts below. Please add new sections to the table if you are able to provide contact information for more people than there are sections below.

Ref No	22-014
Project Title	Maximising Benefits of Marine Reserves and Fisheries Management in Belize
Project Leader Details	
Name	Nicole Auil Gomez
Role within Darwin Project	Project manager overseeing all components for the last two years of project.
Address	
Phone	
Fax/Skype	
Email	
Partner 1	
Name	Beverly Wade
Organisation	Belize Fisheries Department
Role within Darwin Project	Fisheries Administrator overseeing the fisheries components of this project, in particular the Managed Access implementation and Chairperson of the NRZESC
Address	

Fax/Skype	
Email	
Partner 2 etc.	
Name	Julianne Robinson
Organisation	The Nature Conservancy
Role within Darwin Project	Participate in the replenishment zone expansion component, and lead technical modeling activities.
Address	
Fax/Skype	
Email	
Name	Lawrence Epstein
Organisation	Environmental Defence Fund
Role within Darwin Project	Participated in managed access design and implementation
Address	
Fax/Skype	
Email	

Annex 5 Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	