Chagos News

The Periodical Newsletter of the Chagos Conservation Trust and Chagos Conservation Trust US

No 56 July 2020

Ten Year Anniversary Issue 2020

ISSN 2046 7222

Contents

Cover image: Peros Banhos Lagoon Knolls, Ile Vache Marine © Jon Slayer

Editorial

Alistair Gammell, CCT Chair

For centuries people have regarded the sea as an inexhaustible source of food, a useful transport route and a convenient dumping ground–simply too vast to be affected by anything we do.

But whilst we can see the destruction from human pressure on land for ourselves and demand action to give protection to species and habitats, under the ocean it is out of sight and what the eye doesn't see, the heart doesn't grieve.

The idea of protecting land habitats and species has long been a cornerstone of conservation policy–think the Serengeti, Kruger, Yellowstone or, closer to home, Minsmere–and these protected areas are increasingly seen as "wonders of the world" and have become tourist honeypots.

But what about in the sea? Here protection lags far behind protection of wildlife and habitats on land.

Even though the populations of many fish species and marine habitats such as coral reefs or seagrass beds have been severely affected by over-fishing, bottom trawling, seabed mining and pollution, there is practically no protection for marine species.

When most of us hear something is "a protected area", we assume all the species and habitats in it are safe.

Well not always so, particularly in the marine environment where partial protection is the norm allowing many damaging activities to continue. It is 'protection' in name only.

That is why the decision taken by David Miliband in 2010 to fully protect 640,000 km^2 of the Chagos Archipelago (with some minor exceptions) was such a major step in the much-needed protection of the world's oceans.

The British Indian Ocean Territory Marine Protected Area in the Chagos Archipelago is both fully protected and large.

Full protection gives greater protection than partial protection, and protecting large areas provides more effective protection than protecting small areas because the smaller a reserve is, the greater the likelihood that activities outside the reserve spill over and impact on the reserve itself, and that species in the reserve may travel beyond its boundaries and be killed.

And the larger the reserve the greater its positive impact will be on the conservation of migratory species.

Owing to campaign led by CCT in collaboration with other major players in the marine conservation community, for the past 10 years the Chagos Archipelago has been protected.

Today it is one of the world's largest fully protected marine reserves and a haven for the Indian Ocean's hard-pressed wildlife.

Meanwhile, despite the claims of the fishing industry during the campaign about their "responsible and sustainable fishing practices", yellowfin tuna, bigeye tuna and albacore tuna continue to this day to be subject to overfishing in the Indian Ocean, and the fishing industry continues to deplete shark and other species.

Except, that is, in waters of the Chagos Archipelago.

10 year anniversary discount–Chagos: A History

Released in 2016 Chagos: A History, by Nigel Wenban-Smith and Marina Carter, is a high quality 550 page hardback book giving the **first comprehensive account of the history of the Chagos Archipelago** in the Indian Ocean, from its discovery by Europeans in the 1500s up until the expulsion of the islanders in the early 1970s.

In celebration of ten years of marine protection, **CCT is offering a limited-time discount on the book.**

Ten for Ten deal
Buy the book here before 30 September 2020 and receive a 10% discount (reduced from £40 to £36) using the code: TEN2020

Book and membership deal
Join CCT (£20) here before the 30 September 2020 and receive a copy of Chagos: A History at a 35% discount (reduced from £40 to £26) using the code sent to you.

Are you a CCT member already? You will also receive a 35% discount (reduced from £40 to £26) by emailing info@chagos-trust.org before the 30 September, 2020!

Time flies when you are having fun

Heather Koldewey, Zoological Society of London Programme Lead, Bertarelli Foundation's Marine Science Programme

© Jon Slayer

Ten years ago I was dancing around my kitchen, to the bemusement of my two small children, as we heard the news of the declaration of the British Indian Ocean Territory (BIOT) Marine Protected Area (MPA).

This represented a huge step forward in global ocean protection, and the culmination of years of hard work by CCT with many scientists to demonstrate the value of this unique location in the middle of the Indian Ocean.

The MPA also catalysed a programme of science, building on years of research led by Charles Sheppard, with many collaborators.

First, John Turner (Bangor University, with Charles Sheppard and myself) was awarded a Darwin Initiative grant that ran from 2012 to 2015 with the British Indian Ocean Territory Administration as the main project partner, delivering three consecutive years of scientific expeditions for the very first time.

Second, recognising the value of BIOT to scientific discovery, the Bertarelli Foundation convened an international group of scientists with interest and expertise in the region that resulted in a five-year science plan.

This initially led to the Foundation's support for a series of expeditions to BIOT before awarding major funding to nine research projects that run from 2017 to 2021.

This marine science programme now includes 66 scientists plus 27 postgraduate students, representing 24 institutions and six countries, all managed by the Zoological Society of London.

The science plan identified three focal areas of research on sentinel species, reef resilience, and science to management, with

the goal of testing the success of the large marine reserve paradigm in BIOT and ensuring the research was useful to MPA managers.

Our interdisciplinary and collaborative approach has generated new methods, discoveries, ideas and insights, as well as over 50 scientific publications in the last two years alone.

So what do we know now?

As a fully protected MPA, BIOT is a globally significant scientific reference site, providing an important refuge for many species, from cryptofauna[1] to reef fish[2], and habitats[3].

A very recent study has revealed a strong link between rich biodiversity and a thriving ecosystem, with clear evidence of the importance of fish biodiversity to the health of tropical coral reef ecosystems[4].

For sentinel species, research revealed the MPA is vitally important regionally for sea turtle populations, accounting for 39-51% of hawksbill and 14-20% of green turtle clutches laid in the South-West Indian Ocean[5].

Seabird census data from 2008 to 2018 showed the maximum number of breeding seabirds for a nominal year was 281,596 pairs of 18 species[6].

Tagging studies found the MPA is providing substantial protection to its reef manta ray population, with no mantas leaving the protected area throughout the study[7].

Similar findings were made for silky sharks and silvertip sharks–only one silky shark left the MPA during a 40-month period[8].

We have completely new insights into reef resilience: By integrating island and reef studies, scientists have shown how rat introductions have disrupted nutrient flows among pelagic, island and coral reef ecosystems.

Off rat-free islands, fish biomass and coral reef productivity is higher[9], with evidence this may also provide some resilience to bleaching[10].

This research demonstrates that removing rats is the highest priority conservation management action to restore species and build reef resilience, and is now a focus for CCT.

The other key proximate threat to BIOT's wildlife is illegal fishing.

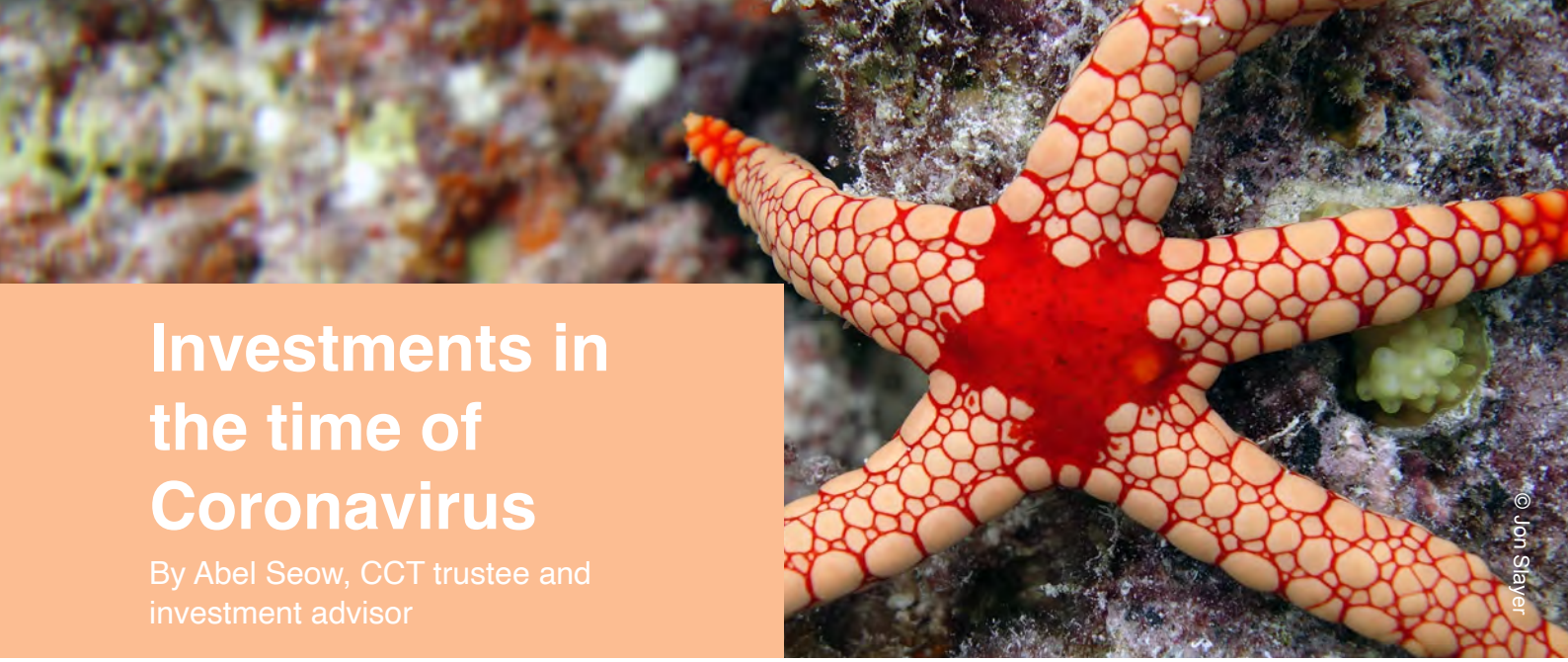
Estimates show grey reef sharks are at 79% and silvertip sharks at 7% of their respective baselines, indicating levels of exploitation that were longer and more intensive than previously estimated[11].

However, oceanographic insights are helping understand the drivers of distribution of sharks[12] and acoustic tracking studies show that shark movements are quite predictable, telling us where we might expect to find them in the future and providing information that can be immediately used by MPA managers[13].

While the MPA may help increase resilience, the archipelago's coral reefs still suffered severe bleaching and mortality in 2015, causing a 60% coral cover decrease from 30% cover in 2012 to 12% in April 2016[14], including the near extinction of some species[15].

To truly secure a future for the remote and spectacular reefs of the Chagos Archipelago, we require global action–the successful implementation of the Paris Agreement and a green recovery from the immense global challenge resulting from the Covid-19 pandemic.

We have ten years to achieve that, which will certainly have me dancing around my kitchen again.



Investments in the time of Coronavirus

By Abel Seow, CCT trustee and investment advisor

The CCT portfolio comprises three funds– the Newton SRI for Charities (31%), Sarasin Climate Active Endowment (40%) and Sarasin Income and Reserves Fund (29%).

As at 21 June 2020, the value of the CCT investment portfolio was £1,091,907 and year to date performance was -1.78%. The CCT portfolio has, along with global markets, endured a volatile year.

After reaching new highs at the start of the year, global markets started to see an indiscriminate sell-off across all asset classes as the severity of the spread of COVID-19 became more evident. Equity markets were the hardest hit and at the depth of the sell-off, the CCT portfolio was -12% (for comparison the benchmark S&P500 was -34% (in USD terms)).

Since then, the CCT portfolio has recovered most of those losses as unprecedented actions were undertaken by central banks and governments globally to support their economies.

We are satisfied with the overall performance of the CCT portfolio. Its resilience is mainly attributable to a move of some of our equity investments into the, mainly fixed income, Sarasin Income and Reserves Fund in February 2020 following a review of the portfolio allocation by the Finance Committee. This reduced the level of risk in the portfolio and brought the asset allocation back in line with CCT's goal of 5% annual returns. This followed a strong 2019 for the portfolio that saw returns of +18.4%, performance that was very much in line with world equity markets.

This ensured that around a third of the CCT portfolio was invested in fixed income instruments that traditionally act as a safe haven during periods of significant market turbulence. It would be fair to say that the overall drop in the value of the CCT portfolio would have been greater without this switch.

The Board unanimously agree that the CCT portfolio should not attempt to 'time the market' but instead aim for 'time in the market'. With that in mind, the CCT portfolio is invested with a long term horizon and there has been no change in our investment strategy.

The Board accepts that there could be some volatility in returns in the short term. Importantly, the Board does not take any active views regarding market outlook but leaves the appointed investment managers to lower and raise the risk of the portfolio as they deem appropriate within their brief.

Regular portfolio updates are provided by the Finance Committee to the Board on, at least, a quarterly basis.

Healthy Islands, Healthy Reefs

By Helen Pitman, CCT director


© Jon Slayer

I am happy to report that our Healthy Islands, Healthy Reefs programme (profiled in Chagos News July 2019) is progressing well.

CCT is developing a ten year conservation programme, in partnership with the British Indian Ocean Territory Administration, that will boost biodiversity across the Chagos Archipelago and help corals build resilience to climate change.

It will include a wide-scale island rehabilitation programme and one of the largest invasive species eradications seen to date in the tropics.

The CCT board agreed to self-fund a feasibility study, an important first step to developing the programme, that has produced clear recommendations of the most appropriate and cost-effective method for achieving rat eradication in the Chagos Archipelago.

With the help of experts Grant Harper, Island Conservation and the Island Eradication Advisory Group, we now have a much clearer idea of how to successfully achieve this and how much it is likely to cost, estimated at £4 million.

Though this is a large figure, it is very good value.

Healthy Islands, Healthy Reefs will increase the available land for seabirds by 95%.

Currently, nearly 50% of the islands of the Chagos Archipelago are in a degraded state caused by their rat populations and the dominance of the former coconut plantations, and consequentially have reduced biodiversity such as seabirds.

Without healthy seabird populations supplying nutrients to coral reefs they are less likely to thrive, particularly having recently suffered two successive years of coral bleaching.

The arrival of Coronavirus and the subsequent lockdown has affected our initial timeline slightly by delaying our planned stakeholder and expert workshop, which will determine the final decisions on how we proceed with the programme.

We are looking at alternatives to keep up the momentum.

This is a long-term programme and comes with a significant price tag but one that we're committed to raising funds for.

At the moment we're talking to funders about the programme and look forward to bring you updates in future issues of Chagos News.

CCT-US update

Following an invitation by William Marsden, a previous Chair of CCT, the Chagos Conservation Trust US formed in 2008 and qualified as a registered US 501(c)(3) not-for-profit organisation in 2009.

CCT-US set out to support William's efforts to create the British Indian Ocean Territory Marine Protected Area, and to extend the goals of CCT to a US audience.

Through its first and formative decade, the CCT-US team was chaired by Sam Purkis, with Steve Snell filling the role of Vice Chair and Treasurer, Carol Garner as Secretary, Gwilym Rowlands as both Membership Secretary and Website Administrator, and Chip Batcheller serving as Outreach Director.

During that decade, CCT-US participated fully with CCT on the latter's expeditionary schedule, contributing in small but meaningful ways to the gathering of data and development of an understanding of the archipelago's ecosystems.

Over those 10 years scientific interest in the archipelago has increased dramatically, and one observation every visitor to the islands notes is the eagerness of the military and contract employees on Diego Garcia to assist in every environmental activity conducted by visiting researchers.

They have been instrumental in studies of sea turtle nesting and coconut crab populations, reforestation and the island-wide efforts to clear the beaches of the worst of the plastic pollution that washes up.

Now, CCT-US is considering a new way to increase that outreach by organising the enthusiastic residents of Diego Garcia into a 'Conservation Club'.

The idea is to work with the BIOTA Environmental Officers, and the appropriate US officials, to assist visiting scientists, and to perhaps develop local initiatives similar to Pete Carr's ground breaking forestry programme.

CCT-US is also looking for members to join our Board of Trustees. Why don't you consider signing up?

Our most recent member is David Snell, son of one of our founders, Steve. Dave is a cybersecurity consultant and retired navy cryptologist, who has a passion for the ocean.

He was first attracted to the Chagos Archipelago based on his father's experiences there and his own love for sharks. He joins our Chair Ted Morris, Secretary Lottie Purkus, and member-at-large Jeff Swanson.

If you would like to know more about our Board, or would like to get involved with a local environmental group on Diego Garcia, please drop us a line at: members@cctus.org.

Conservation research with sea turtles in the Chagos Archipelago

Graeme Hays, Deakin University and
Nicole Esteban, Swansea University

Green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles nest in the Chagos Archipelago.

Although both species were historically exploited, there has been long-term protection in place for several decades.

Throughout the year nesting beaches on Diego Garcia are patrolled every few weeks to count the tracks of nesting turtles, and the data is then used to determine annual nesting numbers.

The results from this ongoing census are showing dramatic increases in nesting numbers.

It has been estimated that the current annual numbers of clutches across the archipelago are around 6,000 for hawksbill turtles and 20,000 for green turtles, reflecting an increase of two-five times for hawksbills and four-nine times for green turtles since 1996[1].

These upward trends in nesting numbers for both species are presumably a reflection, at least in part, of the fact that there has been no known human exploitation of eggs or adults in the archipelago for around 50 years.

These encouraging upward trends also point to the importance, more broadly, of the nesting beaches in the Chagos Archipelago for the South-Western Indian Ocean (SWIO) region.

Regional estimates indicate that the Chagos Archipelago accounts for around half of the hawksbill and one fifth of green turtle clutches laid across the entire SWIO[1].

Ongoing satellite tracking of both nesting and immature green and hawksbill turtles is also uncovering details of their patterns of dispersal.

Tracking has shown that green turtles in the Chagos Archipelago disperse widely across

the SWIO at the end of their nesting season, which peaks between June and October[2, 3].

While some individuals travel to foraging grounds around 80 km away on the Great Chagos Bank, others travel to foraging grounds as far away as the Seychelles, Maldives and mainland Africa.

These tracking results show that the Chagos Archipelago provides an important nesting sanctuary for adult green turtles that forage across much of the ocean basin.

Ongoing tracking is also being used to assess patterns of migration for adult hawksbill turtles after their nesting season, which peaks between October and February[1].

The data is proving valuable in informing marine spatial planning across the SWIO, helping, for example, to determine boundaries of protected areas in the Seychelles.

In-water surveys of green turtle foraging grounds within the marine protected area have led to discoveries of extensive, deep-water seagrass meadows across the south-east Great Chagos Bank[4].

Very little is known about these newly discovered habitats, with in-water surveys previously focussing on coral reef habitats. However, these seagrass meadows appear to support abundant and diverse fish communities[4].

Further, ongoing work tracking immature hawksbill and green turtles foraging at Diego Garcia is starting to uncover how small lagoon areas may support large numbers of foraging immature turtles.

Sand temperature monitoring is also revealing encouraging information about how the nesting beaches in the archipelago are particularly climate resilient with regard to incubation temperatures[5].

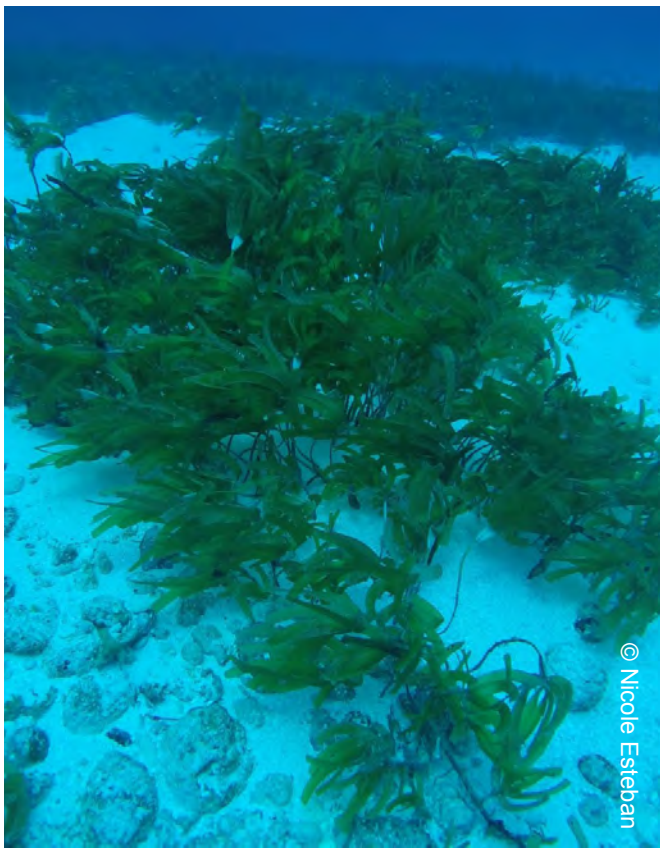
In sea turtles, the incubation temperature determines whether hatchlings become male or female, a phenomenon termed 'temperature-dependent sex determination'. There is concern that at most nesting beaches around the world, climate warming is causing the feminisation of populations, as females are produced at warmer temperatures[6]. A lack of male hatchlings might ultimately lead to population extinction.

Ongoing monitoring at Diego Garcia is showing that the sand at nest depths is relatively cool, most likely because of a combination of heavy rainfall and shading provided by vegetation behind the nesting beaches.

Consequently, it is estimated that hatchling sex ratios are currently balanced[5].

In future scenarios of climate warming, excessive feminisation of hatchlings is therefore much less likely to occur in the Chagos Archipelago than at most other nesting sites around the world.

The successes being seen in the archipelago's turtle populations illustrate how by removing other human pressures, we can help endangered species to build resilience against the threats posed by climate change.



10 years of the BIOT MPA: Challenge and success

Sam Bullen, Deputy Head, BIOTA, looks back on managing the British Indian Ocean Territory (BIOT) marine protected area.

At around 640,000km^2, the BIOT MPA is the size of France. It remains one of the largest and most remote MPAs in the world.

After a decade, what has the MPA achieved and how can this be built on for the future?

With the exception of a small recreational fishery around Diego Garcia, the entirety of BIOT is a no-take MPA with no commercial fishing permitted.

Scientific research has suggested that the introduction of the MPA has had significant positive impacts on the unique wildlife and environment in the territory.

A recent study by Dr Nicole Esteban and Dr Jeanne A. Mortimer has shown a massive increase in the populations of critically endangered hawksbill turtles and endangered green turtles in the archipelago over the past fourteen years.

They estimate that 51% of hawksbill turtles in the Indian Ocean now nest in BIOT. This fantastic news suggests the MPA provides these and other rare and endangered species with a refuge from habitat degradation and humans, where their populations can recover and grow.

A particular focus for the BIOT Administration (BIOTA) and its partners over the past 10 years has been countering the threat posed to the health and sustainability of the marine ecosystem by illlegal, unregulated and unreported (IUU) activity, which is at the core of our environmental priorities.

This activity has potential ecological, social and economic knock-on effects for the whole Indian Ocean region.

Locally BIOT continues to deploy the patrol vessel to intercept illegal fishing vessels, as well as having a growing role in monitoring the health of the territory's environment.

We employ state-of-the-art technology to assist us, and work with our partners to increase the effectiveness of our operations, leading to the regular apprehension of illegal vessels.

Internationally BIOTA works closely with regional states directly and via the Indian Ocean Tuna Commission to share information on IUU threats, ensuring illegal fishing vessels face justice, and encouraging states to increase monitoring of their fleets, helping reduce the threat of IUU and promote environmental protection.

While challenges remain, BIOTA is committed to protecting our unique environment.

The MPA has given us the tools to do so for a decade, and it will continue to do so in the future.

The British Indian Ocean Territory (BIOT) is one of 14 British Overseas Territories.

It is administered from London by the British Indian Ocean Territory Administration.


© Jon Stayer

The campaign that delivered a sea change

Alistair Gammell, Chair, Chagos Conservation Trust

After 40 years working in conservation for the Royal Society for the Protection of Birds, culminating in becoming their International Director, I decided that 2009 was the time to hang up my binoculars and retire.

But retirement proved short-lived. The Pew Charitable Trusts advertised for a campaigner to lead a project to have the Chagos Archipelago declared the world's largest no-take marine protected area (MPA)–and the opportunity proved too good to miss.

So on the 1 September, just one month after my official retirement, I took on the challenge of spearheading one of the most ambitious campaigns ever undertaken by the conservation community.

Led by CCT, the campaign was a collaboration with Pew Environment Group, the Linnean Society, RSPB, the Zoological Society of London, the Marine Conservation Society, Royal Botanic Gardens Kew, Blue Marine Foundation, and Professor Charles Sheppard of Warwick University.

We called ourselves the Chagos Environment Network and I was joined by Elisabeth Whitebread. Together, we provided the secretariat and Simon Hughes, CCT's secretary, was Chair of the campaign.

Many years of research led by Charles and Anne Sheppard and CCT in the Chagos Archipelago had revealed that it contained some of the most pristine coral reefs in the Indian Ocean and was home to important seabird and turtle populations.

Designating the area an MPA would instantly create a safe haven for thousands of species in an ocean subject to a multitude of human pressures.

The Chagos Archipelago was already on the radar of policymakers as earlier that year, CCT, supported by other conservation organisations and universities, published *The Chagos Archipelago: Its Nature and the Future*, which set out the importance of the archipelago for conservation, and provided a vision to assure its protection.

There wasn't a moment to lose because it rapidly became evident that this publication had caught the attention of the Foreign and Commonwealth Office (FCO) and of the British Indian Ocean Territory's Commissioner, and they were in the final stages of preparing for the launch of a public consultation on how conservation of the Chagos Archipelago's marine environment could be enhanced.

The consultation was published on 10 November 2009 with a three-month window for responses.

It specifically invited views on whether an MPA should be created in the British Indian Ocean Territory and, if so, whether it should be fully no-take (BIOT) for the whole area.

Various, watered down options were also proposed including an MPA with exceptions for certain forms of pelagic fishery (e.g. tuna) in certain zones at certain times of the year.

We were delighted that our preferred option was the first on this list–a no-take marine reserve covering the entire territory (excluding Diego Garcia) and its surrounding seas.

CCT, together with our colleague organisations, set about publicising the merits of this option and promoting support from other organisations and members of the public for it.

An intense period of campaigning followed involving meetings with MPs, journalists and other interested parties, launching a website and a social media campaign, drafting a detailed response to the consultation, and organising support for our preferred option through letters from as many sympathetic individuals and organisations as possible–as well as through written and electronic petitions.

Of course not everyone shared our opinion. Opposition to the establishment of a fully protected area came largely from those wanting to continue the tuna fishery, and those who felt that the right of return for the Chagossian community and issues of Mauritius's claimed sovereignty should be resolved before a protected area should be considered.

The Chagos Environment Network knew that securing a no-take MPA was ambitious, but it believed that some parts of the ocean should be fully protected (just as some parts of the land are fully protected so wildlife and natural habitats can flourish) to allow fish of all species some respite from the widespread overfishing that afflicts almost all marine ecosystems, and to allow natural processes to continue with minimal human interference.

This would provide an area of conservation in an increasingly over-exploited ocean, a relatively undisturbed scientific reference area against which other ocean areas could be compared, and give the Chagos Archipelago the best chance of building resilience against other threats such as climate change.

Following an extension of nearly a month to give more time for responses, particularly from communities outside the UK, the consultation finally closed on 5 March 2010.

More than a quarter of a million people had registered a view, with well over 90 per cent of respondents making clear their support in principle for greater marine protection in the Chagos Archipelago.

Of these, the great majority supported our preferred option of a no-take MPA for the whole of the territorial waters, and the Environmental Preservation and Protection Zone/Fisheries Conservation and Management Zone.

Despite the overwhelming support for a large scale, no-take MPA, a significant issue still remained; the sale of tuna fishing licences had been bringing in about £800,000 pa to the BIOT Administration, which had funded their BIOT patrol vessel.

This raised an important question for the UK Government: If tuna fishing was stopped, where would the money come from to fund the essential enforcement patrols?

It was in helping to solve this problem through discussions with the FCO that the generosity of the Bertarelli family proved of crucial importance to the establishment of the MPA.

On 1 April 2010, with an election imminent and as one of his final decisions as Foreign Secretary, David Miliband announced that a fully protected marine reserve would be established in the Chagos Archipelago.

Covering 640,000km^2, with just minor exceptions to permit a recreational/ subsistence fishing zone around Diego Garcia and subsistence by transiting yachts licenced to stop over in the outer islands, the archipelago became the largest no-take MPA in the world.

So our campaign was successful and for the past 10 years the archipelago has been fully protected.

Today the Chagos Archipelago is still one of the world's largest no-take MPAs.

A forthcoming report from the Bertarelli Programme in Marine Science will provide a clearer picture of the impact the MPA to date, but there's no doubt it has provided a haven for the Indian Ocean's exploited wildlife and set in motion a new wave of marine reserve designations across the globe.

References

P6-7: Time flies when you are having fun

1 Head, C.E.I., Bonsall, M.B., Koldewey, H., Jenkins, T.L.,Pratchett, M.S. and Rogers, A.D. (2018) Exceptional biodiversity of the cryptofaunal decapods in the Chagos Archipelago, central Indian Ocean. *Marine Pollution Bulletin*. DOI:10.1016/j.marpolbul.2018.07.063.

2 Samoilys, M., Roche, R., Koldewey, H. and Turner. J. (2018) Patterns in reef fish assemblages: Insights from the Chagos archipelago. *PLOSone*. DIO:10.1371/journal.pone.0191448.

3 Esteban, N., Unsworth, R.K.F., Gourlay, J. and Hays, G.C. (2018) The discovery of deep-water seagrass meadows in a pristine Indian Ocean wilderness revealed by tracking green turtles. *Marine Pollution Bulletin*. DOI:10.1016/j.marpolbul.2018.03.018.

4 Benkwitt, C.E., Wilson, S.K. and Graham, N.A.J. (2020) Biodiversity increases ecosystem functions despite multiple stressors on coral reefs. *Nature Ecology and Evolution*. DOI:10.1038/s41559-020-1203-9

5 Mortimer, J.A., Esteban, N., Guzman, A.N and Hays, G.C. (2020) Estimates of marine turtle nesting populations in the south-west Indian Ocean indicate the importance of the Chagos Archipelago. *Oryx*. DOI:10.1017/S0030605319001108 [Feb]

6 Carr, P., Votier, S., Koldewey, H., Godley, B., Wood, H., Nicoll, M.A.C. (in press). Status and phenology of breeding seabirds and a review of Important Bird and Biodiversity Areas in the British Indian Ocean Territory. Bird Conservation International.

7 Andrzejaczek, S., Chapple, T.K., Curnick, D.J., Carlisle, A.B., Castleton, M., Jacoby, D.M.P., Peel, L.R., Schallert, R., Tickler, D.M. and Block, B.A. (2020) Individual variation in residency and regional movements of reef manta rays *Mobula alfredi* in a large Marine Protected Area. *Marine Ecology Progress Series*. DOI:10.3354/meps13270

8 Carlisle, A., Tickler, D., Dale, JJ., Ferretti, F., Curnick, D.J., Chapple, T., Schallert, R., Castleton, M. and Block, B.A. (2019) Estimating space use of mobile fishes in a large marine protected area with methodological considerations in acoustic array design. *Front. Mar. Sci*., 22 May 2019 DOI:10.3389/fmars.2019.00256

9 Graham, N.A.J, Wilson, S.K., Carr, P., Hoey, A.S., Jennings, S. and MacNeil, M.A. (2018) Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. *Nature*. 559:250-253. 10.1038/s41586-018-0202-3. Citations: June – NA Nov – 9

10 Benkwitt C.E., Graham N.A.J. and Wilson S.K. (2019) Seabird nutrient subsidies alter response of coral reefs to bleaching events. *Global Change Biology*. DOI:10.1111/gcb.14643

11 Ferretti, F., Curnick, D., Liu, K., Romanov, E. and Block, B. (2018) Shark baselines and the conservation role of remote coral reef ecosystems. *Scientific Advances*. DIO:10.1126/sciadv.aaq0333.

12 Hosegood, P. J., Nimmo Smith, A., Proud, R., Adams, K. & Brierley, A. (2019). Internal lee waves and baroclinic bores over a tropical seamount shark 'hot-spot'. *Progress in Oceanography*. DOI:10.1016/j.pocean.2019.01.010

13 Jacoby, D.M.J., Ferretti, F., Freeman, R., Carlisle, A.B., Chapple, T.K., Curnick, D.J., Dale, J.J., Schallert, R.J., Tickler, D. and Block, B.A. (2020) Shark movement strategies influence poaching risk and enforcement decisions in a large, remote Marine Protected Area. *Journal of Applied Biology*. DOI:10.1111/1365-2664.13654

14 Head, C.E.I, Bayley, D., Roche, R., Turner, J., Rogers, A.D., Koldewey, H., Rowlands, G., Tickler, D.M., and Andradi-Brown, D. (2018). Coral bleaching impacts from back-to-back 2015-2016 thermal anomalies in the remote central Indian Ocean. DOI:10.1007/s00338-019-01821-9

15 Sheppard, C., Sheppard, A. and Fenner, D. (2020) Coral mass mortalities in the Chagos Archipelago over 40 years: Regional species and assemblage extinctions and indications of positive feedbacks. *Marine Pollution Bulletin*. 154. DOI:10.1016/j.marpolbul.2020.111075

P12-13: Conservation research with sea turtles in the Chagos Archipelago

1 Mortimer JA, Esteban N, Guzman AN, Hays GC (2020) Estimates of sea turtle nesting populations in the south-western Indian Ocean indicate the importance of the Chagos Archipelago. *Oryx* 54: 332–343. DOI:10.1017/S0030605319001108

2 Hays GC, Mortimer JA, Ierodiaconou D, Esteban N (2014a) Use of long-distance migration patterns of an endangered species to inform conservation planning for the world's largest marine protected area. *Cons Biol*. 28:1636–1644. DOI:10.1111/cobi.12325

3 Shimada T, Limpus CJ, Hamann M, Bell I, Esteban N, Groom R, Hays GC (2020) Fidelity to foraging sites after long migrations, *J Anim Ecol* 89:1008–1016. DOI:10.1111/1365-2656.13157

4 Esteban N, Unsworth RKF, Gourlay J, Hays GC (2018) The discovery of deep-water seagrass meadows in a pristine Indian Ocean wilderness revealed by tracking green turtles. *Mar Poll Bull* 134:99-105. DOI:10.1016/j.marpolbul.2018.03.018

5 Esteban N, Laloë JO, Mortimer JA, Guzman AN, Hays GC (2016) Male hatchling production in sea turtles from one of the world's largest marine protected areas, the Chagos Archipelago. *Sci Rep* 6:20339. DOI:10.1038/srep20339

6 Hays GC, Mazaris AD and Schofield G (2014b) Different male vs. female breeding periodicity helps mitigate offspring sex ra-tio skews in sea turtles. *Front Mar Sci* 1:43. DOI:10.3389/fmars.2014.00043

The Chagos Archipelago is a rare haven of beautiful reefs, diverse wildlife and clean waters, located in the midst of the Indian Ocean. The Chagos Conservation Trust is the only UK charity dedicated to protecting it.

For more information please visit chagos-trust.org

If you would like to contribute to Chagos News please email chagosnews@chagos-trust.org

CHAGOS CONSERVATION TRUST