Chagos News

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EDITORIAL

The Chagos Conservation Trust is making great strides in raising awareness of the need for, and benefits of, the huge Chagos Marine Protected Area. In December, I attended the Big Ocean Network meeting in Auckland New Zealand where the need for these very large MPAs and the need for many more like them was abundantly clear. The consensus for having a scientific basis for these MPAs was highlighted as being very necessary, and a shared research programme was discussed.

Ctenella chagius the Chagos brain

As you read this the Chagos 2012 Expedition will be on site and busy. As you might expect, there is a very large amount of work to be done – Chagos covers a very large area of reef and access is only for a short time on an irregular basis. The cost of research in such a remote place is significant, although the cost of not having the answers we seek will be even greater.

This issue has a very thoroughly researched article on the history of the population of people living on the Chagos atolls through the period that they have been inhabited. Nigel Wenban Smith and Marina Carter have travelled all over the world both literally and electronically to gather the data. These data are presented here and make a fascinating story.

Brightly coloured *Lobophyllia*

And having good data is also the story of the scientific research which has been done on Chagos. It is data driven and published in peer reviewed journals. Every claim as to the superb condition of Chagos and its marine and terrestrial life is based on fact – derived from large amounts of research by some of the world's leading scientists. Some individuals who would like to allow the tuna fishers to start fishing again in Chagos have made some wild claims, but unless their data are made available these are just that - wild claims.

The long polyped *Goniopora*

So the MPA is in good shape and in good hands, and with a great and committed group of supporters. Something we can be proud of is to have been part of the movement which caused the creation of the world's biggest no-take MPA – a true oasis in a declining ocean.

Anne Sheppard

Lacy tables of *Acropora*

The intricate patterns of *Platygyra*

The Chagos Archipelago: the World's Largest No-take Marine Reserve
Review of the Linnean Society of London Meeting

Catherine Head
University of Oxford & Zoological Society of London

Prof David Clary

You may have heard it said that the Chagos Archipelago is the gem of the Indian Ocean with the cleanest waters and some of the most pristine marine ecosystems in the world. Last November a meeting at the Linnean Society of London showcased exactly why we can make these bold claims and indeed why this Archipelago is now the world's largest no-take marine reserve.

In 1999 the Linnean Society of London published the volume *Ecology of the Chagos Archipelago,* a synopsis of data obtained during the 1990s. This time round the Linnean Society and the Chagos Conservation Trust, with the support of the Pew Environment Group, chose to present some of the highlights of ecological research findings uncovered by international scientists over the last decade through a one-day meeting.

The sold-out event had a diverse and insightful scientific programme. It commenced with an introduction from Professor David Clary FRS, Chief Scientific Adviser to the Foreign and Commonwealth Office.

Prof Charles Sheppard

Professor Charles Sheppard FLS, organiser of the event, kicked-off the meeting with an overview of the ecological research carried out over the years. Including his recent research on the fast recovery of much of Chagos' coral reef ecosystem following an intense period of ocean warming and subsequent coral bleaching in 1998. The Archipelago's resilience to the impacts of ocean warming, which have detrimentally affected other coral reefs globally, is thought to be due to the exceptionally good condition of its marine environment.

One of the most jaw-dropping findings presented at the meeting was that of Dr Nick Graham, of James Cook University, Australia, who reported that the Chagos Archipelago has orders of magnitude more fish biomass in its coastal waters than anywhere else in the Indian Ocean, and higher fish biomass than even its isolated Pacific island counterparts such as the Northern Line Islands. Perhaps this alters our understanding of the true baseline for coral reefs? Ongoing genetic connectivity work presented by Dr Matt Craig, of the University of Puerto Rico, showed the importance of Chagos as a stepping-stone for many species across the Indian Ocean. Professor Bernhard Reigl, Deputy Director of the National Coral Reef Institute, USA, talked about his work on the importance of the lagoon system to the survival of Chagos' coral reefs as climate change continues to alter the temperature, currents, and chemistry of our oceans.

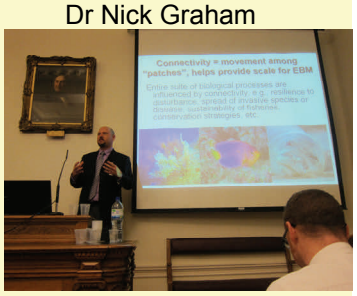
Climate change was an ever-present topic, and Dr Miriam Pfeiffer of Aachen University, Germany, spoke about her work into climate interpretation using Chagos coral. She concluded that Chagos was a key site for monitoring climate because of its global mean temperature (being a combination of land and sea surface temperature). Dr Colin Clubbe, of the Royal Botanic Gardens, Kew, related his discovery of a previously unknown mangrove swamp that has yet to be documented, along with rare original Pisonia woodlands that still exist on some of the islands and give an invaluable insight into the Archipelago's natural habitat prior to human settlement.

Dr Colin Clubbe

Since the establishment of the Chagos no-take marine reserve in 2010 the Chagos Science Advisory Group has been set up to facilitate and direct international scientific research in the Archipelago. Dr David Billet of the National Oceanography Centre, Southampton, introduced the group and its role, which consists of scientists with a variety of research interests from institutes across the UK. Many presenters called for more regular and reliable access to the Archipelago for scientific research. The establishment of the group appears to be a positive step towards this for the purposes of scientific research and monitoring of the marine reserve. One of the major challenges now is how to effectively monitor an isolated, 544,000 km^2, and predominantly open-ocean marine reserve.

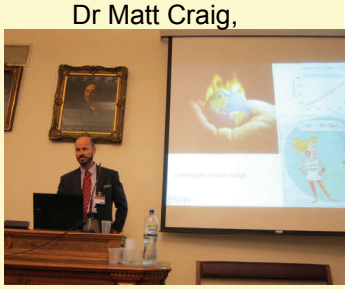
Dr Nick Graham

Alistair Gammell of Pew Trusts gave his take on how the marine reserve could be monitored and enforced as a whole using the patrol vessel *Pacific Marlin* and perhaps information from the US military base on Diego Garcia if they are willing to share it. Dr Matt Gollock, of the Zoological Society of London (ZSL), discussed how scientists at ZSL and University of Western Australia are working together to address the issue of monitoring pelagic fish populations in Chagos by trailing the use of specially designed drop-cameras and other novel methods.



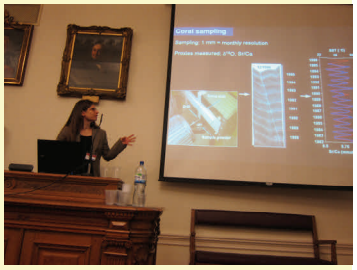
Dr Matt Craig,

The conference closed with a stimulating series of five-minute talks on exciting ideas for future conservation science research for the marine reserve. The proposals listed below ranged from deep-sea exploration, to the development of biomarkers for bleaching susceptibility, to the assessment of crypto-fauna diversity, and much, much more.


Prof Bernhard Riegl

Modelling the fish and coral habitats of the Chagos Archipelago by Dr Sarah Hamylton, Cambridge University (co-authors Dr Jen Ashworth, Dr Annelise Hagan, Dr Helen Scales, Dr Michelle Taylor and Dr Lizzie Tyler)

Biomarkers of bleaching susceptibility: Using Chagos corals to calibrate the baseline by Dr Joerg Wiedenmann, NOC, Southampton University


Dr Miriam Pfeiffer

Use of Chagos as the only natural study and experimental control site for eco-physical and ecosystem level reef research; physiological responses to environmental stress by Dr David Smith, Essex University and Coral Reef Research Group who was unwell and a colleague presented on his behalf

Sea turtles in Chagos by Professor Graeme Hays University of Swansea

Up or down: the role of the trophic dynamics in structuring coral reef biodiversity by Dr Morgan Pratchett, James Cook University


Dr David Billett

Re-survey of sea cucumber (holothurian) populations in Chagos by Professor Andrew Price, University of Warwick

Assessment of microplastics in Chagos by Professor Jim Readman, Plymouth Marine Laboratory (with Professor Andrew Price, University of Warwick)

Cryptofauna (e.g. molluscs and crustaceans); out of sight out of mind by Catherine Head, ZSL (co-author Professor Alex Rogers, Zoology Department, Oxford University)

Alistair Gammell

Ground truthing and mapping seamounts and other deep water ecosystems in Chagos MPA by Dr Chris Yesson, Institute of Zoology London (co-author Dr Alex Rogers, Oxford University)

One of the lasting impressions of this session is that despite the high-quality scientific exploration of Chagos to date we have barely scratched the surface of what this Archipelago has to offer! The thought-provoking day was concluded with a social tipple in the impressive Linnean Society library, surrounded by books that date back as far as 1483.

The fascinating insight into the ecology of the Chagos Archipelago provided by this meeting illustrated the archipelago's exceptionally good environmental condition; its potential as a baseline for global scientific research, of which there are very few around the world; and Chagos' ecological importance in the Indian Ocean. Lets hope that the establishment of the Chagos Archipelago marine reserve will enable more exciting scientific exploration for the future, and most importantly conserve this unique Archipelago for the benefit of the Indian Ocean fauna and it's people.

Dr Matt Gollock

Photographs courtesy of Samantha Brenton

Conservation Medal for CCT Executive Committee Member

The ZSL medal is awarded to a serving or recently retired member of staff for outstanding achievement in the service of ZSL. The ZSL medal is a new award and Dr Heather Koldewey is the first recipient.

Since starting at ZSL, Heather has worked to advance the role of aquariums in fish conservation globally. In 1998, she facilitated a series of workshops that established the first co-ordinated conservation breeding programmes for fish and aquatic invertebrates in European aquariums. She has co-chaired this initiative since its inception.

In 1996, Heather co-founded Project Seahorse and is now Associate Director. She is also involved in many national and international initiatives, ranging from being Chair of the Fish Section of the IUCN Re-introduction Specialist Group to a UK government zoo inspector. She is currently the Chair of the Aquarium Committee of the World Association of Zoos and Aquaria (WAZA) and was one the authors of the global aquarium conservation strategy for WAZA.

As well as the many actual conservation achievements, the work of Heather Koldewey has ensured that ZSL has been at the forefront of aquarium conservation, leading by example.

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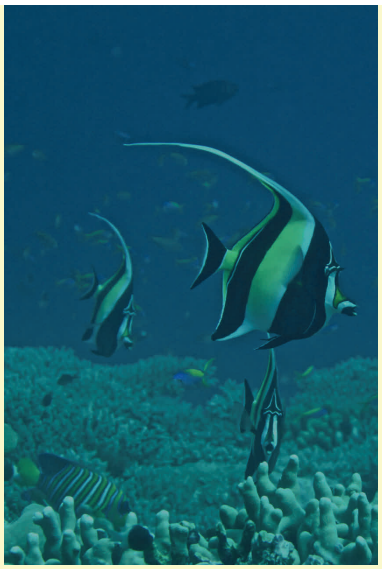


Denizens of DG. (Anti clockwise from top right—the Moorish idol *Zanclus cornutus,* the infamous warty sea slug *Phyllidia varicose* and a butterfly fish Chaeto*don meyeri.* *Photographs courtesy of Frederick Albesa*

CCT merchandise from CafePress

Ted Morris, an active and long time CCT supporter, has created a CafePress shop for CCT. These print direct items are sent to you straight from CafePress and a small profit goes to CCT to help with the work on Chagos. There are some interesting items and Ted has some wonderful designs, with many more coming in future, so it is worth having a look at the site.

http://www.cafepress.co.uk/chagosconservationtrustshop

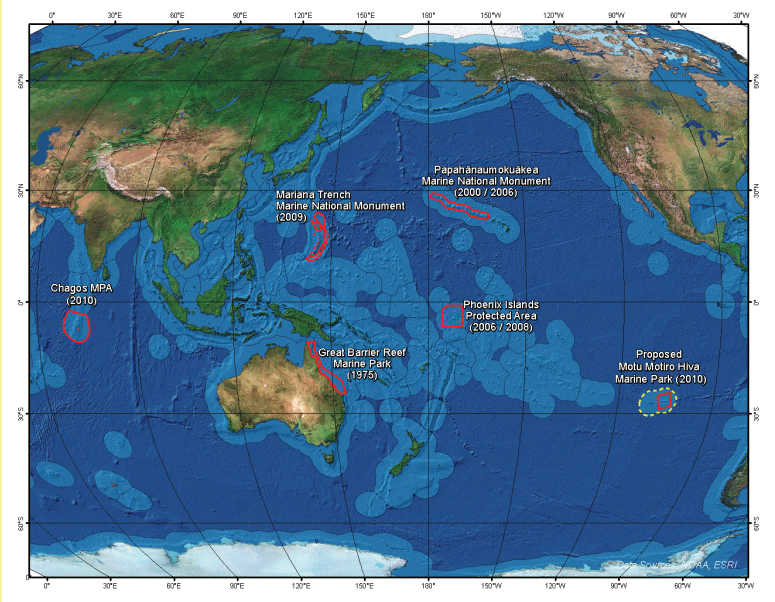
BIG OCEAN
A Network of the World's Large-Scale Marine Managed Areas

Big Ocean Network Meeting and Think Tank Auckland, New Zealand 1-5 December 2011

Anne Sheppard

The Big Ocean Network (BON), an association of the six largest MPAs in the world, held its third annual business meeting of Marine Protected Area (MPA) managers in Auckland in December. Following on from that meeting were the Think Tank discussions, which convened over four day days to seek to forward the design of a shared research agenda across Big Ocean sites, and to investigate how to best design large-scale MPAs using scientific principles. It was one of many of the Marine Conservation Think Tanks hosted by the Society for Conservation Biology's Marine Section and held in the few days before the 25th Annual International Congress for Conservation Biology (ICCB) held at the same location.

Chagos was represented at these meetings by Anne Sheppard, from CCT and Ian Wright, from the BIOT Science Advisory Group (SAG) .



The sessions started with a representative from each MPA giving an overview of the condition, the research done and the benefits created by their MPA. Of interest to the other groups was the fact that the regular coral cover surveys that has been conducted in Chagos since 1978 have allowed us to chart the recovery of corals since the disastrous 1998 bleaching event, which devastated coral reefs throughout the Indian Ocean. There is sometimes an idea that management and science are independent of each other, but it became apparent, and was shown very clearly with this example, that science is very much needed to inform the management of any MPA.

Management is a big issue in all the other MPAs. What is management and what is science was discussed, in the context of science being experimental and management being more operational. It was considered that monitoring is more a management issue than a science issue. During the discussions, when a difference in outlook between managers and scientists became obvious it was agreed that management questions should be raised between scientists and managers in iterative discussion. Scientists should help managers formulate the questions needed for scientists to answer This is not as strange as it sounds and is a useful example of the way that scientists and managers need to work together, and the importance of the discussions and sharing of information at events like this. Chagos however is unique in that the management of the MPA is far simpler because it is not inhabited and is fully no-take, although the same is true of the Papahanaumokuakea MPA, the closeness of the population in the other Hawaiian islands means a greater management need.

Economic arguments were considered very important to illustrate the value of large MPAs.

The Great Barrier Reef Marine Park Authority (GBRPMA), after many more years of managing a large MPA than most places, has found that the following factors were the greatest drivers for getting help and support in managing the MPA:

1. Economic valuation. In the Great Barrier Reef (GBR), tourism, because of the MPA, brings in $5.1 billion every year. Commercial fisheries bring in about $360million and recreational fisheries about $160million. A good MPA for its own sake is therefore worth much more than the extractive uses it is put to.
2. Bioregional classification.
3. Direct effects of industries/fishing.
4. Hindcasting historical records to show what they used to have.
5. Hindcasting coral core data to show changes influencing the GBR (eg change in 1930s allowed them to go to farmers and say 'this was you, you must change).

Everyone agreed that allowing a tuna fishery to fish in an MPA is encouraging not only the deterioration of the MPA but allows a small number of people (generally corporations) to make a lot of money, to no benefit of the MPA. The information that all tuna are not necessarily migratory and can be protected within a very large MPA was also of interest to those working in the other MPAs, adding to the list of benefits from very large MPAs.

The research agenda questions which the meeting agreed were relevant to all the very large MPAs focussed on questions which will help the management of these special places. The representatives of all the very large MPAs noted that they all have their critics, who are almost entirely those who want to make money from the MPA at the expense of everyone else. The questions which needed to be considered are

1. What makes our place special or unique?
2. How much does our site contribute to the greater 'good' of the oceans?
3. How much do our sites depend on what's going on outside the MPA?
4. How does the site contribute to the welfare of the people?
5. What are the lessons learned for other sites?

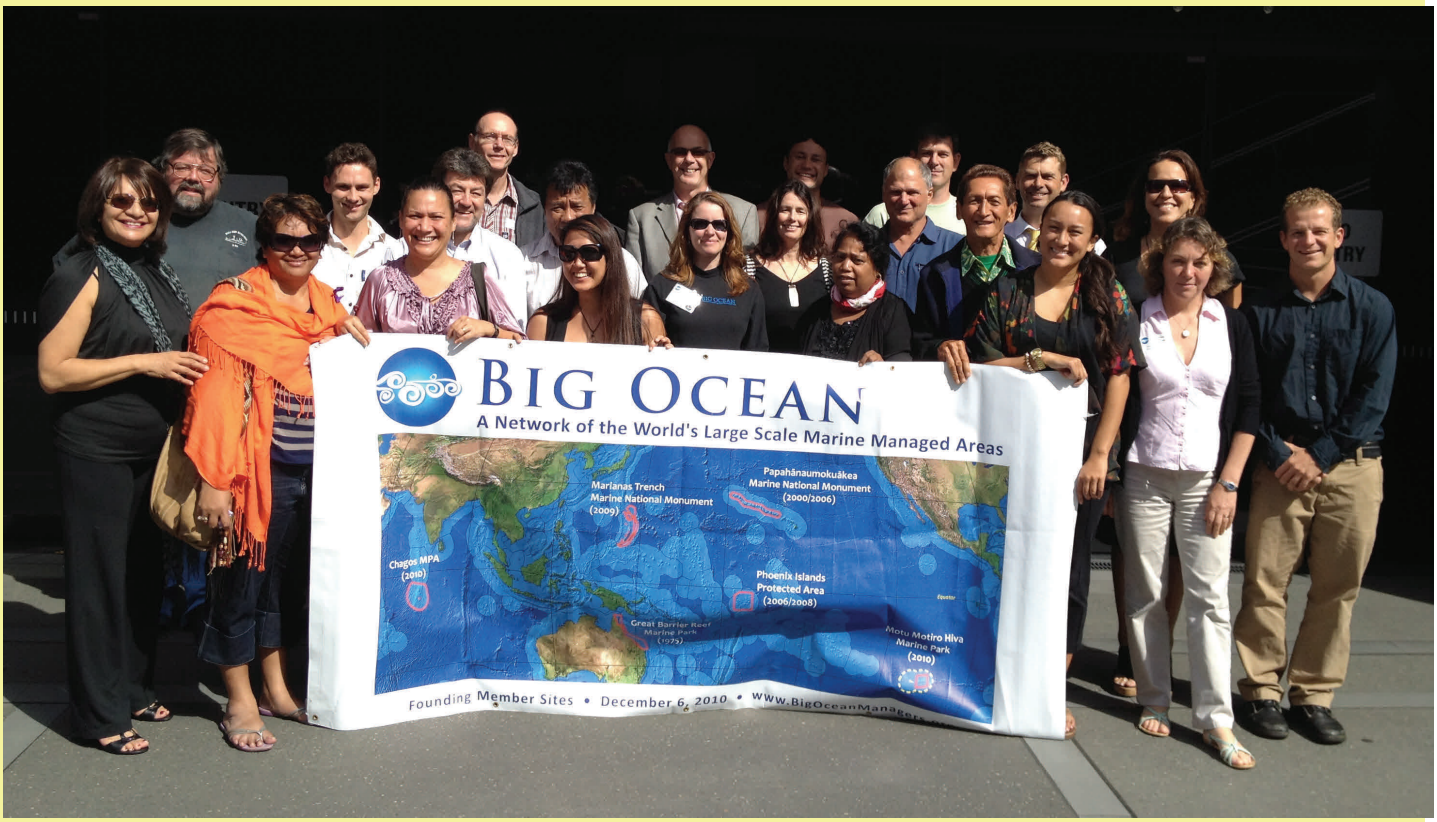
In order to help other countries and organisation, as well as present members of the BON, it was suggested that the group try to prepare a guidebook for large scale MPAs to perhaps be published by IUCN. It is not enough to write scientific papers but they must be interpreted for management and communication purposes if you want them to be effective.

The most pressing issue with regards to Chagos is the surveillance and policing of the MPA. This is a common theme in all the MPAs. One method used In the Hawai'i MPA, is that *all* shipping entering the MPA has to have already obtained permission to do so. If this were to become the case in the Chagos MPA, any tuna boat would have to have radioed for permission to traverse the MPA in innocent passage and BIOT would therefore be aware of it's presence. The ship could then be monitored or escorted through the MPA by the Pacific Marlin. Any poachers are immediately breaking the law by being in the MPA at all with no need to have to catch them in the act of fishing.

The meeting was extremely useful and, as is common in gatherings of people working in similar fields, the discussions during breaks and at the social events allowed for a valuable exchange of information for both research and Chagos. One useful discussion I had was on the problems with recovery of the holothurians (sea cucumbers) after a large percentage of the population has been removed by poachers. There was also helpful information on management from managers of some of the other MPAs who have had far longer experience.

The next meeting will be in held September 2012 at Jeju, Korea.

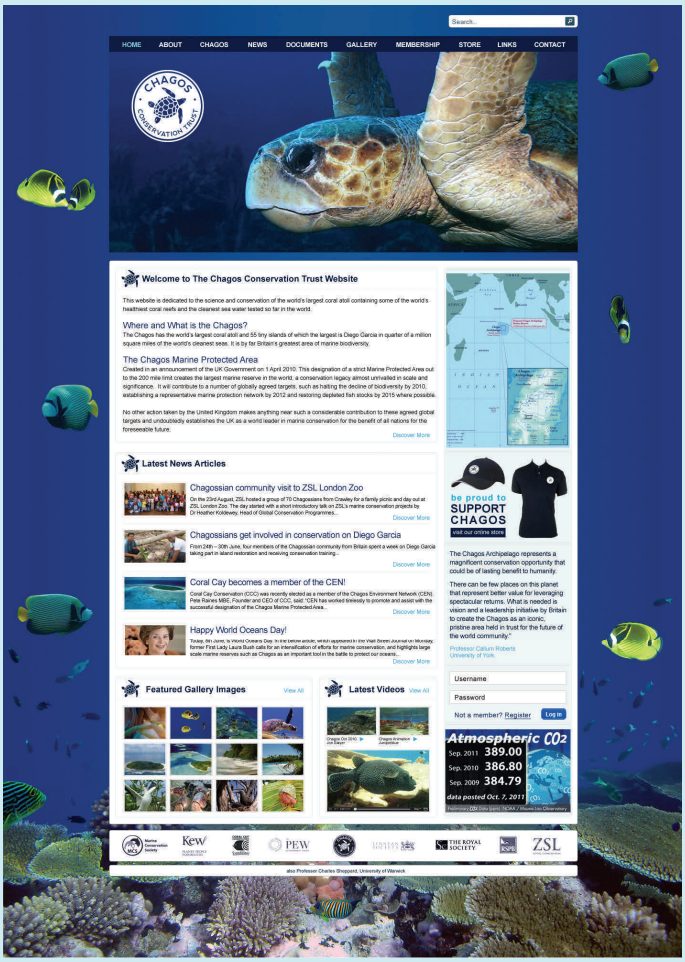
Big Ocean Network Think Tank participants. Representing Chagos, Anne Sheppard is second from the right and Ian Wright is in the middle at the back.



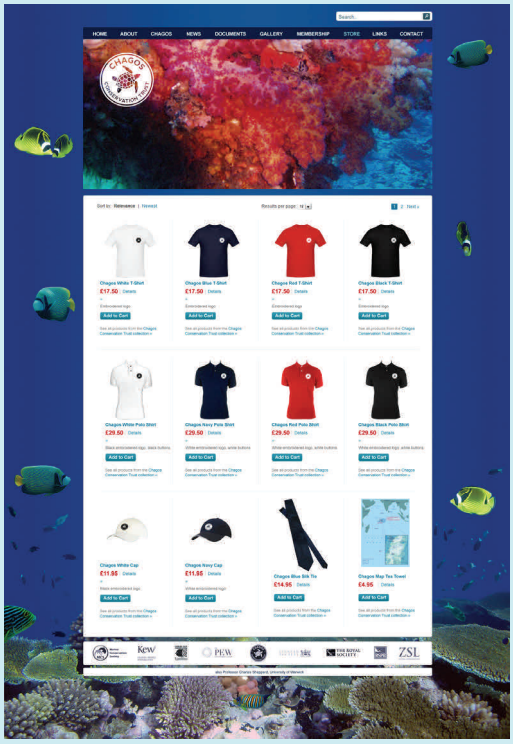
New Website, New Logo

On February 11th, CCT will have a new website . The old CCT site has been merged with the Protect Chagos site, which existed to campaign for the creation of the MPA, and the old site had become very static and needed updating. The new site has the wonderful visual appeal of the old Protect Chagos site combined with all the documents and information from the old CCT site. It will be a much more dynamic site with more information, more images and more up to date information about events in and affecting Chagos.

The site has been created by Richard Moore at JuniperBlue, who also produced the Protect Chagos site. Richard has also updated the CCT logo—to make it more readily recognisable. It will also metamorphose into other colour variants for other purposes, but the black background shown here is the official version.



The homepage of the new website—do have a look at it. The website will also include a new store where you will be able to purchase various Chagos related items, to the benefit of CCT. Examples of possible CCT merchandise are shown below. Prices unfortunately fictitious!



Visit the new website at

www.chagos-trust.org

A Day in Diego Garcia History

Steve Snell (Diego Garcia, May 1983 – June 1984)

The Day The Rock Rocked – so said the ubiquitous t-shirts that appeared in the Ship's Store after the earthquake that struck Diego Garcia on November 30, 1983. The earthquake occurred at 21:46 local time and registered 7.6 on the Richter scale, making it one of the largest earthquakes ever recorded in the Indian Ocean. It lasted 142 seconds. There were 5800 inhabitants on the island at the time—U.S. Navy personnel, Royal Navy and Marines, and a multi-national force of construction workers, mostly consisting of Filipinos.

The epicenter of the quake was approximately 40 nautical miles to the southwest, so the consequences were quickly felt on the island. Buildings were evacuated, personnel accounted for, and there were no injuries reported. However, there was some physical damage—some cracks in the roadway (DG-1), minor damage to the runway, and a vertical crack in the concrete block structure at the Transmitter site on the south end of the island. As I recall it being described at the time, the damage was not any more severe (being so close to the epicenter) because the coral foundation of the island acted as a sponge and absorbed much of the shock. That assessment was not a scientific evaluation, but seemed sensible. There were also reports from the aviation community who overflew the island after the earthquake that a crack had appeared in the center of and along the axis of the lagoon.

Another concern was the potential for a post-quake tsunami—which did, in fact, occur. With the epicenter to the southwest, a tsunami wave did cross the southwest corner of the island some time later. A wave of sufficient height was able to traverse the barrier reef, wash through the *Scaviola*, across DG-1, and empty into the lagoon around Turtle Bay. No damage occurred from this wave, other than the spreading of some debris, and likely much to the consternation of the land crabs who inhabited that part of the island. The relatively small size of tsunami wave associated with such a large earthquake begs the question as to why it was not worse. To answer that question, one must take note of the fact that the Diego Garcia rises sharply off the ocean floor. A tsunami wave requires a long gradual rise in the seabed floor to generate energy and height. I inquired of John Topp after the deadly Indonesian tsunami in 2004 as to whether there was evidence of that tsunami at Diego Garcia. John gave me the same answer—that the sharp rise in the foundation of the island muted the tsunami wave to the extent that there was only slight evidence of a wave coming ashore on the East side of Diego Garcia.

I must confess that I was off the island on my mid-tour leave when the earthquake occurred, and arrived back on the island only several days later. It was a hot topic of conversation for some time, and was reinforced by a sequence of aftershocks that occurred periodically for months.

Some other interesting eyewitness stories about the earthquake are at

http://www.zianet.com/tedmorris/dg/quake.htm

Recent Magnitude 4.7 Earthquake - Chagos Archipelago Region - 24-01-2012 -02:21 GMT

Magnitude **mb 4.7**
Region **CHAGOS ARCHIPELAGO REGION**
Date time **2012-01-24 02:21:58.0 UTC**
Location **6.79 S ; 72.22 E**
Depth **2 km**
Distances
1735 km SW Moratuwa (pop 185,031 ; local time 08:21:58.3 2012-01-24)
1227 km S Malé (pop 84,972 ; local time 07:21:58.3 2012-01-24)
687 km S Feydhoo (pop 2,657 ; local time 07:21:58.3 2012-01-24)

http://www.emsc-csem.org/Earthquake/earthquake.php?id=252215

More information at: USGS/NEIC Denver, USA

This is the latest earthquake in Chagos. There was also one in November 2011.

Chagos Conservation Trust 2011 AGM

The Trust's Annual General Meeting was held on Thursday 24 November 2011 at the Linnean Society of London straight after the successful conference reported elsewhere in this edition of Chagos News.

Executive Committee Members were elected and your committee now consists of:

Alan Huckle, *Chairman*	Birgitta Bostrom	Pete Carr
Colin Clubbe	Chris Davies	Simon Hughes, *Secretary*
Rachel Jones	Heather Koldewey	Richard Martin, *Treasurer*
Sam Purkis	Pete Raines	Anne Sheppard
Charles Sheppard	John Turner	Hayley Tam, *Membership Secretary*

The minutes of the meeting and the financial accounts for the year are on the website.

Simon E Hughes
Secretary

From the Chagos Conservation Trust Chairman

This is the first issue of the Chagos News since I was formally elected as Chairman of the CCT at the Trust's AGM on 24 November 2011. So it is an opportunity for me to set out some of the key objectives for CCT this year.

First, I have to pay tribute to William Marsden, who gave up the chairmanship last year after eight years of indefatigable service to the cause of environmental conservation in the Chagos Archipelago (British Indian Ocean Territory). He was a key mover behind the campaign to establish the no-take marine protected area (MPA) and can take much of the credit for its successful launch in 2010. It will be difficult to emulate this achievement but I am pleased and honoured to succeed him. I see it as my charge to build on the work that he has done to make the CCT the key non-governmental organisation promoting the environmental conservation of the Chagos.

We should this year see a transformation of the CCT. A substantial bequest from the estate of its founder, John Topp, will put it onto a much firmer financial footing over the long term. This does not mean that CCT will become a significant funding organisation but it will give us the flexibility to support projects that will have a significant impact on preserving the pristine natural environment of the islands and their surrounding waters. One specific bequest, for example, will allow CCT to underwrite a comprehensive botanical survey of the Chagos every 5-10 years. In the prospect of another bequest, we shall be advertising soon for two people to help us to fundraise and improve our outreach on a part-time fee-paid basis. This will not change the Trust from being a group of committed, like-minded volunteers willing to give up their time to its cause but it should give us greater capacity to expand our activities. And very soon, we shall launch our new website which, we hope, will bring us closer to those who share our conservation objectives.

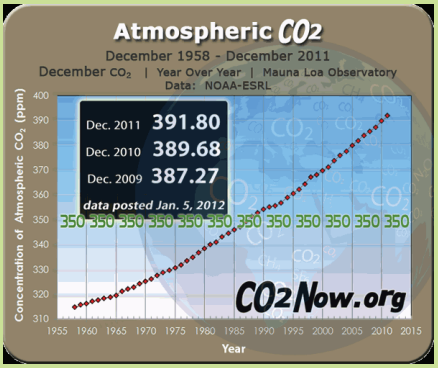
One of CCT's key aims must be to help to ensure that the Chagos MPA is properly and effectively managed on the basis of sound science. The science conference, held at the Linnean Society in November last, attracted many international scientists and was adjudged to have been a major success. We plan to replicate such conferences on a regular basis. The Chagos 2012 science expedition, scheduled for February/March this year, will advance scientific research and help the FCO's BIOT Administration to develop a new environmental management plan for the Chagos. We look forward to the FCO's invitation to tender for the MPA management contract. The publication this month of an authoritative new science review on the Chagos by Charles Sheppard and an international group of scientists should also clarify the environmental challenges to the Chagos. I would also commend to those, who have not yet seen it, Pete Carr's recently published book on the "Birds of BIOT" - obtainable through the Trust. Without entering into the politics of the Chagossian issue, we shall continue to offer training opportunities to Chagossians who are interested in preserving the environmental heritage of the islands and want to advance their relevant skills. A previous Chagossian trainee has, for example, been given one of the 14 places on the 2012 expedition and we hope that this can be continued in the future.

CCT is only one of many organisations, like the Zoological Society, RSPB, and Kew, that work within the Chagos Environment Network (CEN) to promote environmental conservation work in the Chagos. I am pleased to say that, at its last meeting, it was decided to renew the relevant memorandum of understanding for a further 5 years. CEN provides a forum for the co-ordination of environmental conservation work in the Chagos and keeps the Chagos to the forefront of member institutions' project planning. There are several significant project proposals submitted for funding. If successful, this can only be good for the future environmental health of the Chagos.

It should be an active and interesting year for the Trust.

CO_2 Reefs and Widgets

Charles Sheppard



There is a little widget built in to the new CCT web site showing global average carbon dioxide levels in the atmosphere. The data for this comes from a monitoring station on Mauna Loa in Hawai'i . The gas CO_2 is important, both because it creates a stronger greenhouse 'blanket' which is causing overall warming, and because it dissolves in sea water where it decreases the pH value of the water (which means reduces the alkalinity, or, as it is more commonly expressed, increases the acidity).

Today the annual average concentration is around 393 parts per million (ppm), up from about 280 in pre-industrial times. The rise is a couple of ppm every year, and accelerating, due to fuel combustion, land use changes and other factors. It is now higher than at any time in the last million years or longer. The oceans take up about half the CO_2 discharged, resulting in a pH drop in the last 30 years of 0.1 units, which means a 30% increase in H^+ concentration (increase in acidity).

This is very important to coral and reef growth and indeed to most organisms which deposit limestone skeletons, including the life supporting plankton. Atmospheric CO_2 takes a few decades to equilibrate with the ocean uptake; if the atmospheric level did not rise any more, ocean pH would continue to acidify for many years to come. We have estimated (Veron *et al*., 2010) that the equilibrium level of CO_2 in the atmosphere should not exceed 350 ppm because, when this equalizes with the oceans, the ability of much marine life to develop would be severely impaired. As noted, today's level is already substantially greater. Some people thought that the 2010 Copenhagen climate conference failed because no global agreements were reached, but the hoped for agreement was for atmospheric levels to be stabilised at 450 ppm. The delegates were sent back to think again, and a suicidal agreement was averted.

Reference:
Veron JEN, Hoegh-Guldberg O, Lenton, Lough, Obura DO, Pearce-Kelly P, Sheppard CRC, Spalding M, Stafford-Smith MG, Rogers AD 2009. The coral reef crisis: The critical importance of < 350 ppm CO2.
Marine Pollution Bulletin **58**:1428-1436.

http://co2now.org/

Beach Clean up in Diego Garcia

Two hundred and forty US and British military personnel and civilians took part in a huge beach clean-up on September 2011. They collected almost 2.5 tons of rubbish that had washed up on the beach from all parts of the globe.

Two-hundred and forty U.S. Sailors and Airmen, British Royal Marines Commandos and contractors volunteered to clean up Diego Garcia, British Indian Ocean Territory collecting more than 5,000 pounds of trash to promote environmental and recycling awareness, and to prepare the beaches for the seasonal nesting of endangered sea turtles.
MC3 Benjamin Malvezzi

The main environmental purpose of the beach cleanup was to prepare the beaches for the turtle nesting season.

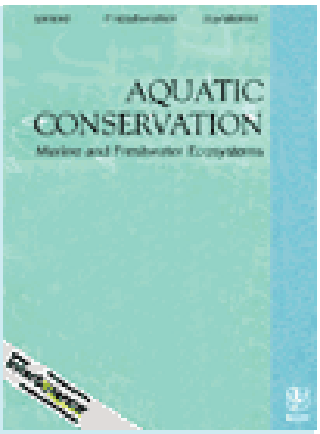
The US commanding officer of the base, Capt David Tidwell said "As tenants of a maritime protected island here in the British Indian Ocean Territory, it's important that we respect and work with our gracious host, the British government. Although we live here, this isn't our island—we're just visitors. Obviously the responsibility falls on us to clean up the trash we produce, but we must also maintain the delicate balance of this environment for it's Natural inhabitants who rely on this island for their survival. Being stewards of the environment is also one of the navy's missions".

Cmdr Victor Velasco, the Diego Garcia Public Works Officer, said " Our goal is to ensure local wildlife such as the great green and hawksbill sea turtles have the ability to come ashore and nest here." Velasco expected the volunteers to see a large variety of rubbish due to recent tsunamis in the surrounding areas.

The volunteers were expected to collect a lot of material that has found its way onto the island from the sea, everything from plastic bottles, fishing buoys and nets and the inevitable large number of flip flops. This litter is dangerous to marine life, and is a global problem.

To read more about it see - http://greenfleet.dodlive.mil/currents-magazine

A crab uses a hollowed-out golf ball that washed ashore as its shell. The golf ball is just one example of the wide variety of trash collected as part of the 2 September beach cleanup.
U.S. Navy photo by Mass Communication Specialist 3rd Class Benjamin Malvezzi



A major scientific review has just been published in *Aquatic Conservation: Marine and Freshwater Ecosystems*. Its large number of authors reflects the very broad range of information incorporated in this review. Its title, author list and abstract are given below.

Reefs and islands of the Chagos Archipelago, Indian Ocean: Why it is the world's largest no-take marine protected area.

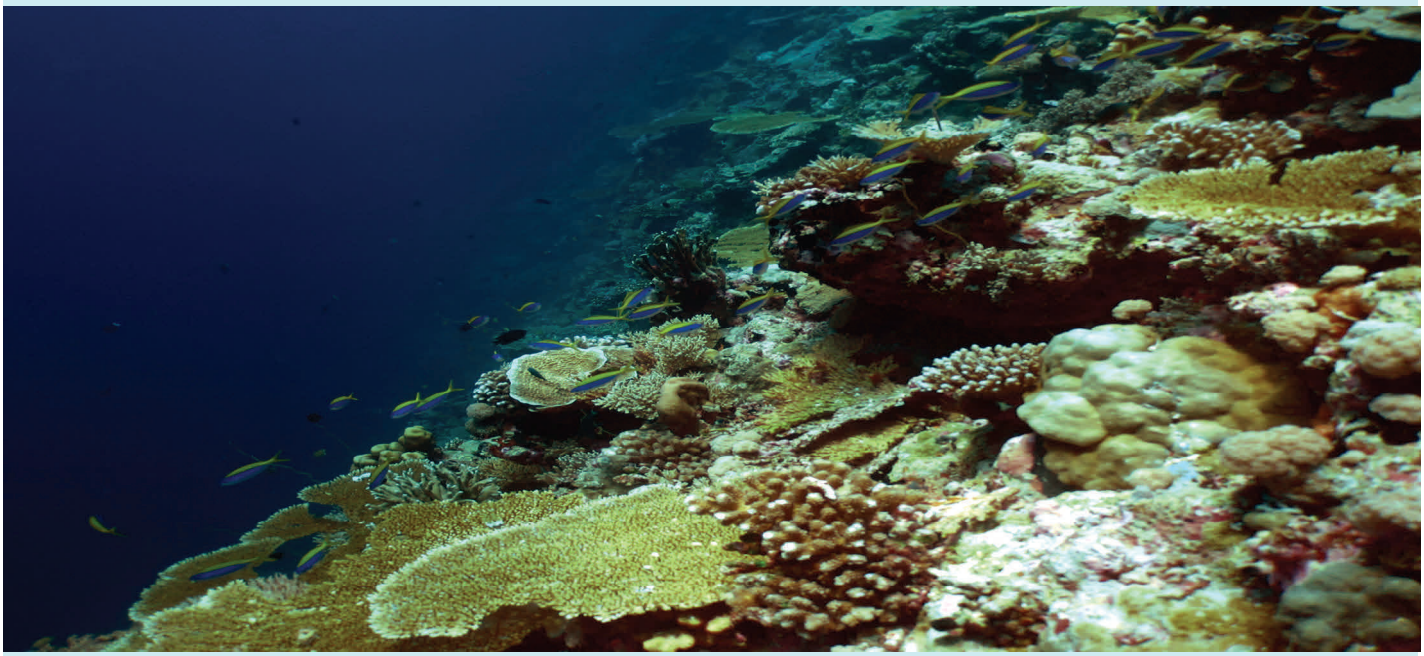
C.R.C. Sheppard, M. Ateweberhan, B. W. Bowen, P. Carr, C.A. Chen, C. Clubbe, M. T. Craig, R. Ebinghaus, J. Eble, N. Fitzsimmons, M. R. Gaither, C-H. Gan, M. Gollock, N. Guzman, N.A.J. Graham, A. Harris, R. Jones, S. Keshavmurthy, H. Koldewey, C.G. Lundin, J.A. Mortimer, D. Obura, M. Pfeiffer, A.R.G. Price, S. Purkis, P. Raines, J.W. Readman, B. Riegl, A. Rogers, M. Schleyer, M.R.D. Seaward, A.L.S. Sheppard, J.Tamelander, J.R. Turner, S. Visram, C. Vogler, S. Vogt, J.M-C. Yang, S-Y. Yang, C.Yesson.

Abstract

1. The Chagos archipelago was designated a no-take MPA in 2010; it covers 550,000 km^2, with >60,000 km^2 shallow limestone platform and reefs. This has doubled the global cover of such MPAs.
2. It contains 25-50% of the Indian Ocean reef area remaining in excellent condition, as well as the world's largest contiguous undamaged reef area. It has suffered from warming episodes, but after the most severe mortality of 1998, coral cover was restored after 10 years.
3. Coral reef fishes are orders of magnitude more abundant than in other Indian Ocean locations, regardless of whether the latter are fished or supposedly protected.
4. Coral diseases are extremely low, and no invasive marine species are known.
5. Genetically, Chagos marine species are part of the Western Indian Ocean, and serves as a 'stepping-stone' in the Ocean.
6. The no-take MPA extends to the 200NM boundary, encompassing important pelagic species. This also includes 86 un-fished seamounts and 243 deep knolls.
7. On the larger islands, native plants, coconut crabs, bird and turtle colonies were largely destroyed in plantation times, but several smaller islands are in relatively undamaged state.
8. There are now 10 Important Bird Areas, coconut crab density is high and numbers of green and hawksbill turtles are recovering.
9. Diego Garcia atoll contains a military facility; this atoll contains one Ramsar site and several Strict Nature Reserves. Pollutant monitoring shows it to be the least polluted inhabited atoll in the world. Today, strict environmental regulations are enforced.
10. Shoreline erosion is significant in many places. Its economic cost in the inhabited part of Diego Garcia is very high, but all islands are vulnerable.

Chagos is ideally situated for several monitoring programmes, and use is increasingly being made of the archipelago for this purpose.

The paper is available free to download at http://onlinelibrary.wiley.com/doi/10.1002/aqc.1248/pdf



Chagos Scientific Research Expedition

13th February – 7th March 2012

Overview

Between 13th February and 7th March 2012 a scientific research expedition will take place in the Chagos archipelago (British Indian Ocean Territory), supported and facilitated by the Foreign and Commonwealth Office and numerous other institutions. Twelve scientists and supporting team members will participate in the first full scientific expedition since the no-take marine protected area (MPA) was established in April 2010. Our research plans therefore prioritise the continuation of long-term monitoring programmes as well as establishing the best and most resource-efficient methods to monitor and manage the MPA. We believe our initiatives will assist BIOT in understanding and managing the world's largest fully no-take MPA, maintaining this extraordinarily rich area of marine and terrestrial biodiversity.

(Photo: Chris Davies)

Itinerary

13 February:
Expedition team fly from Singapore to Diego Garcia.

14-17 February:
Location: Diego Garcia.
Purpose: Load equipment and supplies; test and commission equipment; briefings, equipment familiarisation and safety training; sorting and testing scientific equipment; undertaking scientific research on Diego Garcia.

18 February - 03 March:
Location: Northern atolls and Chagos Bank; provisionally Salomon Atoll (3 days), Peros Banhos Atoll (5 days), Great Chagos Bank (3 days), Egmont Atoll (3 days).
Purpose: Scientific research.

04-06 March:
Location: Diego Garcia.
Purpose: Off-load equipment and decommission for on-site storage or re-export; debriefs; final research on Diego Garcia (if required).

Research Objectives

1. Long-term monitoring of reef condition in the Indian Ocean (Charles Sheppard, Anne Sheppard, Pete Raines, Heather Koldewey)

Our long-term reef monitoring programme has involved coral cover measurements since 1978, and then coral recovery assessments following the climate change mortality. The value of this routine, ongoing project has been to show that coral recovery patterns in Chagos are unmatched by other places in the world. Furthermore few places have coral cover data over such a long period and over such a significant time for coral reefs.

We will conduct repeat measurements at the same locations across Chagos to contribute to the longest time series of reef condition data in the Indian Ocean – this being valuable because a 'trajectory' yields far more information than does a one-off set of measurements. Now that recovery is complete – following the 1998 bleaching event – we will expand monitoring to measure juvenile coral recruitment.

2. Monitoring fish and shark assemblages across the Chagossian shelf – (Jessica Meeuwig, Tom Letessier)

We plan to deploy Baited Remote Underwater Video Cameras (BRUVS) in order to study the fish and shark assemblages of the coral reefs. The recent implementation of the MPA in Chagos means that there is an urgent need for robust monitoring, in order to (1) demonstrate the benefits of the MPA and (2) evaluate any potential requests to reopen fisheries with the Chagos Exclusive Economic Zone. By using BRUVS, we are able to complement existing SCUBA visual surveys (VS), to extend the taxa sampled as well as the depth range over which sampling occurs. Specifically we wish to explore:

a) How do the fish species assemblages vary with habitat and depth across the Chagossian shelf?
b) Is the variability in community composition, as determined by BRUVS sampling, low enough to provide sufficient power for long term monitoring of Chagos?
c) Do VS and BRUVS yield similar diversity patterns across habitat and depth? Are there habitats where either is more efficient?
d) Current depth ranges of many reef fish reported in the literature may be restricted by previous VS sampling. Does sampling with BRUVS extend known species vertical ranges significantly?
e) Top predators, including reef sharks, are depleted in fish communities from exploited reefs on shelf and coastal areas. Do near pristine reefs like those of Chagos hold a greater overall shark/large fish component because of the inaccessible conditions of the area?

3. Long-term monitoring of reef shark populations (Nick Graham)

We will continue the long-term monitoring dataset of shark populations that started in the 1970's using visual survey methods. This builds on findings published in a paper that reported a 90% decline in shark numbers from the 1970s to 2006 (Graham et al. 2010, *Aquatic Conservation*). In 2010 the shark numbers were slightly up from 2006, and a continuation of this monitoring is imperative to assessing the effects of the MPA status on reef shark population recovery.

4. Assessing the impacts of the recreational fishery around Diego Garcia on reef fish assemblages (Nick Graham, Heather Koldewey, Charles Sheppard)

This study will compare reef fish assemblages using underwater visual census between fished reefs in north east Diego Garcia to the RAMSAR protected reefs in north-west Diego Garcia. I will work with Charles Sheppard on this, who will be conducting similar surveys of corals. The information will be used to assess the need and design of a zoning plan.

5. Fish behaviour and life-history characteristics (Nick Graham)

We will assess some key fish behavioural and life history characteristics in this remote, unfished location. This will include, for example, the "flight initiation distance" of fish, which is an indication of the effects of fishing elsewhere in the world, size at sex change in parrotfishes, maximum attainable body size distributions, and foraging range size. Dr Graham's research group has similar data in more heavily fished and impacted locations across the Indo-Pacific, and also several smaller MPAs in these fished locations. Such information, in conjunction with data on fish abundance and biomass collected in Chagos in 2010 builds a picture of the uniqueness of this large marine wilderness area, and how much the ecological communities differ from fished locations and even the small MPAs that dot coastlines elsewhere. The information will also support the need for careful management of Chagos, and provide key reference points to measure other locations.

6. Human impacts on coral reef biodiversity (Catherine Head, Heather Koldewey)

Our understanding of the overall implications of human impacts on coral reefs for biodiversity of smaller species groups is extremely poor, in comparison with some groups such as reef-forming corals, fish and some bottom-dwelling invertebrate mega-fauna, despite making up the largest component of coral reef diversity.

This project focuses on assessment of the diversity of select groups of reef crypto-fauna and examines the relationship between these and reef-forming corals, fish and conspicuous mega-fauna on the relatively pristine reefs. To assess the number of small bottom-dwelling invertebrate species and their abundance at sites within the Chagos archipelago dead coral heads and coral rubble will be collected on exposed and sheltered sides of the reef slope. Samples will be analysed using a combination of morphological and molecular methods, including novel DNA barcoding methods. These will be compared with the diversity of corals, fish and conspicuous megafauna, established using conventional survey methods.

The broader scope of this project involves biodiversity assessments over varying scales of human impacted reefs at locations across the Indian and Pacific Ocean enabling a trans Indian–Pacific Ocean biodiversity comparison to be made with the Chagos archipelago.

7. Long-term monitoring of bird populations (Pete Carr)

We will continue the long-term monitoring and research of the internationally important breeding seabird colonies on the ten designated and two proposed International Bird Areas (IBAs). The focus of the monitoring and research is to unravel the breeding phenology of the seabirds of BIOT in order to answer the following questions:

- Is the present specific island designation for IBAs (as opposed to island clusters) the best long-term conservation management strategy for breeding seabirds in BIOT? (Collaborative project with RSPB.)
- What triggers breeding of seabirds in BIOT? (Pete Carr thesis for MRES, supervised by Charles Sheppard).

8. Monitoring physical parameters on Chagos reefs (Charles Sheppard, Anne Sheppard)

We will continue the collection and replacement of currently deployed temperature loggers which have recorded a set of two-hourly sea temperature measurements taken at many depths and locations, some since early 2006. Analysis of these data is helping to determine what physical factors assist in maintaining the good condition of Chagos reefs. These results have all underpinned the moves which led to the proclamation of the Chagos MPA.

9. Management plan (Charles Sheppard, Heather Koldewey, Anne Sheppard, Pete Carr, Pete Raines, Nick Graham)

We will use the opportunity of having a world-leading group of scientists – all of whom are also involved in marine management – to continue development of a new management plan for BIOT. Over the course of the expedition a revised draft of this management plan will be produced to submit to BIOT for review and consideration.

10. Species inventory (Heather Koldewey, Pete Carr, Anne Sheppard)

An updated species inventory will be compiled during the expedition that updates previous lists of fish and aquatic invertebrates, marine mammals, turtles and birds. Site localities and other biological parameters will be collected for Chagos endemics, particularly the Chagos brain coral, *Ctenella chagius* which is a priority species for ZSL's EDGE of existence programme.

11. Sample collection (Anne Sheppard and others)

Important, value-for-money aspects of previous expeditions have been the collection of material for other research programmes in other parts of the world. On this expedition, we will be collecting minute quantities of holothurian tissue (sea cucumbers) for genetic (DNA) analysis by the University of Hawai'i to determine the recovery potential of the Chagos holothurian population following severe poaching; and similar echinoid samples for biogeographic distribution studies. Trace coral tissue samples will also be collected for global connectivity studies being conducted in several institutions. Drilled coral cores will also be collected as part of an ongoing study by Dr Miriam Pfeiffer from Aachen University, Germany, as part of the Indian Ocean climate analysis project.

12. Photo-documentation (Anne Sheppard, David Tickler)

We will continue to illustrate the recovery of the Chagos corals and the remarkable biodiversity of the area through underwater photography. We will also produce comprehensive photo-documentation of the expedition. The use of the BRUVS means we will also have a substantial collection of video imagery of fish assemblages.

Team Biographies

Professor Charles Sheppard (Expedition Leader)

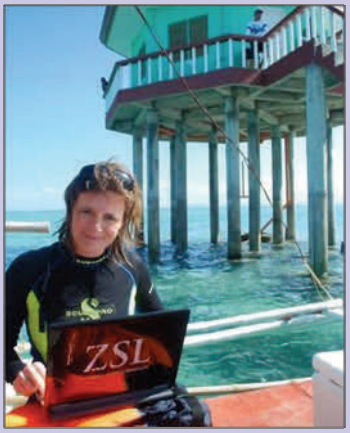
Charles has led several scientific research expeditions to the Chagos Archipelago. Following some early visits in the 1970s, expeditions he has organised since 1996 have involved over 100 scientists from numerous institutions, chosen to produce an Integrated understanding of this archipelago. His own speciality is the condition of coral reefs, especially those around the world that have suffered from human impacts, which quickly led to recognition of the contrasting, remarkable and unique condition of the huge area of reefs in Chagos; Chagos has escaped most of the impacts that have affected most of the world.

He has contributed to, organised or led much of the work that has shown how Chagos reefs recovered extremely well from the climate change effects which killed so much of the Indian Ocean corals in 1998 and, with others including several research students, examined the repopulation of Chagos reefs to produce the exceptionally rich condition that exists today. Throughout he has attracted scientists of numerous, interlocking disciplines to produce the detailed synopsis and understanding that today underpins the scientific justification of the MPA. His own repeat measurements at the same locations at many dates has produced the longest time series of reef condition data in the Indian Ocean – this being valuable because a 'trajectory' yields far more information than does a one-off set of measurements. Various ancillary projects include a set of two-hourly sea temperature measurements taken at many depths and places by deployed instruments, in order to determine what physical factors also assist in maintaining the good condition of Chagos reefs. These results have all underpinned the moves which led to the proclamation of the Chagos MPA.

Pete Raines (Expedition Manager)

Pete Raines is a marine biologist and Chairman of Coral Cay Conservation (CCC), an organisation he founded in 1985. He has over 26 years of award-winning leadership and experience in coral reef conservation and is the author/co-author of over 300 scientific publications. He is an executive member of the Chagos Conservation Trust and Chagos Environment Network, and served as Expedition Manager on the Chagos 2010 Expedition. In 2004, Pete was awarded the MBE for services to the protection of biodiversity.

Dr Heather Koldewey (Chief Scientist)



Heather is Global Section Head of Conservation Programmes at the Zoological Society of London (ZSL). She has worked on community-managed MPAs in the Philippines for over 15 years through Project Seahorse as part of a wide portfolio of international marine and freshwater conservation projects. In addition, she has been involved in both research and conservation in Chagos, particularly on the benefits of large marine reserves for migratory species like tuna and sharks. She is an executive member of the Chagos Conservation Trust and Chagos Environment Network. She played a lead role in Project Ocean, a partnership between ZSL and Selfridges that raised awareness and funds for MPAs and generated funds to support this expedition.

Catherine Head (Scientist)

Catherine is a marine biologist and conservationist currently undertaking a PhD at the University of Oxford and Zoological Society of London (ZSL) on the effect of direct human activity on the biodiversity of coral reef ecosystems. Previous to this she completed her BSc and MSc in Zoology from Royal Holloway University in 2003 and 2004 respectively. She then went on to work on a variety of coral reef conservation and research projects with Coral Cay Conservation in the Philippines and Tobago, and the Bermuda Ocean Institute in Bermuda. Most recently, she was Project Co-ordinator for the ZSL's EDGE Coral Reef Project where she developed and co-ordinated marine capacity building projects.

Professor Jessica Meeuwig (Scientist)

Jessica is the Director of the Centre for Marine Futures, University of Western Australia. Her main expertise is marine and fisheries conservation, and quantitative modelling. Her research group works across a range of taxa, from humpback whales to sharks to bony fish and includes some benthic ecology with key questions centring on how animals use habitat and the impacts of human activities on their ecology, population biology, energetics etc. Her group also has a strong interest in the development of video and image based sampling methods and maximising the power of information obtained from these methods. Jessica has worked as a marine ecologist in a wide range of temperate and tropical ecosystems and is a keen science communicator.

Dr. Tom Letessier (Scientist)

Tom is a Research Assistant Professor at the Centre for Marine Futures, University of Western Australia. His main expertise is in the meso- and basin-scale processes at the low-end of pelagic ecosystems. His PhD research focused mainly on the ecology of the model zooplankton order Euphausiacea. He has participated in several research cruises in the Atlantic and Indian Ocean and previously conducted SCUBA-based research on coral reefs and on fish and coral taxonomy in the tropical Atlantic and Pacific Oceans.

Anne Sheppard (Scientist)

Anne is a Research Fellow at the University of Warwick and has participated in a number of expeditions to Chagos. She has co-authored several scientific publications arising from her work there. Her main activities will be in participating in the measurement of coral recovery, the physical recovery and replacement of ten in situ temperature loggers, and in detailed estimates of how many new coral juveniles have recruited onto the reefs along what has now become the 'standard' monitoring transects. In addition, her many underwater photos taken on past expeditions have been made available to numerous organisations for educational purposes to promote the Chagos MPA, these being used in numerous websites, newspapers and magazines.

Dr. Nick Graham (Scientist)

Nick is a Senior Research Fellow at the ARC Centre of Excellence for Coral Reef Studies, James Cook University in Australia. His research focuses on large-scale ecological questions directly relevant to the management of coral reef ecosystems. He has assessed the longer-term impacts of coral bleaching and mortality of reef corals on fishes and identified the collapse of the reef structural matrix as a major driver of declines in a wide range of species and size classes. He has had an interest in the impacts of fishing and marine protection on reef fish assemblages for some time and has worked on the time scales necessary for full recovery in No Take Areas and the effects of fishing and protection on predator-prey relationships and the overall size structuring of fish communities. More recently he has been assessing recovery dynamics of reefs from pulse disturbances, and is getting increasingly interested in methods of linking social-ecological systems for natural resource assessment and management in a changing climate. He has participated in two previous scientific expeditions to Chagos in 2006 and 2010.

Pete Carr (Scientist)

In conjunction with the RSPB, Peter has recently (2011) published Birds of BIOT, a book that summarises the avifauna of the Territory; he was also the author of the original paper that designated the ten IUCN categorised Important Bird Areas (IBAs) within BIOT. As a member of the Chagos 2010 Scientific Research Expedition he was co-responsible for terrestrial monitoring, focusing on ecological restoration priorities, Odonata distribution as well as seabird censuses. For the past three years he has spearheaded forest and wetland restoration work whilst working on Diego Garcia.

Pascaline Cotte (Dive Support Assistant)

Pascaline is 19 years old and of Chagossian descent. She's an outgoing person with a passion for nature and its beauty. Two years ago she had the chance to learn about marine conservation in Tobago through a Coral Cay Conservation scholarship. Her wish is to help keep the Chagos Islands as much of a paradise as it has always been.

Robert Long (Medical Officer)

Dr Long is board certified in both Family Medicine and Diving and Hyperbaric Medicine in both the US and Australia. He is currently working for a large oil company in Saudi Arabia in their primary care department. Previously he was the Medical Director for the Wesley Centre for Hyperbaric Medicine in Brisbane Australia. As an avid diver for over 35 years he has worked as the Diving Medical Officer for an Aquarius mission (NEEMO 2) and with the USS Monitor salvage operation. He enjoys triathlons and swimming in his free time.

David Tickler (Dive Technician)

David is a professional dive instructor and guide and has spent the last seven years working on charter and private vessels in various parts of the world, including Australia and Micronesia. As well as his diving qualifications, David has a Yachtmaster qualification and is a Diver Medic Technician. Prior to becoming a diving instructor he worked as an analyst for a bank in the UK, a think tank in Tokyo and a consulting firm in Sydney.

Acknowledgements
This expedition gratefully acknowledges the support of the Australian Research Council, the BIOT Administration, BIOT Commissioner's Representative and Commander of British Forces Cdr Richard Marshall, the Executive Officer Major John Lugg, Bertarelli Foundation, Blue Marine Foundation, Chagos Conservation Trust, DG21 LLC, Natural Environment Research Council, Branch Health Clinic (Diego Garcia), the crew of the Pacific Marlin, Project Ocean, the BIOT Scientific Advisory Group, Selfridges Ltd and the UK Foreign and Commonwealth Office. In addition, the following companies have also supported the expedition logistics: Amphibian Sports, Bauer Kompressoren UK Ltd, Chas Newens Marine Co Ltd, Chiswick Honda, DDRC, EXPD International, Helen Lee, Sub-Aqua Products, VivoMed Ltd.

POPULATION OF THE CHAGOS, 1820-1973

Nigel Wenban-Smith

Introduction

While the first settlement of any of the Chagos islands began in Diego Garcia in the early 1780s, few useful figures are available until 1827, a year in which the slave population of the Archipelago shot up from 170 to 346. By the 1850s, the population had reached 500; by 1881, 750; by 1901, over 1,000. The highest figure recorded was 1,237 in the 1911 census.[i] Thereafter the number was mostly below 1,100, with a slight rise in the years after the Second World War to 1,163 in 1951. From 1960 onwards, there was a progressive decline. Figure 1 shows the overall total population between 1850 and 1960.

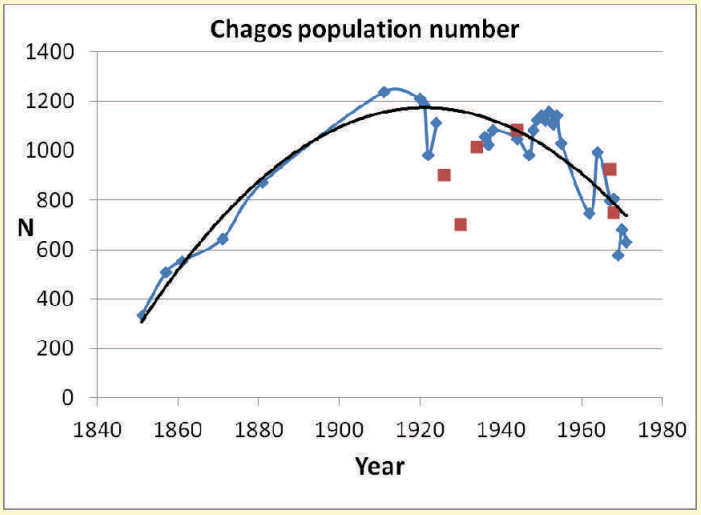


Figure 1. Overall total population between 1850 - 1960. Blue dots and blue line are data from the census, red dots are some alternative estimates. Black line is curve of best fit for blue data.

During the first half of the nineteenth century, the archipelago was rarely visited by government representatives. Such surveys as took place were usually related to investigations of slavery and the slave trade. From 1875, magistrates began to make visits with increasing frequency, but only after the First World War was the target of an annual visit to each island achieved with any regularity. Full censuses of the islands took place decennially from 1871 until 1931, and in 1944 and 1952. The last census, in 1962, dealt very summarily with Mauritius' Dependencies - under which heading the Chagos islands were classified. Unfortunately detailed statistics regarding occupation and racial/geographical origins of each island's workforce were printed only in 1911 and 1921. Another problem is that the magistrates did not record their findings in a standardized format and rarely made clear whether plantation staff and their families were included or excluded from the figures. There could be a dozen or more in this category on Diego Garcia alone. Detailed and comparable statistics for the composition of the population, by age, sex and origin are available for only two years, 1856-7 and 1921. Exceptionally in 1952 a plethora of visits by officials resulted in the accumulation of a great deal of information. Together, these inspections offer an interesting picture of change and continuity between the period of multiple exploitation by the holders of individual concessions under the Crown (*jouissances*) and that of five distinct groups of proprietors, which by 1952 had been amalgamated into a single private company.

In 1856-57, HMS *Frolic* visited all the 'Oil Islands' (C.O. 167/386) and made a detailed record of the population. In Table 1, the information regarding age and gender is summarised, island by island, with (for the Chagos as a whole) a calculation of the proportions of men, women and children. Table 2 shows their distribution by race/origin, which points to differing recruitment practices among the different concessionaires. There is a comparatively large number of 'whites', presumably owners/managers and a very small number of 'Creoles of the Islands', compared with the bulk of the population of 'Creoles of Mauritius'. It would appear that quite a number of children born in Chagos must have been counted as Mauritian. The disproportion between men and women is very striking.

Table 1. Chagos Population 1856/7

Atoll	Men		Women		Children		Total
Diego Garcia	195		37		67		295
Perhos Banhos	48		6		6		60
Salomon	70		13		6		89
Eagle Island	18		4		13		35
Egmont	19		2		3		24
Total	350		62		95		507
Ratio M/W/C		5.6		1		1.5	

Table 2. Origins of Chagos Inhabitants 1856/7

	Diego Garcia	Peros Banhos	Salomons	Eagle Island	Egmont	Total
Whites	17	5	2	5	6	35
Indians	7					7
Africans	10*					10
Creoles of the Islands	16**					16
Madagascans	19#	15	30		3	67
Negroes		10				10
Creoles of Mauritius	230	30	57	30	15	362
Total	299	60	89	35	24	507

*East Point only; **Minni Minni only; ***Pte Marianne only; #none at East Point

The 1921 details are taken from that year's census, which seems to have gone into greater detail than any other year, before or since. Tables 3 and 4 extract information to compare with that in Tables 1 and 2. There were roughly two thirds as many women as men, a proportion still socially undesirable, but one which may well have reflected the labour requirements of the plantations, an issue deserving further examination on another occasion. A closer look at Table 4 reveals that in 1921, 507 out of the total population had been born within the Archipelago, 556 in Mauritius and 118 elsewhere in the western Indian Ocean. Interestingly, the population figures for Agalega show that just over half the population of 500 were born locally, with just under 200 being born in Mauritius. Only 30 originated in the Chagos, just as only 34 Agalegans had found their way to the Chagos. The two populations were evidently quite distinct.

Table 3. Chagos Population 1921 (from Mauritius census tables xvi, xxxv, xlviii, lxi,)

Atoll	Men	Women	Children	Total
Diego Garcia	173	126	155	454
Peros Banhos	138	89	119	346
Salomon	61	39	43	143
Eagle Island	56	36	40	132
Egmont	54*	30	31	115
Total	482	320	388	1190#
Ratio M/W/C	1.5	1	1.2	

*This figure excludes 50 men of Scandinavian origin, presumably constituting the crew and passengers of the Swedish ore carrier *El Maren*, which was wrecked on Egmont in June that year.
#This figure does not tally exactly with the total arising from other tables used in Table 5, which produce an overall population figure of 1193. It has not been possible to trace the reason for this discrepancy.

Table 4. Chagos Population by place of origin and racial category (Africa: General Population/Indo-Mauritian) Source 1921 census tables.

	Diego Garcia		Peros Banhos		Salomon		Egmont		Eagle Is		Total
	GP	I-M	GP	I-M	GP	I-M	GP	I-M	GP	I-M	
Agalega	3	-	15	-	5	-	6	-	5	-	34
Coetivy	-	-	1	-	-	-	-	- -	-	-	1
D.G.	157	14	20	7	7	-	1	-	8	2	216
Mauritius	189	28	124	31	53	7	58	9	47	10	556
Madagascar	8	-	5	-	3	-	-	-	3	-	19
Peros B	5	-	101	16	1	-	1	-	7	2	133
Reunion	11	-	1	2	-	-	-	-	1	-	15
Rodrigues	-	-	3	-	2	-	2	-	-	-	7
Salomon	7	-	2	3	57	3	5	-	10	2	89
Seychelles	2	-	5	-	1	-	2	-	1	-	11
Egmont	4	-	7	-	3	-	22	-	6	-	42
Eagle	1	-	1	-	-	-	4	-	21	-	27
Africa	2	-	4	-	1	-	2	9	6	-	24
Other	10	2									12

Discussion: emergence of the 'Ilois'

This article brings together the scattered statistics regarding the size and distribution of the Archipelago's population; it does not explore in any detail the factors responsible for changes over the years. A forthcoming history will attempt to cover that ground. It is useful nevertheless to discuss very briefly how the people of the islands came to acquire a distinct or homogenized status.

Throughout the plantation period, there was considerable movement between Mauritius and the islands and from island to island. There was also some movement between islands administered from the Seychelles and those administered from Mauritius; all this reflected the increasingly close links between the entrepreneurs who had been granted concessions to exploit the islands' resources. In the nineteenth century, progress from slave ownership to employment of free individuals on mutually agreed contracts was slow in the extreme. Workers, especially those born in the islands and the skilled artisans, were reluctant to bind themselves to contracts, with clear terms of engagement, while local managers often found that it also suited them not to be bound by the corresponding responsibilities, e.g., for the physical safety of their employees. Magistrates found it an uphill struggle to put employment legislation into effect. In general, it appears that the carrying capacity of the supply ships, arriving roughly every four months, was the main regulator of population movement. The managers did of course know which of their workers were reaching the end of their contracts and whether they planned to return; they also tried to insist that workers intending to quit should give notice in time for replacements to be brought in the ship that would bear them away. But such plans were often thrown into disarray, when individuals were dismissed or sentenced to punishment in Mauritius by a magistrate. Such movements were further complicated by the fact that each supply ship would usually be visiting several islands, each having its own requirements for arrivals and departures. In researching the history of the Chagos, we have traced some passenger lists from the contemporary press records, but there are no continuous series from which serious estimates can be made. If any sort of judgment is to be made, it would seem that there was rarely an excess of labour seeking employment in the islands, and that the managers preferred to have too many rather than too few on their books. A notable exception was the 1930s depression, when the population remained well below 1,100, dipping below 1,000 in 1947 and only increasing again in the 1950s towards 1160, the post-war maximum.

While there was no basis for living on the islands except for the employment offered by the concessionaires (who from 1865 were the outright owners), there were many factors, additional to those just described, making for continuity between successive generations of those employed. Families born in the islands literally grew into acceptance of the tasks required and of the lifestyle which the primitive physical conditions allowed. The absence of any sort of formal education rendered those whose childhood had been spent there increasingly less able to compete with young people growing up in Mauritius, where, in addition, employment conditions in the sugar cane plantations were generally harsher than in the islands. Furthermore, disposable income in the islands was and remained miserably low, allowing little possibility of accumulating sufficient savings to make a fresh start in Mauritius. With each atoll in the hands of a monopoly employer, and each local manager having strong incentives for maintaining the docility of his workforce in a situation of extreme isolation, the situation revealed in Table 5 comes as no surprise. Nor would it be surprising that the people of the Archipelago should develop distinctive cultural traits, under the combined influences of similar historical roots, shared living experiences and the close kinship of extended family relations.

For the twenty five years after 1921, there were plenty of pressures to reinforce the distinctness of the Archipelago. First, several years of inflation in Mauritius and shortage of labour; then the Great Depression of the 1930s, characterised by unemployment in Mauritius and extreme parsimony in the islands; and then the Second World War (1939-1945), disrupting trade and production, forcing the plantation Company into bankruptcy and weakening such links as remained between the Chagos and Mauritius.

Post-war Developments and the arrival of Seychellois

As Figure 1 shows, the overall population of the Chagos declined somewhat in the war years, but did not fall below 1,000 until 1947 (980). It then returned quite quickly to about 1150, with the highest post-war total being reached in 1951 (1163). There were censuses in 1944, 1952 and 1962, but the published results were much less detailed than those for 1921 or even 1931. The summary figures are set out below in Table 5.

Table 5. Summary of Chagos censuses held in 1944, 1952 and 1962 (source: Mauritius census reports)

Date	Diego Garcia	Peros Banhos	Salomons	Total
1944	502 (M 247, F 254)	332 (M 160, F 172)	215 (M 115, F 100)	1048
1952	619 (M 331, F 288)	327 (M 157, F 170)	212 (M 116, F 96)	1158
1962	200 (no breakdown by sex	342	205	747

All of the increase between 1944 and 1952, just as all the decrease between 1952 and 1962, was accounted for by Diego Garcia. Meanwhile, on the island of Mauritius itself, there had been an increase in the number of respondents giving the Chagos as their place of birth, from 57 (M 38, F 19) in 1944, to 245 (M113, F132) in 1952 and 694 (M338, F356) in 1962.

The early 1950s were unusual years for the Chagos. For the first time, they were visited, not just once, but in three successive years by the Governor of Mauritius, accompanied by senior officials of his administration, who subjected the Archipelago to the most searching examination, just as Diego Garcia was emerging from the most inadequate management it had ever experienced. In 1951, the Director of Medical Services, Dr. Lavoipierre, noted that "a large proportion of the labourers are born, live and die on the islands and can perhaps visit Mauritius on one or two occasions in their lifetime. The remainder of the labour force is recruited from Mauritius, and it is noted that there was a new departure last year, when about one hundred men came over from Seychelles to work at Diego Garcia."[ii] In 1953, the acting Director of Social Services was among the officials to visit Chagos for several weeks. She noted that Diego Garcia was the least homogeneous, with over a fifth of the population, that is 79 men and 32 women, coming from Seychelles.[iii] It is not clear how many of these had arrived in 1951, but Miss Darlow added that recruitment for Diego Garcia had been very difficult on account of overall unruly conditions there, a situation greatly improved by 1953. A few years later, in early 1956, another Governor, Sir Robert Scott, "was surprised to find that a relatively high proportion of the residents regard the islands as their permanent home and they have their characteristic way of life, unlike that of those Creoles of Mauritius who most resemble them physically. I was told that until recently some 80% of the population were 'natives', but that there is a growing tendency for islanders to visit Mauritius, where a number are settling. The labour force is drawn from these 'natives', supplemented in varying degrees by Seychellois, imported on contract. These Seychellois usually keep very much to themselves, but, since they are preponderantly men, their presence in a society which is notably partial to alcoholic refreshment and broadminded with regard to marriage ties does not make for harmony..."[iv] Sir Robert's impression of increased movement to Mauritius is borne out by the 1962 census returns noted above.

Whether on account of the uneasy relationship between Seychellois and the existing islanders or for other reasons it was noticed in 1961 that "For some obscure reasons posting to Diego does not seem to be welcome among the personnel, all of whom seem to prefer their own islands."[v] The proportion of Seychellois workers was, however, about to increase sharply. In February 1962, a majority shareholding in the Chagos plantations passed to Paul Moulinié's Seychelles-based Chagos-Agalega Company and Moulinié found to his annoyance[iv] that large numbers of the workers from Diego Garcia had chosen to accompany their manager back to Mauritius. Hence the sharp fall (Table 5 above), from 619 to 200, in that year's census figures for that island, reflected also in the sharp rise in the numbers of those in Mauritius recorded as having been born in the Chagos, up from 245 to 694. Unfortunately, there is no record of the exact number of new employees introduced at once by Moulinié; all we know is that they came on 1 or 2 year contracts.

In July 1964, a Colonial Office official, Robert Newton, visited the Chagos in connection with moves to establish American facilities on one or more islands in the area. His aim was to find out how many people might need to be displaced by such facilities. His assessment of the population, distinguishing between Seychellois and others, is shown in Table 6 below. The preponderance of Seychellois on Diego Garcia is striking, but in light of the evidence cited above, not altogether surprising. Also worth noting is that the overall population had fallen to its lowest point since 1947.

Table 6. Chagos Population in 1964

	Diego Garcia	**Peros Banhos**	**Salomons**	**Total**
Seychellois	**311**	**30**	**14**	**355**
Mauritians and Ilois[vii]	**172**	**261**	**205**	**638**
Total	**483**	**291**	**219**	**993**

When the islands were next visited, in April-May 1967, they formed part of the recently declared British Indian Ocean Territory, then administered from Seychelles. At the time, the British Government was negotiating with Paul Moulinié to purchase the freehold of the islands and lease them back, a deal concluded shortly afterwards. The Administrator, John Todd, took passage aboard mv *Mauritius*, which called at Port Louis on both outward and inward voyages from Mahé. The vessel arrived in the Chagos carrying 291 passengers for the Archipelago and left with 164. The arrivals included 189 Seychellois (M 106; F 26; C 57) and 94 Ilois (M 24; F 20; C 50). The departures included 156 Ilois (M 43; F 39; C 74) and 3 Seychellois (all men). In short there was a net decrease of 56 Ilois and a net increase of 186 Seychellois, a considerable shift in the population balance. On the ship's departure, the population was as shown below in Table 7.

Table 7. Chagos Population in May 1967

	Diego Garcia	**Peros Banhos**	**Salomons**	**Total**
Seychellois	327	70	21	418
Mauritian	10	2	7	19
Ilois	166	181	140	487
Total	503	253	168	924

Todd paid a further visit to the Chagos just under a year later, in March 1968. By this time the arrangement under which Moulinié & Company leased back the plantations from the Crown had been changed to one under which he managed them on the Crown's behalf. On arrival, Todd found that overall numbers had been further reduced, largely on account of the reduction in the number of Seychellois on Diego Garcia, as shown in Table 8 below. In his report containing all these figures, Todd explains how he classified the Ilois, as follows:

"The entire population consists of employees of Moulinie & Company and the families of the employees. In addition to Seychellois and Mauritians, there are a number of persons employed who were born in the Chagos and whose parents and in some case whose grandparents were also born in the islands. This particular class is known locally as Creoles des Iles or Ilois. Although many of them have been long resident in the islands their continuation in the islands has always been contingent on their being employed on the plantations. The great majority have links with Mauritius and have been accustomed to take leave there between contracts. …In the case of the figures for March 1968 those shown as Ilois were classified after obtaining details of their place of birth and that of their parents. Ilois were then defined as those born in Chagos or in Mauritius whose father, or in the case of illegitimate children, whose mother, was born in Chagos. In the other cases, those shown as Ilois are those who declared themselves to be so."

Table 8. Chagos Population in March 1968

	Diego Garcia	Peros Banhos	Salomons	Total
Seychellois	230	65	22	317
Mauritian	22	11	23	56
Ilois	128	168	138	434
Total	380	244	183	807

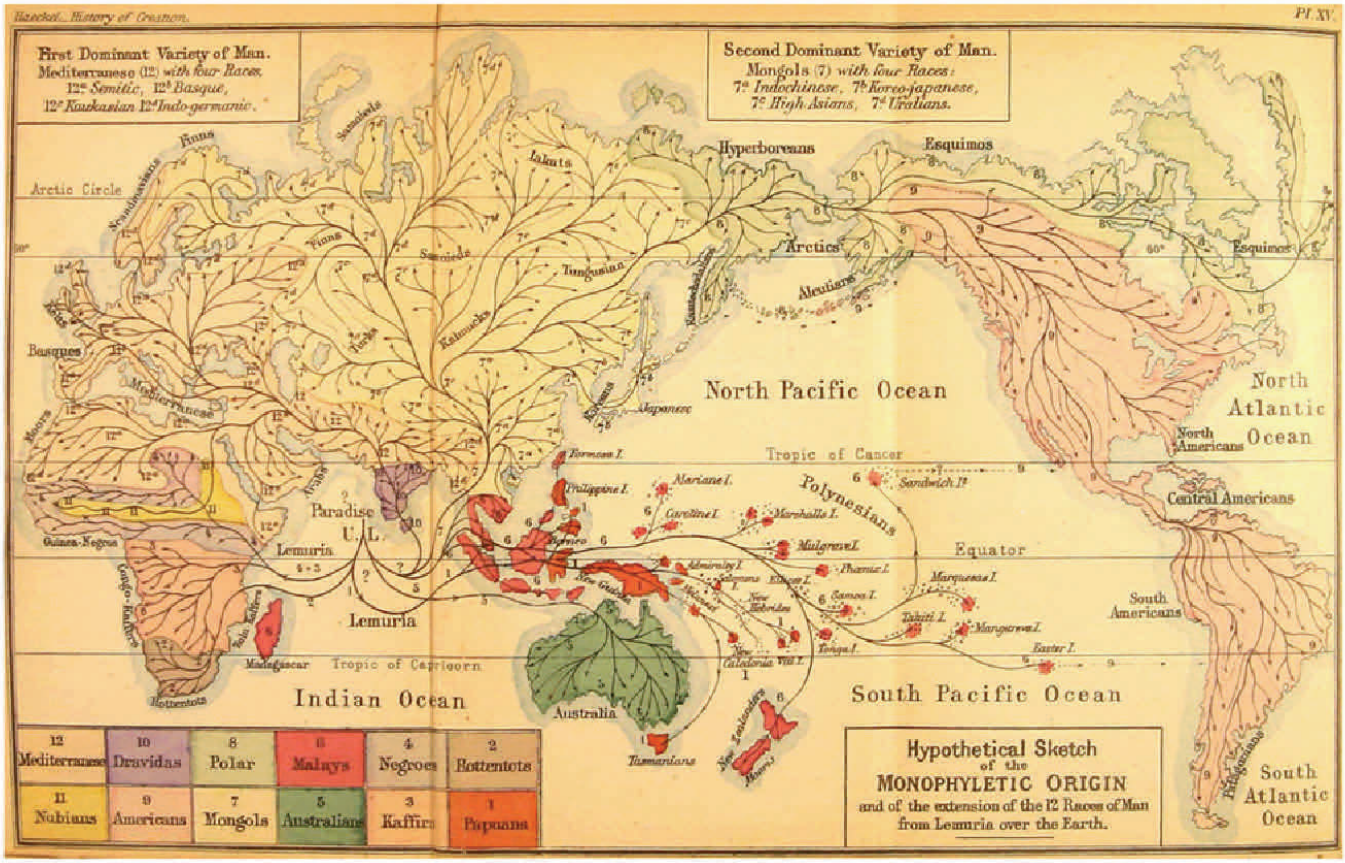
It does not appear that any subsequent calculation was made of the Chagos population prior to their wholesale removal, first from Diego Garcia in 1971 and then from Peros Banhos and Salomon in the years 1972-73. Since the management objective set by the British government was to run the plantations down, it seems unlikely that Moulinié & Co would have introduced additional workers during this period. It does not seem possible therefore that the number of people expelled could have been greater than 800. Of these many, and probably a substantial majority of the 300 or so Seychellois, would have been relatively recent arrivals, the bread winners being on short-term contracts. It may equally be assumed that most of the Mauritians and all of the Ilois would have had strong ties to the Chagos. Thus, some 500 of the total might have been included among those who lost their livelihoods and homes in the 1971-1973 expulsions. On the other hand, if all those Mauritians and Ilois present in 1964 were held to have lost their all as a consequence of British and American policy, the figure would rise above 600.

This article is confined to estimates of the size and composition of the Chagos population. It does not attempt to discuss the rights and wrongs of the creation, continuation or ending of the plantation era. The figures cited are the most authoritative that it has been possible to consult. In relation to the numbers of Ilois removed from the Archipelago they are substantially lower than those cited by some commentators on Chagos affairs, some of whom have put the total population as high as 2,000, with as many as 1,600 being forcibly expelled. Of course, there may be some confusion between the numbers of those expelled and the numbers who qualified for compensation under terms subsequently negotiated between the parties concerned; however the latter figure, being based on links of birth and descent, not actual removal, is bound to have been a much larger one. The main point to emerge, however, is that very many fewer humans underwent the suffering of expulsion than has commonly been assumed, a fact surely to be welcomed by all people of goodwill.

[i] This figure was exceeded in 1921 when a figure of 1240 was recorded. By chance the census took place just after the Swedish ore carrier *El Maren* had run aground on Egmont and her crew of 50 were, misleadingly, included in the count.
[ii] Report dated 17 October 1951, TNA CO 1023/132
[iii] Report enclosed with Mauritius Tel no. 1004 Saving, dated 3 December 1953, TNA CO 1023/132
[iv] Despatch dated 16 January 1956, TNA CO 93/176/03
[v] Source: unpublished report by Managing Director of Rogers & Co, dated September 1961, communicated privately to the author
[vi] Marcel Moulinié, nephew of Paul, who was sent by his uncle to manage the Chagos plantations in the early 1960s, stated this vehemently to the author during a visit to Seychelles in 1995. Robert Talbot, last Mauritian manager of Diego Garcia, confirmed to the author in 2010 that 'quite a number' had returned with him.
[vii] The term 'Ilois', reproduced here as it appears in John Todd's report, has exactly the same meaning as 'Creole des Iles'/Creole of the Islands, to describe individuals born on one of the many western Indian Ocean islands, other than in the Seychelles or Mauritius. Initially, the term 'Creole' referred also to people born on Mauritius/Seychelles/Reunion, regardless of skin colour .
[viii] J.R.Todd, *Notes on the Islands of the British Indian Ocean Territory,* dated 10 January 1969, Seychelles National Archive

Chagos - The Centre of the World!

Charles Sheppard



A few books have referred to Lemuria (or Limuria) in the context of Chagos. What and where is Lemuria?

The idea of lost continents was commonplace in fairly recent history, and was invoked as an explanations of, amongst other things, similarities of animals and plants across what are now large open and watery spaces – this was before plate tectonics was understood. Atlantis and Hyperborea were two such. Lemuria is the 'lost continent' of the Indian Ocean, extending from Madagascar and the Seychelles to India, encompassing the Chagos-Maldive chain whose present day islets were thought by some to consist of the still exposed remnants. All this area was presumed to have mostly sunk, or perhaps flooded in the biblical interpretation, and this was thought to be possible before people understood how great were the huge depths of the Indian Ocean. Understanding of plate tectonics put paid to these ideas; Madagascar and India were indeed once connected, but they slid apart – there was no land bridge that sank.

It was nonsense, but several used its purported existence to reasonably (for the time) try and explain various biological observations. Sclater in 1864 proposed the name 'Lemuria' for the landmass, and used its supposed existence to explain, amongst much else, why lemurs, today only living in Madagascar, were found as fossils in India too: how could they have crossed between Madagascar and India if there had never been a land bridge, after all? Perhaps the idea peaked in significance with regard to ideas of human diasporas following the evolution of humans: it was used by Haeckel in his attempt at explaining the different movements and races of people, from their point of origin, and in this case he went so far as to suggest Lemuria, in the present Seychelles-Chagos area, was the origin of mankind in its entirety:

"…there are a number of circumstances (especially chorological facts) which suggest that the primaeval home of man was a continent now sunk below the surface of the Indian Ocean … " Although he had to admit: "We as yet know of no fossil remains of the hypothetical primeval man (Homo primigenius) …"

We now think that Africa was the site of human origin of course, based on DNA evidence, from which point the radiation of humans worldwide occurred in a burst 60,000 years ago (though with earlier exoduses that seem to have failed to extend very far). Now Atlantis, Hyporborea and Lemuria remain popular in mysticism only, and cults around the world invoke several such places, mostly idyllic, rich and lovely, but now lost to mankind.

Map from: Haeckel, Ernst., 1876. *Natürliche Schöpfungsgeschichte*. (*The History of Creation*), 2 vols. (Translated from the German by E.R. Lankaster). Kegan Paul, Trench & Co., London.