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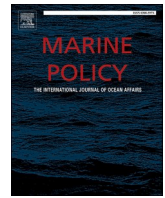
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## Marine Policy

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## Resolving conservation and development tensions in a small island state: A governance analysis of Curieuse Marine National Park, Seychelles

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## A B S T R A C T

The management and conservation of marine resources in Seychelles, a small island developing state (SIDS) in the western Indian Ocean, is fundamental to maintaining the flow of international visitors which forms the mainstay of the nation's economy. There is an increasing trend towards empowering non-governmental organisations and parastatal entities with protected area management responsibilities, which partly reflects the chronic underfunding of the state protected area management institution. This paper explores these and related issues through a governance analysis of Curieuse Marine National Park, which is the most popular state-owned marine national park in terms of recorded visitor numbers. This demonstrates that the inability to implement economic incentives through not fully capitalising on the use and non-use values of the park has deleterious consequences for managing the combined impacts of tourism and fisheries on the ecological assets of the park. Furthermore, the capacity of the state management institution is being eroded through a focus on the development of an extensive network of new marine protected areas under the direction of an international non-governmental organisation. Suggestions are made that could strengthen economic, participative and interpretative incentives to provide a more sustainable basis for marine national park management.

### 1. Introduction

This paper presents a governance analysis of Curieuse Marine National Park in Seychelles, a small island developing state (SIDS) in the Western Indian Ocean. The case study draws upon fieldwork, observations and local knowledge accrued through authors' visits conducted over the period 2012–2017, together with secondary sources derived from journals, websites and newspapers. The case study addresses the importance of recognising financial incentives as a determinant of protected area governance and the pervasive influence of international political and economic development drivers on policy. It utilises the marine protected governance (MPAG) analysis framework, this paper being one of several such case studies in this Special Issue.

### 2. Context

Seychelles is an island nation off the east coast of Africa, with a population of 97,500 people and a GDP per capita of US\$15390 in 2016 which ranks 50th in the world, together with a Human Development Index of 0.782, which places the country in the UNDP 'High Development' category [1]. However, the most recent Gini coefficient for Seychelles is 65.8 which is the highest in the world [1], underlining the

extent of income inequality within the country. The largest island of Mahé accounts for around 90% of the population, with the remainder in nearby Praslin (8%) and La Digue, although there is a total of 155 inner granitic and outer coralline islands in the Seychelles archipelago. Seychelles is particularly notable for its extensive maritime exclusive economic zone (EEZ), which extends over 1.37 million km<sup>2</sup> in contrast to the land area of just 459 km<sup>2</sup>. Tourism is a mainstay of the economy, with a direct and indirect contribution amounting to 65% of GDP, whilst direct and indirect employment in tourism accounted for 66% of the workforce in 2017 [2]. International tourist arrivals reached 350,000 in 2017, representing a doubling of foreign visitors since 2010 [3]. This largely reflects the growth of overseas investment in the airline and hotel sectors, particularly from the Middle East, since economic liberalisation measures were introduced in 2008 [4].

The Seychelles National Park Authority (SNPA) is a government organisation within the Ministry of Environment, Energy and Climate Change and is mandated with management of the four marine national parks in Seychelles, together with a number of other terrestrial and marine protected areas. The Seychelles protected area estate is characterised by a diversity of management arrangements including NGOs, the private sector and more recent collaborative initiatives between a parastatal organisation responsible for island development and a domestic

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NGO (Table 1). The latter has management responsibility for a suite of protected areas designated in 2011, which are principally located in the outer islands. This enabled the achievement of a national target set in 2010 to designate 50% of the land mass under protected area status. However, given the extensive EEZ, fully gazetted marine protected areas still only cover 1% of the maritime jurisdiction.

The piecemeal designation of protected areas over time (Table 1) means that achieving a comprehensive, adequate and representative network of protected areas as required under the Biodiversity Convention represents a significant challenge to the government. This has been addressed through the recent conclusion of an innovative debt-for-nature (DFN) swap agreement brokered by NatureVest (the investment arm of The Nature Conservancy), in partnership with the Seychelles government, the Paris Club of overseas lenders and Oceans 5 (a philanthropic organisation). This process, which commenced in 2016, involves the loan of US\$15.2 M from TNC with an additional US\$5 M from Oceans 5 to the newly created Seychelles Conservation and Climate Adaptation Trust (SeyCCAT). SeyCCAT will then loan this US\$20.2 M to the national government to buy back almost US\$22 M of foreign debt from the Paris Club creditors. The government will repay SeyCCAT over a 20 year period, which will in turn repay the loan from TNC and Oceans 5. Through re-investing the interest accrued on these repayments, SeyCCAT will realise an estimated US\$600,000 annually which will be used to fund marine planning and climate adaptation programmes during and beyond the 20 year loan repayment period [5].

As part of this DFN swap agreement, the Seychelles Government has committed to designate 30% of its marine EEZ under some form of protection by 2020. This will comprise 15% of the EEZ being demarcated as no-take areas with another 15% subject to regulations on fishing, whilst the remainder will remain open to multiple economic

uses [6]. To put this into perspective, this will result in an expansion of the current total marine protected area estate from just under 124,000ha to around 41 M ha, i.e. by 330 times the current area. In order to facilitate this process, the country embarked upon a national Marine Spatial Planning process in 2015 led by The Nature Conservancy (hereafter TNC) which is an international non-governmental organisation headquartered in the United States covering the entire EEZ to identify appropriate zonation and related measures. At the time of writing (May 2018), this process has not yet concluded. Some implications of this MSP process will be explored later in this paper.

### 3. Objectives

Curieuse Marine National Park (CMNP) was designated in 1979 under the National Parks and Nature Conservancy Act (1969) and is located off the island of Praslin in the inner Seychelles (Fig. 1). In common with many other marine national parks in Seychelles, CMNP does not have a currently operational management plan. Management objectives are therefore defined with reference to those prescribed under the national Protected Areas Policy which was developed in 2013. This Policy was established to provide a consistent framework for protected area management and to align existing protected area categories into the IUCN categorisation in accordance with CBD objectives. The Policy states the primary objective of national parks is 'to protect natural biodiversity along with its underlying ecological structure, supporting environmental processes and services, and to promote education and recreation' [7 p15]. This primary conservation objective is supplemented by two secondary conservation objectives: maintaining ecological representativeness and ensuring ecosystem integrity, as well as three operational objectives: providing cultural services (education and

**Table 1**  
Protected areas of the Seychelles.

Management responsibility	Name	IUCN Category	Marine ha	Terrestrial ha	Designation
<b>Governmental organisation</b>					
Seychelles National Park Authority	La Digue Veuve Special Reserve	Ib	0	21	1991
Seychelles National Park Authority	Baie Ternay Marine National Park	II	3045	0	1979
Seychelles National Park Authority	Curieuse Marine National Park	II	1370	286	1979
Seychelles National Park Authority	Iles Cocos, Ile La Fouche, Ilot Platte Marine National Park	II	0	1	1997
Seychelles National Park Authority	Morne Seychellois National Park	II	0	3123	1979
Seychelles National Park Authority	Port Launay Marine National Park	II	158	0	1979
Seychelles National Park Authority	Praslin National Park	II	0	530	1979
Seychelles National Park Authority	St Anne Marine National Park	II	1073	0	1973
Department of Environment	Recif Island Special Reserve	II	0	13	2010
Department of Environment	Beacon, Booby, Boudeuse, Etoile, Ile aux Vaches, Les Mamelles, King Ross	IV	0	10	1966
Ministry of National Development	African Banks	II	3	2	1987
<b>Non-governmental organisation</b>					
Green Island Foundation	Denis Island	V	700	143	tbd
Island Conservation Society	Aride Island Special Nature Reserve	Ib	0	68	1975
Moyenne Island Foundation Society	Moyenne Island National Park	II	0	9	2008
Nature Seychelles	Cousin Island Special Reserve	Ib	1200	27	1968
Save Our Seas Foundation	D'Arros and St Joseph Special Reserve	I and VI	4000	135	tbd
Seychelles Islands Foundation	Aldabra Atoll Special Nature Reserve	Ib	23,100	15,260	1981
Seychelles Islands Foundation	Vallée de Mai Nature Reserve	Ib	0	20	1979
Silhouette Foundation	Silhouette Island National Park	II	3045	1860	2010
<b>Parastatal - NGO collaboration</b>					
Islands Development Company and Island Conservation Society (IDC-ICS)	Desroches Sustainable Use Protected Area	VI	34,300	369	tbd
IDC-ICS	Alphonse Sustainable Use Protected Area and St. Francois and Bijoutier Ecological Reserve	I and VI	12,830	194	2011
IDC-ICS	Poivre (South Island) National Park	II	2838	137	2011
IDC-ICS	South Island Farquhar National Park and Banc du Sable/Ile Goelettes Ecological Reserve	II and VI	22,290	402	2011
IDC-ICS	Cosmoledo Grand Ile Area of Outstanding Natural Beauty, Grand & Petite Polyte Special Reserve	n/a	2400	164	2011
IDC-ICS	Desneufs Island Area of Outstanding Natural Beauty	n/a	800	39	2011
IDC-ICS	Assumption Island National Park	II	10,000	482	2011
<b>Private sector</b>					
North Island Company	North Island	V	700	201	tbd

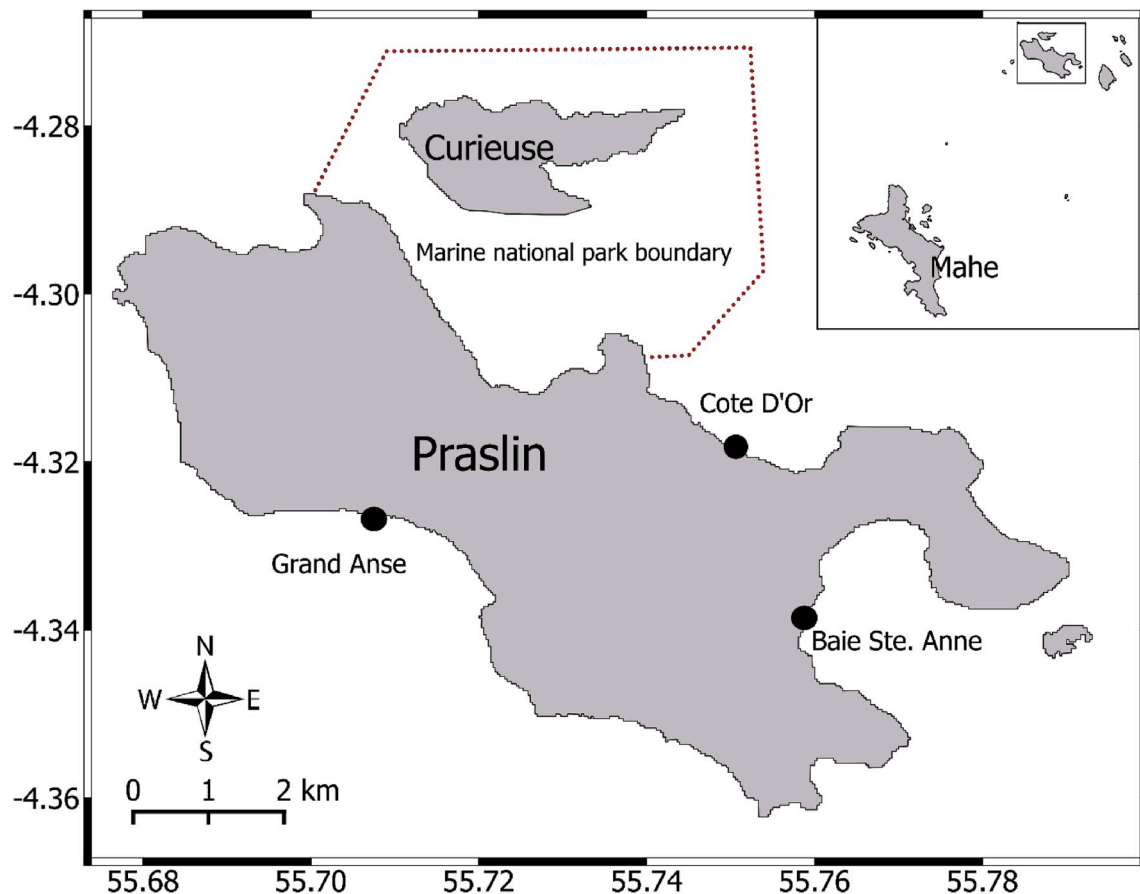


Fig. 1. Location of Curieuse Marine National Park, Seychelles.

recreation), managing visitor impacts and delivering economic contributions through activities including tourism. It is important to note that all extractive activities including fishing are prohibited in all Seychelles national parks. There is no existing zonation of activities within CMNP, although this situation could be refined with the production of a new management plan. However, the national park objectives detailed in the Protected Areas Policy confirm that CMNP should continue to operate as a *de facto* no-fishing zone.

#### 4. Drivers and conflicts

As the primary park objective, the effective protection of biodiversity within CMNP is subject to several impacting activities and associated drivers. Whilst the provision of economic benefits through tourism is an operational park objective, tourism represents a significant pressure through the development of supporting infrastructure and the volume of visitors. The impacts of tourism infrastructure are exemplified by the Raffles Praslin hotel resort bordering the western shorelines of CMNP. This consists of 86 villas spread over 30ha of steeply sloping land which opened in 2011. The extensive clearance of vegetation during the construction phase took place immediately prior to the wet season and resulted in heightened erosion and sedimentation, which was manifest in significant declines in coral cover adjacent to the resort [8]. The development of smaller hotels along the Praslin coastline of CMNP has also been linked to problems of coastal erosion and poorly treated effluent entering the park [9]. Whilst a national moratorium on large hotel construction (defined as those with more than 25 beds) was introduced in 2015, this excluded developments which had already gained planning permission, including a new hotel development at Anse Boudin located north of Raffles Praslin, which also borders CMNP.

These impacts may be associated with broader politico-economic

and institutional drivers at the national and international level. As noted earlier, the Seychelles Government introduced a wide-ranging set of economic liberalisation measures in 2008 as part of a debt restructuring agreement with the International Monetary Fund following a default in loan repayments. These included encouraging more foreign direct investment (FDI) in the economy, with a particular emphasis on tourism as the pillar of the national economy. Annual FDI has stayed above US\$200 M in the period 2010–2015, which is double that of the previous decade [10]. The hotel and restaurant sector accounted to 67% of total FDI inflow into greenfield projects in Seychelles in the period 2003–2013, with the United Arab Emirates representing over a third of total FDI over this period [11].

The government's attempts to stimulate FDI have clearly resulted in a boom in the hotel sector, epitomised by Raffles Praslin and other large resorts across Seychelles, which are most commonly owned by Middle Eastern entities. Seychelles has a comprehensive legal and administrative framework for environmental impact assessment (EIA), which stipulates that any new hotel construction, together with any activity inside a national park or special reserve, will require an EIA. However, there are several aspects to this process that undermine the effectiveness of the EIA process in limiting and mitigating the impacts of hotel construction. Resource and skills constraints usually dictate that the proponent undertakes the EIA rather than an independent consultant, whilst there is no provision for the inclusion of civil society groups in EIA consultation and public comment is limited to a period of two weeks [12]. Furthermore, the same authors note that many EIA submissions are too vague to allow meaningful monitoring and evaluation to be undertaken.

The preceding discussion has explored the drivers behind the observed environmental impacts of tourist infrastructure around the borders of CMNP. The other pressure of note in this context relates to the

various components of fishing activity in waters around CMNP and their implications with respect to the conservation objective of the national park. This will be discussed with reference to the tourist market, the local market and the industrial tuna fishery. Whilst there is no official record of visitor numbers on Praslin, the recent increases in international tourist arrivals coupled with the proliferation of accommodation all around Praslin point towards a significant year round tourist demand for fresh seafood. All restaurants and hotels offer locally caught fish on a daily basis, with preference given to higher value species such as red snapper and octopus. Our research conducted in 2017 indicated that all the major hotels on Praslin sourced at least some of their fish from local suppliers, suggesting that these hotels and restaurants that cater almost exclusively for overseas tourists will exert a significant pressure on fish stocks around CMNP. The second component of pressure on fish stocks associated with tourism involves the sport and charter fishery, which in Seychelles comprises around 200 boats, many with the capacity for full day fishing or live aboard excursions [13]. Management of recreational fisheries falls outside the remit of the Seychelles Fishing Authority, which relies upon voluntary logbook returns for catch assessment. The poor rate of logbook returns precludes any quantitative assessment of this sector [14], but it is clearly apparent that the level of technology used, spatial range of vessels and the infrequency of catch and release will exert a significant pressure on inshore fish stocks. This is illustrated by the fact that a recent sports fishing tournament yielded a catch of 8 metric tonnes in one day, which is close to the approximate average daily catch of 10 metric tonnes for the entire artisanal fishery [13,14].

Turning attention to the local demand for seafood, Seychelles is noted as having one of the highest per capita consumptions of fish at around 50 kg annually, the vast majority of which is consumed fresh [15]. This preference for fresh fish has strong cultural roots and also reflects the limited availability of local ice-making equipment and cold storage facilities. In a survey of 200 Praslin households conducted by the authors in 2016, 66% of the sampled households stated that fish was consumed daily and a further 31% indicated that fish was consumed several times a week. All householders stated that they purchased their fish from artisanal fishers who sell their daily catch from informal and basic landing sites along the coast. The Seychelles artisanal fishery comprises a mix of handline, nets and traps and a range of vessel types, with trevally, mackerel and jobfish accounting for half of the overall catch [14]. The Praslin household survey conducted in 2016 also indicated that 40% of households experienced problems in obtaining the fish they required at least once a month, citing factors including poor seasonal weather, the catch being sold before they could get to the landing site and an inability to purchase the species they desired.

An additional component of fishing pressure relating to local communities involves subsistence fishing carried out by local residents for daily needs. At the national level, 14% of households cited fishing as an activity in the 2010 census [16]. However, 72% of these households engaged in fishing for pleasure and/or consumption, indicating that the artisanal fishing sector represented a quarter of all households engaged in fishing activity. Furthermore, comparison of census data indicates a considerable decline in households fishing primarily for pleasure (from 66% to 49% of fishing households) and a concomitant increase in households fishing primarily for consumption (from 0.4% to 23% of fishing households) in the period 2002–2010. This is less than the 37% of households sampled in the 2016 Praslin survey that engaged in fishing for personal consumption, with 64% of this group stating that fishing was carried out more than three times a week. It is important to note that the annual surveys of the artisanal fishery conducted by the Seychelles Fishing Authority employ the creel technique, whereby information is collected from individual fishers by surveyors stationed at establishing landing and sale points. Creel surveys inevitably exclude data relating to household-level recreational or subsistence fishing activity which does not utilise points of sale. The data presented here indicates that this predominantly inshore line and trap subsistence fishery is at least as important in terms of nearshore fishing pressure as the artisanal fishery

on Praslin.

The industrial and semi-industrial vessels operating in Seychelles waters targeting tuna, billfish, marlin and shark are active throughout Seychellois waters, although effort is generally focused towards the northern limit of the EEZ. However, the bycatch associated with these vessels' activities can amount to 30% of the total catch [17], which will clearly impact upon fish stocks at a broader spatial scale. The decision by the Indian Ocean Tuna Commission to reduce yellowfin tuna catch quotas by 15% from 2017 may force vessels operating in Seychelles waters to reduce costs by fishing closer to port, hence the bycatch impacts on nearshore stocks could become more significant in the future.

In the absence of regular monitoring of inshore fish stocks utilised by the tourist market and local communities, it is not possible to precisely determine the impacts of these pressures in or around CMNP. The most recent comparative survey of fish stocks in Seychelles MPAs was carried by Jennings et al. [18]. This indicated that the biomass of several reef fish families commonly targeted by local fishers such as parrotfish, snapper and emperor fish was significantly less in CMNP than in St Anne Marine National Park and Cousin Island Special Reserve, both of which are also granitic reef MPAs and are of similar size to CMNP. The fact that this was noted over twenty years ago is grounds for concern given the likely enhanced pressures on nearshore fish stocks associated with increased numbers of visitors and the growth of Praslin's population, which increased by 21% to 8600 during the 2002–2010 intercensal period alone [16]. The relatively small size of CMNP means that achieving the prime objective of protecting marine biodiversity within the park's boundary will inevitably depend upon the status of fish stocks in adjacent waters. Given the magnitude, growth and diversity of pressures on nearshore fish stocks associated with the tourism sector, the resident population and the industrial fisheries as outlined above, it is highly likely that these constitute significant barriers to achieving park objectives.

The severity and frequency of coral bleaching events is increasingly apparent, with Seychelles experiencing the most significant decline in coral cover across the entire Western Indian Ocean region after the 2016 bleaching event [19] which itself followed earlier bleaching occurrences [20]. Whilst the long term consequences of repeated bleaching are as yet uncertain, the shorter term impacts in terms of visitor numbers and ecological functionality of reefs within CMNP and other sites are of prime concern.

## 5. Governance framework and incentives

### 5.1. Governance approach

Curieuse Marine National Park is managed by the Seychelles National Park Authority (SNPA) which is a government entity within the Ministry of Environment, Energy and Climate Change. The governance of CMNP can therefore be best described as 'governed primarily by the state under a clear legal framework'. SNPA was created in 2010 from the former Seychelles Centre for Marine Research and Technology-Marine Parks Authority (SCMRT-MPA) which had held responsibility for marine park management, and was charged with additional responsibility for managing the state-owned terrestrial national parks. It should be noted that SNPA manages just 6.5% of the country's total protected area estate, consisting of eight sites with a total marine area of 5646ha (4.6% of the marine protected area estate) and a terrestrial area of 3961ha (16.9% of the total terrestrial protected area estate). A number of more recent protected areas designated in 2011 are under the aegis of a new parastatal-NGO collaboration, reflecting recommendations made in a recent Global Environmental Facility project which emphasised the need to create new partnerships in light of limitations on government finances for new protected area management [21]. Table 2 provides a summary of the governance incentives discussed below.

**Table 2**  
Governance incentives in Curieuse Marine National Park.

Incentive type	Used	Details of incentive usage
<b>Economic</b>		
1. Payments for ecosystem services	N*	Introducing schemes to capitalise upon carbon capture and other services provided by marine assets within CMNP could provide a significant income stream to support improved conservation, noting that interest in this could potentially be stimulated by the DFN swap scheme.
3. Reducing the leakage of benefits	N*	Assuming that CMNP accounts for half of all SNPA visitor fee revenue (pers comm, SNPA CEO), CMNP would have generated approximately \$480,000 in visitor fees in FY2012-13 (GEF 2013). All of this income reverts directly to the Treasury and cannot be used for investment in protected area-related activities. If all the visitor fees generated by CMNP were available for re-investment in CMNP, this alone would meet 68% of park financing needs under a basic management model (GEF 2013).
4. Promoting profitable and sustainable fishing and tourism	N*	Fishing is not permitted within the CMNP and this could be leading to spillover/export benefits but these are not studied or promoted (see below). With regards to tourism, the emphasis appears to be on promoting the size and profitability of the sector, with little consideration of sustainability in terms of reducing impacts, etc.
5. Promoting green marketing	N	No extractive activities are permitted. Whilst the pristine nature of the park's terrestrial and marine environment is promoted in brochures, visitor numbers are not constrained, hence this cannot be construed as 'green' marketing
8. Investing MPA Income/funding in facilities for local communities	N*	See above regards visitor fees
9. Provision of state funding	Y*	SNPA is chronically under-funded by the government. Using data provided by the GEF (2013) for FY2012-13, the budget allocation for the entire SNPA-managed protected area estate in 2012-13 was \$1.43 M. This represents 52% of the total protected area management costs (at a rate of \$422/ha) which reflect a scenario of 'basic' management activities only. Options to strengthen this incentive include enabling revenue from all income streams, particularly visitor fees, to be reinvested in park management.
10. Provision of NGO, Private Sector and user fee funding	Y*	Visitor fees are levied by the SNPA on overseas visitors (equivalent to \$15) and an overnight mooring fee is levied for tourist boats equivalent to \$18. These are standard across all SNPA-managed protected areas. These fees are substantially (50%) less than those charged by NGOs and private sector entities who lease or own other islands and reserves and have not been increased since 2009. Whilst CMNP fees can be paid on Praslin, the vast majority are collected by SNPA rangers based on Curieuse, hence a significant number of beach users, casual snorkelers and others rarely, if ever, pay fees. A very minor income stream

**Table 2 (continued)**

Incentive type	Used	Details of incentive usage
		paid by researchers using CMNP is present. The DFN swap payments seem likely to be allocated to the new large offshore MPAs rather than smaller existing marine national parks, which is a missed opportunity to promote the conservation of more intensely used inshore areas. Options to strengthen this incentive include raising visitor fees to a level which is appropriate for park management costs, introducing initiatives to capture fees from all park users or hypothecating a proportion of revenue from the Tourism Marketing Tax paid by tourism-related businesses
<b>Communication</b>		
11. Raising awareness	Y*	The SNPA website promotes awareness of all protected areas with a regular online newsletter and other information. There is no specific section devoted to CMNP but it figures largely in the content due to its primacy as a visitor destination. However, this information focuses mostly on terrestrial fauna (the highly photogenic Aldabra giant tortoises ( <i>Aldabrachelys gigantea</i> ) and flora (the endemic Seychelles coco-de-mer ( <i>Lodoicea maldivica</i> ) on Curieuse rather than the marine habitats and species of the park. Greater coverage of the marine ecosystems and their associated services would increase public awareness of the park's importance.
12. Promoting recognition of benefits	N*	Interpretative material focuses on the photogenic and visual appearance of flora and fauna, with little information on broader ecological benefits, particularly the potential spillover benefits of CMNP and other no-take marine national parks. Options to strengthen this incentive include promoting greater awareness of the scientific value of CMNP reefs in the context of reef resilience to climate change, including seeking international recognition.
13. Promoting recognition of regulations and restrictions	Y*	As above. Financial constraints on SNPA restrict the construction and maintenance of on-site visitor information, including awareness raising on regulations and restrictions.
<b>Knowledge</b>		
14. Promoting collective learning	N*	Given the lack of participatory mechanisms, opportunities for collaborative learning are limited. Options exist whereby improved collaboration with some key groups, including artisanal fishers, could augment and contribute to scientific knowledge of marine resource condition to benefit management
<b>Legal</b>		
17. Hierarchical obligations	Y*	CMNP was designated in 1979 and the history of protected areas in Seychelles is piecemeal, with no policy of designing comprehensive, adequate or representative networks. The size of CMNP means it contributes little to Aichi 10% MPA target, which is being addressed via the Marine Spatial Planning and DFN swap process outlined above. However, the objectives of the CMNP in the new (2013) national Protected Areas Policy

(continued on next page)

Table 2 (continued)

Incentive type	Used	Details of incentive usage
18. Capacity for enforcement	Y*	could enable the government to meet CBD obligations relating to systematic protected area planning. Whilst a permanently staffed ranger base is present on Curieuse, most staff time is focused on land-based visitor management, catering and fee collection. Resource and time limitations constrain active patrols on the water. This is essential if illegal fishing activities (particularly involving pots and traps) are to be detected and offenders identified.
19. Penalties for deterrence	Y*	National rules apply for infringements but enforcement constraints coupled with charges often being dropped due to clientelism, nepotism, etc., means that these are rarely applied (see above) so these may be insufficient deterrence.
22. Cross-jurisdictional coordination	N*	The CMNP falls within one government jurisdiction and no inter-institutional collaborations are known to take place. Improved collaboration with the Ministry of Tourism is necessary to ensure tourism infrastructure, particularly hotels, do not cause conflicting environmental impacts in the CMNP.
23. Clear and consistent legal definitions	Y	The CMNP boundaries are clearly defined in the enabling legislation (National Parks and Nature Conservancy Act 1969) and there is no internal zonation
25. Legal adjudication platforms	Y	Offenders are subject to a process of appeals and penalties enacted under the National Parks and Nature Conservancy Act (1969)
26. Transparency, accountability and fairness	Y	The Seychelles is generally regarded as having a transparent system of law following the English model.
<b>Participation</b>		
27. Rules for participation	N*	There are very few opportunities for stakeholder participation in SNPA-managed protected areas, though this is needed. Priority is given to enforcing existing rules rather than engagement in management.
28. Establishing collaborative platforms	N*	No such mechanisms exist but are essential for ensuring stakeholder engagement
34. Building linkages between relevant authorities and user representatives	N*	These do not exist in the context of the CMNP (or other SNPA sites). Building links with key users including artisanal fishers' groups should be a high priority to improve the potential for partnerships and cooperation.
35. Building on local customs	N	With a history of recent settlement (1770), there are no traditional or local customary practices as such
36. Potential to influence higher institutional levels	Y*	As the most popular protected area nationally in terms of visitor numbers, CMNP can potentially influence policy in other SNPA-managed sites. However, this has been constrained by resource limitations within SNPA and the more recent advent of protected area expansion, which is likely to fall under other governance arrangements following the DFN swap agreement. The CMNP is subject to considerable stress associated with recent well documented bleaching events (eg Graham et al., 2015) and this should translate through to future iterations of Nationally Determined Contributions under the UNFCCC Paris Agreement.

## 5.2. Economic incentives

As a government entity, SNPA receives a fixed annual budget to cover its operational costs, which in 2017 amounted to the equivalent of US\$1.53 M [22]. This represents an inflation-corrected increase of just 2.2% from the 2013 budgetary allowance of US\$1.43 M, which is the earliest date for which data are available [23]. The magnitude of the 2017 budgetary allowance can be examined through using estimates of SNPA protected area management costs [23]. After correcting for inflation, these are equivalent to US\$442/ha and US\$704/ha under a 'basic' and 'optimal' management model respectively. This indicates that the 2017 budget only provides for 36% of the expected costs of managing the SNPA protected area estate under a 'basic' scenario, falling to just 23% under an 'optimal' scenario.

The significance of this chronic shortfall in funding for protected area management is underlined by the fact that, as a government body, all revenues collected by the SNPA through mechanisms such as visitor fees and permits, research permits and merchandise is returned directly to the Treasury. Furthermore, SNPA has not been able to vary its visitor entry fee since its inception in 2009, when fees were set at the current (2018) equivalent of \$US15 per person. Consequently, the real value of the visitor fee has diminished by 14% due to inflation alone. In comparison, protected areas run by NGOs and the private sector are able to determine their own fee structure, with the result that most currently charge entry fees double that of the SNPA [24].

The total number of visitors to marine national parks in Seychelles has increased by 71% in the period 2010–2016, with over half of these visitor fees being derived from CMNP alone (Table 3). The total revenue stream from visitor fees in 2016 is in the order of US\$1.31 M, which would almost double the 2017 SNPA budget to US\$2.84 M if all the preceding year's visitor fees were retained. This would still represent a shortfall of 33% and 58% on expected total management costs under the 'basic' and 'optimal' management models outlined above, but is clearly a vast improvement on the existing situation.

Furthermore, all visitor fees are collected by SNPA staff based on Curieuse Island in the MPA. This means that all tourists on Praslin who use the waters of CMNP for bathing, snorkelling and other water-based activities without setting foot on the island are excluded from fee payment, despite the fee being applicable to anyone entering the park. This shortfall in revenue collection is exacerbated by the fact that the various hotels on the Praslin coast bordering CMNP clearly benefit from its proximity yet are also excluded from making any direct financial contribution towards its upkeep.

The fundamental constraint upon developing efficient economic incentives for park governance clearly relates to the inability to reinvest visitor fees and other income streams into park management. This is the focus of a current initiative within government and it is expected that this will lead to a favourable change in policy in the near future (SNPA 2017, pers comm). Assuming that is the case, there are several means by which this particular income stream can be amplified. As outlined above, the current SNPA visitor fee is low in comparison to those levied by other management entities and has declined in real terms since 2009. The question of what fee level is appropriate can be explored through considering a willingness-to-pay (WTP) survey conducted by Mathieu et al. [25] involving four Seychelles marine national parks, including Curieuse. This indicated that an acceptable entry fee could be set at \$19 (after correcting for inflation) for CMNP, which was higher than the other parks sampled (Baie Ternay, Port Launay and St. Anne). Moreover, the average WTP increased to \$43 amongst visitors undertaking additional activities such as diving in CMNP. Using the 2016 visitor data from Table 2, a rise in visitor fees to \$31 would enable the total protected area management costs to be met under the 'basic' management model outlined above, which is well within the range of inflation-corrected WTP identified by Mathieu et al. [25].

Aside from the various caveats regarding WTP surveys [26], there are additional points to bear in mind when interpreting these findings.

**Table 3**

Fee-paying visitors to marine national parks 2010–2016.

	2010	2011	2012	2013	2014	2015	2016
Curieuse	29,136	24,003	28,083	38,248	40,583	45,916	47,380
Ile Cocos	4006	11,751	11,910	17,882	18,824	12,006	14,207
Ste Anne	16,377	14,750	20,301	13,340	17,687	22,154	22,468
Port Launay/Baie Ternaie	1479	3724	1257	1375	1523	2631	3378
Total	50,998	54,228	61,551	70,845	78,617	82,707	87,433

Source: Seychelles National Park Authority, pers. comm.

Mathieu et al. [25] concluded that country of origin was a key determinant of WTP, reflecting different motivations and expectations. Whilst total international visitor numbers to Seychelles have increased from 130,000 in 2000 to 350,000 in 2017 (the longest timescale for which detailed data are available), there has been a particularly significant increase in the Asian market, which accounted for 4% of visitors in 2000 and 23% in 2017, with a parallel decline in the proportion of European visitors [3]. This is largely led by the dramatic rise in visitors from the United Arab Emirates (from 0.5% of visitors in 2000 to 8% in 2017) and China (from 0.4% in 2000 to 3.4% in 2017). In addition, the link between higher marine park visitor WTP and undertaking activities such as diving implies that a greater emphasis should be placed on supporting marine activities in order to justify the imposition of a visitor fee in the higher bracket. Consequently, the magnitude of an acceptable increase in visitor fees in CMNP and other marine parks will likely differ from that found by Mathieu et al. [25] and thus requires further research.

The preceding discussion also emphasises the extent of income stream loss through non-payment of CMNP visitor fees by certain user groups. It is clearly incumbent on the SNPA to ensure equity and fairness in fee payment. This could be addressed through the imposition of a ‘hidden fee’ on guests of hotels bordering the CMNP, similar to those paid by tourists using charter boats visiting CMNP where the visitor fee is included within the total cost. Businesses with an annual turnover in excess of SCR 1 M (USD 73,000) pay 0.5% Tourism Marketing Tax which was introduced in 2013 at a rate of 0.5% on gross turnover. Currently, this tax funds tourism promotional activities carried out by the government, but could also be utilised to support reinvestment into management activities in popular tourism sites.

Finally, the diversification of SNPA’s income streams could encompass the development of payments for ecosystem services (PES) schemes, which are closely aligned with the country’s pursuit of a ‘Blue Economy’ based on the sustainable use of marine resources [27]. The potential to realise economic benefits through PES schemes in association with mangroves, corals and seagrasses, all of which are present in CMNP, is sufficiently well-established for this to be a realistic strategy [28,29].

### 5.3. Communication and knowledge incentives

The impact of these financial aspects of MPA governance are felt in other incentive categories. The provision and maintenance of interpretative material is a costly activity and has been noted as occupying a low priority due to financial constraints (SNPA 2017, pers comm). Greater inclusion of some groups, particularly artisanal fishers, through management institutions could lead to enhanced collaboration and sharing of marine resource knowledge, which would clearly benefit the objectives of park management. The significance of this is reflected in the fact that CMNP offers considerable potential to enhance public understanding of the impacts of climate change as a result of longstanding scientific research in the park. CMNP has been the focus of two longstanding coral reef research programmes, one supported by Global Vision International and the other by the Mitsubishi Corporation through Earthwatch. The former programme has conducted monthly surveys of coral and fish biodiversity along established transects dating back to 2004, which represents a rare example of a longitudinal coral

reef database in the Western Indian Ocean, which is noted for the paucity of reef monitoring data [30]. The latter research programme has also conducted regular reef surveys in CMNP since 2010 and also recently uncovered evidence suggesting a hitherto unsuspected degree of resilience to elevated sea water temperatures amongst certain species of coral [31]. These activities serve to underline the international significance of the CMNP as a focus for scientific research. However, this value cannot be readily quantified in economic terms and hence runs the risk of being marginalised in management decision-making. One option to address this involves the addition of CMNP to the Man and the Biosphere (MAB) reserve list, reflecting the scientific value of the park and its importance to the local user community. Such a move would be congruent with the requirement that MAB reserves act as ‘pilot sites’ for conservation, reflecting the international significance of the research findings. It would also, through the designation of core, buffer and transition zones required in MAB reserves, likely address the concerns of local artisanal fishers in the context of CMNP. The current Protected Area policy also allows for new site designation where the scientific, social and environmental merits can be demonstrated. Clearly this is a process that may evolve over the medium term, but offers the scope for realising the full range of use and non-use values of CMNP whilst also raising the profile of Seychelles and the Blue Economy initiative in particular at the global level.

### 5.4. Participation incentives

The provision of mechanisms for stakeholders to engage in management, either through establishing rules to ensure consistent participation opportunities or building linkages to stakeholder organisations or collaborative platforms, are notably absent in this case MPA, a pattern which is reflected in other MPAs within Seychelles. This situation reflects the overall problems of resourcing noted in Section 5.2, along with the obvious difficulties of attracting suitable qualified individuals to facilitate in a remote small island developing state context. It is noted that potential user representative group partners do exist, encompassing artisanal fishers and sports fishermen, but these groups are not routinely involved in collaborative or participatory activities. Measures which could enhance funding streams to facilitate improved management are identified in Section 5.2 which could over time result in improved participatory incentives.

### 5.5. Legal incentives

Seychelles is characterised by a mixed legal system drawing upon its British and French colonial heritage and is placed 56th out of 192 countries in the latest World Bank government effectiveness index, representing the second highest ranking for African nations [32]. This relatively well-developed legal system is reflected in the legislative framework and associated incentives pertaining to CMNP. However, enforcement of park regulations, which include prohibitions on all extractive activities, is beset by a number of problems. These include the need for ranger staff to collect fees from visitors upon arrival on the island and also to cater for pre-booked barbecues, which takes up the majority of staff time to the detriment of active patrolling. The single ranger base on the east coast of the island also renders passive



enforcement difficult, particularly in the west of the park where there is no direct line of sight, whilst entry of fishing vessels into park waters under cover of night is also problematic to police. Personal interviews conducted with ranger staff indicate that recovery of fish traps deployed inside park waters is the most common indicator of illegal activity, although there are no official records kept of these or other transgressions. It should also be noted that it is virtually impossible to trace the owner of any such traps, hence no follow-up penalties or targeted awareness-raising activities can be implemented.

## 6. Effectiveness

The question of governance effectiveness in the case of CMNP reveals a fundamental paradox that has been implied in the earlier discussion of visitor fees and financial incentives. The marine environment of the park boasts a highly diverse range of habitats, including coralline fringing reefs, granitic boulder reefs, deepwater patch reefs, algal and seagrass flats, rocky shores, sandy beaches and mangroves. Whilst this high ecosystem diversity contributes to the ecological value of the park, this is not reflected in visitor priorities and behaviour. The vast majority of paying visitors make the journey to experience the two charismatic species present in the park, both of which are terrestrial. These are the endemic Seychelles coco-de-mer (*Lodoicea maldivica*), which is only present on Curieuse and the small reserve of Vallée de Mai on Praslin and is famed for its production of the largest seeds of any plant in the world. Curieuse is also host to a free-ranging breeding population of approximately 400 highly photogenic Aldabra giant tortoises (*Aldabrachelys gigantea*) which were introduced in 1978. Consequently, despite its designation as a marine national park, the non-use values of the marine environment within CMNP are not realised and the roles of the SNPA rangers are accordingly geared towards terrestrial visitor management activities.

The second point of discussion in this context arises from the prohibition of all fishing activity within park waters, which extend from high water mark to the 30 m depth contour. Bearing in mind the pressures on nearshore fisheries outlined earlier, this exclusion generates significant concern within the domestic artisanal fishing sector, with the principal local fishers' association having long advocated for fishing rights within CMNP to be granted to artisanal fishers. Given that there is no obvious mechanism through which the prohibition of fishing generates local economic benefits, the grounds for this point of view could be substantive. Furthermore, there are no data that would support the hypothesis that spillover provides benefits to local fisheries, whilst the small size of the protected area could well undermine the delivery of such benefits [33].

This inability to generate tangible economic benefits from the use and non-use values of the marine assets of CMNP should, however, be contextualised through reference to the potential of the park to contribute towards enhanced scientific knowledge regarding coral resilience to bleaching. Along with many other sites worldwide, the reefs in Curieuse experienced significant bleaching in 2016 which affected around 90% of the hard coral cover in the park [34]. However, research both within CMNP [31] and across the Indo-Pacific more broadly [20] demonstrates the extent to which some coral species may be able to tolerate these elevated temperatures, which has clear worldwide significance in terms of identifying appropriate management strategies in light of future more intense and frequent bleaching events.

Consequently, although governance effectiveness is shaped and to some extent constrained by the relative economic value of the park's terrestrial assets, the capacity of its marine ecosystems to yield information regarding coral reefs' responses to global warming represents an invaluable yet intangible asset that must be considered. In summary, this implies that the overall direction of MPA effectiveness is declining yet there is clear potential for the reversal of this trend.

## 7. Cross-cutting issues

### 7.1. The role of NGOs

This section will reflect upon the implications for protected area governance of the DFN swap outlined earlier in this paper and the marine spatial planning activity that is integral to this agreement. The Nature Conservancy, an international NGO, has been the linchpin of this entire process through its financial contribution that underpins the agreement and its leadership in the technical and administrative aspects of marine spatial planning. There are three salient points emerging that can be identified.

As outlined above, the estimated \$600,000 annual flow of funds generated through the DFN swap will be administered by the Seychelles Conservation and Climate Adaptation Trust (SEYCCAT). This revenue will be used to support the expanded network of protected areas and programmes related to climate change adaptation through charitable, educational and scientific activities. The nine members of the SEYCCAT Board of Directors comprise three from the NGO sector (TNC, Nature Seychelles and the Seychelles Islands Foundation) along with five government representatives and one from the Islands Development Corporation, which is a parastatal entity charged with economic development of the outer islands [35]. The exclusion of SNPA from this important decision-making body reflects the emphasis on NGO and private sector management of new protected areas outlined in earlier documents [7, 23, 36]. The role of the SNPA in the context of newly established protected areas appears to be limited to ensuring that 'the management, surveillance and enforcement of these areas is consistent and legal' [36, p7], rather than assuming any direct management responsibility. Taken together, this seems to imply that the marine spatial planning process is not going to enhance the profile or influence of the SNPA in any significant way, whilst the likelihood of funding generated via the DFN swap being channelled to any existing SNPA-managed sites appears low.

Secondly, it is suggested that the Praslin artisanal fishing sector has been sidelined in the marine spatial planning process, despite its vulnerability to decisions regarding fishing restrictions in the new protected area framework, this being consistent with broader concerns about the lack of participation or influence of small-scale traditional use groups in MSP [37]. This is reflected in the absence of any Praslin artisanal sector representation in the records of steering groups, working groups and stakeholder workshops held to date [38]. Earlier documents circulated in workshops attended by one of the authors acknowledged that the artisanal fishery also operates in offshore areas likely to be designated no-take zones, hence the lack of input from this stakeholder group implies that further restrictions on their activities may result. This is of consequence with regard to the CMNP as such restrictions could add to problems of enforcement if artisanal fishing activity is pushed closer to the shore as a result of the closure of offshore areas under the marine spatial planning process.

Finally, there are grounds for concern over the broader governance implications of the move to empower Seychelles NGOs and parastatal bodies with protected area management. Duffy [39] uses the term 'governance state' to describe the reshaping of environmental policy-making in a sovereign state as a result of the complex interactions between international financial institutions, international and domestic NGOs and the national government. The parallels between Duffy's analysis of Madagascar as a governance state and the evolving situation in Seychelles are striking, suggesting that the neutralisation of domestic NGOs through their co-option into an agenda driven by international NGO priorities will lead to a similar loss of state and domestic NGO independence. Indeed, Seychelles arguably presents an even starker situation than Madagascar, given the constraints on civil society and state resources in a small island state context. The end product of the transition to a governance state is inevitably a diminution in the power of participatory processes and a loss of management accountability, neither of which is desirable in the pursuit of good governance.

## 8. Conclusion

This case study has demonstrated the importance of economic incentives as a means to understand MPA governance in a small island state. Despite a situation of chronic underfunding, marine national parks such as Curieuse still hold the prospect for improved governance if measures are taken to capitalise upon the increasing flow of international tourism to provide financial self-sufficiency. However, the dependency of Seychelles on external investors, whether in the context of tourism or marine protection, is manifest in a situation whereby the autonomy of state policy is being progressively eroded and the responsibility for marine resource management is increasingly vested in institutions with less public accountability. It remains to be seen whether the state-run national parks, including smaller inshore designations, can maintain their viability in a situation where vast expansions in offshore marine protected areas are being undertaken that will serve to cement the influence of international NGOs in domestic marine policy.

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