Earthwatch 2016 Annual Field Report

DISCOVERING SHARKS IN SOUTH AFRICA

Assessment of the biodiversity and relative abundance of shark and fish species across different habitats in Walker Bay, South Africa

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PERIOD COVERED BY THIS REPORT: 2016

Dear Earthwatchers,

On behalf of the South African Shark Conservancy field team staff, we would like to extend an enormous thank you to all the volunteers who were involved in the 2016 fielding season. Although time flies so very quickly while you are here, we achieved a huge amount of research in the short time that you were with us.

The 2016 Earthwatch teams contributed to the following projects:

Eggcase surveys: While conducting shark eggcase surveys for our partners Whale Coast Conservation (www.whalecoastconservation.org), we collected eggcases from four endemic shark species, the Leopard catshark (*Poroderma pantherinum)*, Pyjama catshark (*Poroderma africanum)*, Dark shyshark *(Haploblepharus pictus)* and Puffadder shyshark *(Haploblepharus edwardsii)*. Also included was an endemic skate species the Roughnose legskate (*Cruriraja parcomaculata*). We also collected many eggcases from the St. Joseph shark (*Callorhinchus capensis)*, a chimaera endemic to Southern Africa. The data collected will be used to better understand the important areas and seasons for the sharks', skates', rays' and chimaeras' reproduction in Walker Bay.

Angling surveys: During our angling surveys - from both the boat and the shore - the Earthwatch teams contributed data for 28 sharks to our ever-growing tag data base. As you are all aware, Katie is conducting her PhD research on the genetic analyses of endemic catshark species, and co-supervising an honours student at Stellenbosch University, Michaela van Staden, who is collaborating on Katie's genetics research. The Earthwatch teams contributed a significant number of samples, as well as photographic documentation for four species (Leopard catsharks; Pyjama catsharks, Dark shysharks and Puffaddder shysharks). Data for the heavily fisheries exploited Soupfin shark (*Galeorhinus galeus*) was also collected. The sharks were all measured, tagged and genetic samples and photographs for identification purposes were added to Katie's PhD and Michaela's project database.

Beside Katie's PhD and Michaela's projects, during the Earthwatch 2016 Fielding season, SASC hosted a Masters of Research student from Plymouth University, Josh Williams. Josh was conducting trophic level research on the endemic catshark species. Tissue, fin and blood samples were collected during angling surveys to determine the isotopic signatures of the sharks.

Baited Remote Underwater Video (BRUV): Although this is not always the most exciting data to analyse, the Earthwatch teams contributed hugely to the SA Shark Conservancy (SASC) BRUV project. During 2016, Earthwatch volunteers dedicated many hours to the analysis of the footage collected. We collected data for Smoothhound sharks (*Mustelus mustelus)*, Pyjama catsharks *(Poroderma africanum*), Dark shysharks *(Haploblepharus pictus)* as well as the exciting discovery of a Biscuit skate (*Rostroraja straelini)* which is classified as Data Deficient by the International Union for the Conservation of Nature (IUCN). Many teleost (fish) and invertebrate species were recorded. It was through the Earthwatch programme that SASC was able to secure three more BRUV rigs and we are now BRUVing on a much larger scale than before. We have now identified 148 BRUV sites in Walker Bay and are deploying up to twenty-one times per trip.

The Earthwatch 2016 Fielding Teams contributed a significant amount research data to our ongoing Walker Bay research programmes and it is due to each volunteer's passion and dedication to conservation that we have the opportunity to continue this valuable research. Beside the Earthwatch volunteers' contribution to research, we are eternally grateful for the friendships formed; each and every one of you left a small part of your heart with us after your departure and I am sure we will all continue to stay in touch in the future.

With much gratitude,

The South African Shark Conservancy Earthwatch Scientific Team.

SUMMARY

During the 2016 Earthwatch fielding season 28 sharks from five species were tagged and measurements, photographs, stable isotope and genetic samples were collected as part of the Walker Bay Elasmobranch Survey. Baited Remote Underwater Videos (BRUVs) were collected and analysed by the volunteers. 83 eggcases from 6 species were collected by the 2016 Earthwatch team during eggcase surveys.

GOALS, OBJECTIVES, AND RESULTS

Objective 1: Assess the biodiversity and relative abundance of shark and fish species across different habitats in Walker Bay

Three methods of sampling were used to contribute data toward assessing the biodiversity and abundance of species in Walker Bay:

1.1) Fishing surveys:

Several fishing surveys were performed during the 2016 Earthwatch Fielding season. The data collected during fishing surveys are added to the SASC database. Earthwatch volunteers assisted in tagging and data collection for 28 sharks from five species. Genetic samples, measurements, sex and male maturity were collected for all tagged sharks. Four previously tagged sharks were recaptured. Photographic data was collected for *Haploblepharus* and *Poroderma* species.

Table 1: The number of tagged sharks per capture method during 2016 Earthwatch fishing surveys

Number tagged	Capture method	Common name	Species name
3	Boat handline	Soupfin shark	*Galeorhinus galeus*
6	Shore based rod and reel	Dark shyshark	*Haploblepharus pictus*
7	Boat handline	Dark shyshark	*Haploblepharus pictus*
1	Trap	Dark shyshark	*Haploblepharus pictus*
3	Boat handline	Puffadder shyshark	*Haploblepharus edwardsii*
3	Shore based Handline	Pyjama catshark	*Poroderma africanum*
1	Shore based rod and reel	Pyjama catshark	*Poroderma africanum*
2	Boat handline	Leopard catshark	*Poroderma pantherinum*
2	Shore based rod and reel	Leopard catshark	*Poroderma pantherinum*

1.2) Baited Remote Underwater Video:

In the 2016 Earthwatch fielding season we conducted BRUV surveys in various locations both from the boat and the shore The Earthwatch teams assisted with deployment and analysis of BRUVs deployed during their volunteer time.

Table 2: Species observed on the BRUV deployed during Earthwatch 2016

Species name	Common name
Nucella dubia	Common whelk
Bullia spp	Plough shell
Plagusia chabrus	Cape Rock crab
Poroderma africanum	Pyjama catshark
Ovalipes trimaculatus	Three spot swimming crab
Raja straelini	Biscuit Skate
Galeichthys feliceps	Sea barbel
Sardinops sagax	Sardine
Chelidonichthys kumo	Bluefin gurnard
Mustelus mustelus	Smoothhound shark
Pomadasys olivaceum	Piggy
Jasus lalandii	West Coast Rock Lobster

1.3) Eggcase surveys:

Eggcase surveys were performed in three locations during the 2016 fielding season. 83 eggcases from six endemic species were collected in three locations in Walker Bay.

Table 3: Eggcase survey locations, species and number collected by the 2016 Earthwatch volunteers

Location	Species	Number collected:
Betty's Bay Marine Protected Area	Dark shyshark	25
Betty's Bay Marine Protected Area	Leopard catshark	5
Betty's Bay Marine Protected Area	Pyjama catshark	1
Betty's Bay Marine Protected Area	unidentified skate species	1
Betty's Bay Marine Protected Area	Roughnose legskate	1
Sandbaai Beach	Dark shyshark	3
Grotto Beach	St Joseph shark	38
Grotto Beach	Leopard catshark	1
Grotto Beach	Pyjama catshark	1
Grotto Beach	Roughnose legskate	1
Grotto Beach	Puffadder shyshark	2
Grotto Beach	Dark shyshark	4

Objective 2. Compare the species diversity, relative abundance and economic cost between the two sampling methods, BRUVs and shark angling

During the eggcase sampling volunteers collected eggcases from three locations in Walker Bay. The Betty's Bay location produced the highest number of *Haploblepharus* eggcases while Grotto Beach saw a higher abundance of the endemic chimera *Callorhinchus capensis*. Compared to the 2015 fielding season there was a marked increase in the chimera eggcases. No spearnose skate (*Rostroraja alba*) were collected in 2016. Roughnose legskate (*Cruriraja parcomaculata*) eggcases were collected in the 2016 Earthwatch fielding season. During the analysis of BRUV footage, no spearnose skates were observed. One roughnose legskate was observed indicating possible seasonal separation between the two species.

Due to the limited sampling performed with Earthwatch volunteers (directly related to the short time with SASC) it is difficult to compare sample methods with regard to diversity and abundance. Economic costs of eggcase surveys are the lowest; BRUV and fishing surveys are more expensive depending on distance of travel to the sampling locations. The BRUV surveys revealed a higher diversity of species as teleosts, invertebrates and elasmobranchs are observed. Fishing surveys contributed higher numbers of diversity and relative abundance of elasmobranch species. This highlights the value of the three complimentary sampling methods to get a better idea of species diversity and relative abundance of elasmobranch and teleost species in Walker Bay.

Objective 3: Clarify the taxonomy of the endemic shysharks (*Haploblepharus* spp.) and determine whether hybridisation is occurring between species of this genus

Morphometric data, photographs and genetic samples were collected for all *Haploblepharus* species caught during the fishing surveys. Katie and Stellenbosch University Honours student, Michaela van Staden, have been working hard in the genetics lab at Stellenbosch University processing these samples. We have had some VERY interesting results so far, and look forward to sharing these results with you in the near future! We are currently preparing a peer-reviewed scientific publication on these results, which we will forward to everyone once it is published. We will also produce a user-friendly infographic to communicate our scientific findings to a wider audience. Earthwatch and all our volunteers will be acknowledged for your time and contribution to our research.

PROJECT IMPACTS

1. **Increasing Scientific Knowledge**

   SASC hosted a total of 11 Earthwatch volunteers in the 2016 fielding season for a total of 21 research days (excluding travel time). A total of nine hours of training and research were performed per day. The Earthwatch teams contributed a total of 2079 hours in the 2016 field season.

   a. **Peer-reviewed publications**

A peer-reviewed publication is currently being written by Katie Gledhill and collaborators at

Stellenbosch University. This will be submitted in December 2016 or early 2017.

   b. **Presentations:**

Katie Gledhill was an invited speaker at the Southern African Shark Conservation pre-CITES CoP17 workshop in Cape Town. Katie's research on the genetics of South African endemic catsharks, including our Earthwatch research, was discussed in this presentation. Results from this study will be presented at Southern African Sharks and Rays Symposium hosted by SASC in September 2017.

2. **Mentoring**

   a. **Graduate students** – list graduate students doing thesis work on the project and include student CVs and their research proposal on file with the university as an attachment when you submit your annual report

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
Josh Williams	Master of Research (Plymouth University)	Stable Isotope analysis of three South African endemic catshark species.	2017
Michaela van Staden	Honours	DNA barcoding and *in silico* development of microsatellites in South African endemic catsharks	2016

   b. **Community outreach**– provide details on how you have supported the development of environmental leaders in the community in which you work.

Name of school, organization, or group	Education level	Participants local or non-local	Details on contributions/ activities
Jungle Kids	Pre-primary school	Local	Educational programme delivery.

3. **Partnerships** – list your current active professional partnerships that contribute to your project

Partner	Support Type(s)[1]	Years of Association (e.g. 2006-present)
Department of Agriculture, Forestry and Fisheries (DAFF)	Technical, academic, permits, collaboration, data	2008 - present
Stellenbosch University	Collaboration, technical support, academic support	2012 - present
Whale Coast Conservation	Data, logistics, collaboration	2010 - present
Cape Nature	Funding, logistics, permits, technical support, collaboration	2010 - present
Various shark cage diving industry members (White Shark Project, SharkLady, White Shark Cage Diving Company)	Logistics, data, technical support, collaboration	2010 - present
Southern Right Charters	Data, collaborations	2012 - present
University of Technology Sydney	Collaboration, technical support, academic support	2015 - present
SCUBA Africa	Technical support,	2015 - present

4. **Contributions to management plans or policies** – list the management plans/policies to which your project contributed this year

Plan/Policy Name	Type[2]	Level of Impact[3]	New or Existing?	Primary goal of plan/policy[4]	Stage of plan/policy[5]	Description of Contribution
IUCN Shark Specialist Group	Management plans	Regional	Existing	Species conservation	Adopted	Species assessments
South African National Plan of Action for Sharks (NPOA Sharks)	Management plans	National	Existing	Natural resource conservation/species conservation	Adopted	Data and species assessments
South African Shark Biodiversity Management Plan	Management Plans, Policy	National	Existing	Species conservation	Adopted	Data and species assessments

5. **Conserving natural and sociocultural capital**
    a. **Conservation of taxa** – In the past year, has your project helped conserve or restore populations of species of conservation significance? If so, please describe below.

Species	IUCN Red List category	Local/regional conservation status	Local/regional conservation status source
Poroderma pantherium	Data deficient	Data deficient	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students, academics and management through the ORI database. A population genetics study with elucidate genetic diversity, differentiation and connectivity *of P. pantherinum* throughout the distribution range.		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection, abundance of species
Poroderma africanum	Near Threatened	Near Threatened	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students, academics and management through the ORI database		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection, abundance of species
Haplobleph arus pictus	Least Concern	Least Concern	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students, academics and management through the ORI database		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection, abundance of species
Haplobleph arus edwardsii	Near Threatened	Near Threatened	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students,		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection,

	academics and management through the ORI database		abundance of species
Rostoraja alba	Endangered	Endangered	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students, academics and management through the ORI database		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection, abundance of species
Cruriraja parcomaculata	Not assessed	Not assessed	IUCN Red List
	Description of Contribution: Data collected is added to the Ocean Research Institute (ORI) national collaborative tagging programme. All tag data is shared with prospective students, academics and management through the ORI database		**Resulting Effect:** all data collected contributes to better understanding of genetic diversity, population dynamic, seasonal distribution, habitat selection, abundance of species

b. **Ecosystem services** –Indicate which ecosystem service categories you are directly studying in your Earthwatch research and provide further details in the box below.

☐Food and water   ☐Flood and disease control
xSpiritual, recreational, and cultural benefits   xNutrient cycling

By collecting baseline data on the biodiversity of Walker Bay, we will gain an understanding of the value of ecosystem services the area provides to the local and wider community in South Africa. The data that we will collect will contribute to the proposal to declare Walker Bay a Marine Protected Area which will maintain the area and the ecosystem services it provides.

The depletion of ocean resources has linked biological and socio-economic implications that stem from accelerated biodiversity loss and impaired ecosystem service delivery (Lester et al. 2009; Levin et al. 2009). In 2000, the estimated value of the direct benefits derived from all coastal goods and services in South Africa was approximately R168 billion, with indirect benefits contributing a further R134 billion (White Paper on Sustainable Coastal Development of 2000). The primary, secondary, and tertiary aspects of the fishing industry are important sources of direct employment for nearly 28 000 people living at or near the coast. Compare with other employment sectors, fishing provides high quality employment, generating substantial individual incomes. Fishers earn on average R36 000 per year, although gross earnings vary among different skills groups (that is, among unskilled and semi-skilled workers and managers). The earnings from South African commercial fisheries in 2000 totalled approximately R1 billion.

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