



**JNCC Report 752**

**Technical assistance programme for effective coastal-marine management in  
the Turks and Caicos Islands (DPLUS119)**

**WP4: Knowledge Exchange Programme – Final Report**

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**November 2023**

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ISSN 0963 8091

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**This report should be cited as:**

Irving, E., Englefield, E., Anderson, L., Vaughan, D., Pettit, L., Cilenti, C., Cotton, C. & Tierney, M. 2023. Technical assistance programme for effective coastal-marine management in the Turks and Caicos Islands (DPLUS119). WP4: Knowledge Exchange Programme – Final Report. *JNCC Report 752*. JNCC, Peterborough, UK. ISSN 0963-8091. <https://hub.jncc.gov.uk/assets/14b34883-52cd-490b-be09-415fe5272e6a>.

**Acknowledgments:**

This work was funded by the UK Government through the Darwin Plus project DPLUS119 'Technical assistance programme for effective coastal-marine management in the Turks and Caicos Islands'. We are very grateful to our colleagues in the Government of the Turks and Caicos Islands Department of Environment and Coastal Resources (DECR) and the South Atlantic Environment Research Institute (SAERI) for reviewing the draft version of this report.

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## Summary

Knowledge exchange is a core component of the project 'Technical assistance programme for effective coastal-marine management in the Turks and Caicos Islands' ([DPLUS119](#)). This project is led by JNCC, working in partnership with the Government of the Turks and Caicos Islands Department of Environment and Coastal Resources (DECR) and the South Atlantic Environment Research Institute (SAERI). Funding is provided by Darwin Plus through the UK Government's Darwin Initiative. The project aims to improve the evidence base in the marine and coastal environments in order to support sustainable coastal and marine management approaches in the Turks and Caicos Islands (TCI).

This report details the objectives and findings of activities undertaken as part of Work Package 4, the project's Knowledge Exchange Programme. The purpose of Work Package 4 is to support the promotion of long-term benefits from the tools and techniques developed during the project by delivering capacity building activities across the technical Work Packages (1–3) and data management Work Package (5). Work Package 4 also aims to raise awareness of the project and the benefits provided by the coastal-marine environment in the Turks and Caicos Islands through the delivery of community engagement events.

Activities undertaken as part of the Knowledge Exchange Programme include:

- High level meetings with the TCI Governor's Office and the Office of the Premier to introduce the project and the Knowledge Exchange Programme.
- A series of four virtual workshops and a three-day in-person workshop with relevant TCI government departments and external organisations to support the future use and development of sustainable marine management approaches.
- Meetings with relevant stakeholders to understand current environment data management practices, needs, and opportunities.
- Community outreach including three youth engagement sessions in Providenciales, Grand Turk and North Caicos; a presentation of the project at the DECR's Environmental Awards Ceremony; and delivery of a session on natural capital for the DECR's well-established Nature School platform.

This report outlines the key findings from the technical knowledge exchange activities. Findings from the knowledge exchange workshops help to define priorities and next steps related to the use of natural capital techniques, vulnerability and status assessments, marine indicator development, and data management to support these techniques. Findings related to the reach and impact of community engagement events help to understand their effectiveness for raising awareness of the project, its purpose, and broader value of the marine environment which is important for increasing public knowledge and support for sustainable coastal-marine management practices.

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# 1 Project Background

The Turks and Caicos Islands (TCI), one of the UK Caribbean Overseas Territories, face complex environmental management issues in the face of anthropogenic and climate change impacts. The ability of the natural environment to support the TCI economy and provide resilience to climate change impacts requires access to the best available evidence to inform decision making, from community to Ministerial levels.

An international partnership led by the UK's Joint Nature Conservation Committee (JNCC) was awarded Darwin Plus funding in 2020 to undertake the following 3-year project: *Turks and Caicos Islands technical assistance programme for effective coastal-marine management* (DPLUS119). The partnership of JNCC, the Turks and Caicos Islands Government Department of Environment and Coastal Resources (DECR), and the South Atlantic Environmental Research Institute (SAERI) aimed to develop an enhanced evidence base to support sustainable coastal and marine management approaches in the islands.

The DPLUS119 Turks and Caicos Islands technical assistance programme had two core objectives:

- To develop tools and methods to enhance the evidence base needed to support status assessment and management programmes in coastal-marine environments.
- To provide support and build capacity in using and applying data, tools, and methods developed under the project through an effective knowledge sharing programme.

This report focuses on the work carried out through the Knowledge Exchange Programme, that took place during June 2023, both online and in-person on the Turks and Caicos Islands.

## 1.1 Work Packages

Project outputs constitute the following distinct work packages (WP1 to WP5) which contribute to achieving the project objectives and provide the foundations for strategic and sustainable coastal-marine management.

- WP1: Natural Capital Evidence Base and Tools.
- WP2: Status and Vulnerability Assessments.
- WP3: Marine Indicators.
- WP4: Knowledge Exchange Programme.
- WP5: Environmental data management and IT (Information Technology) capacity in the Turks and Caicos Islands.

## 2 Knowledge Exchange Objectives

The objectives of the Knowledge Exchange Programme were as follows:

- Deliver in-depth capacity building through a structured programme of JNCC senior specialist placements into the Turks and Caicos Islands. Work closely with Turks and Caicos Islands Government (TCIG), with DECR staff being the primary partner, on key deliverables, providing focused skills transfer across technical areas.
- Hold targeted workshops/events to share outputs of habitat, condition, and risk mapping exercises, and to support development of indicator development.
- Raise awareness/appreciation of goods/services provided by the coastal/marine environment through working with existing community groups to facilitate engagement and uptake.

The Knowledge Exchange programme and agenda for each event held, either online or in person, are provided in Appendices 1, 2 and 4. The recordings of the online events and the presentations are available on the JNCC YouTube Channel:

<https://www.timespub.tc/pdfpub/summer-2023-Times-of-the-Islands.html>.

### 3 High-level Engagement

To gain support amongst high-level policy makers, the background, schedule, and outputs of the Knowledge Exchange events were shared through presentations to the Governor's Office prior to the events, and to the Premier following the completion of the events.

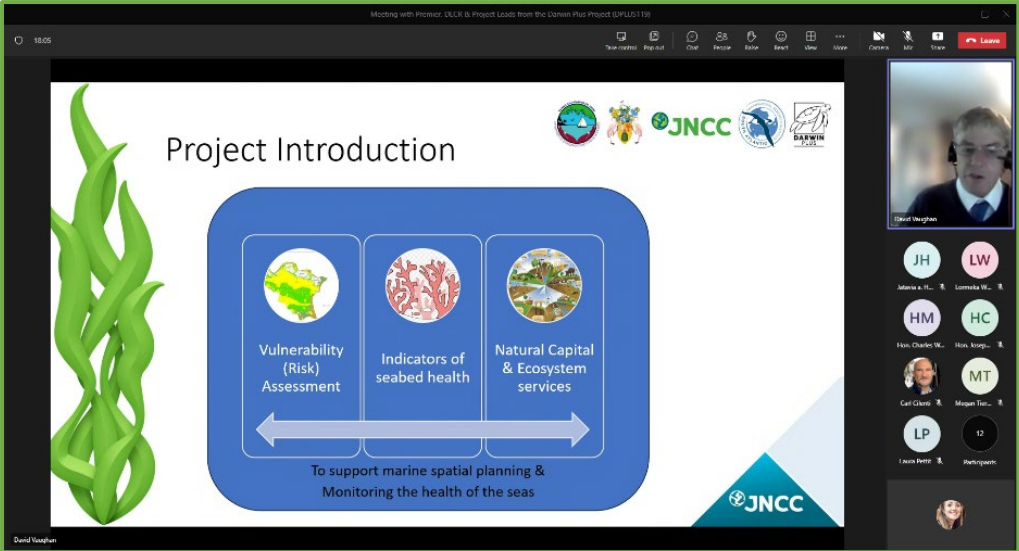
During the meeting with the Governor's Office (26 June 2023) the Work Package Leads presented a summary of each technical Work Package, project outputs and progress and future directions (Figure 1). An interest was shown towards the application of natural capital and incorporating the cultural services that the marine environment provides into decision making. A summary of the community engagement events planned were also provided, with the youth engagement receiving a positive response.



**Figure 1.** JNCC and DECR staff presenting an overview and key outcomes of the DPLUS119 project to the TCI Governor's Office.

During the online meeting with the Premier of the Turks and Caicos Islands (4 July 2023), the Work Package Leads presented a summary of the project and each technical Work Package, highlighting progress under the project, outputs of the Knowledge Exchange Workshops, and potential future direction. Following the meeting there was time for questions and discussion. Topics that were of particular interest included:

- Assessment of the condition of seagrass and incorporation into indicators.
- Monitoring to better inform estimates of value from carbon sequestration.
- Common standards for the collection and centralisation of data.
- For data to feed into other projects, particularly natural capital valuation work.



**Figure 2.** Screenshot of presentation and participants at the online meeting with the Premier, providing an overview and key outcomes of the DPLUS19 project.



## 4 Technical Components (WP1 to WP3)

### 4.1 Natural Capital Evidence Base and Tools (Work Package 1)

#### 4.1.1 Introduction

Work Package 1 (WP1) employs natural capital approaches to existing data for the TCI coastal-marine area, to contribute towards the tools and capacity needed for using natural capital in decision-making processes. The objectives set out and met under this work package are:

- To create a Natural Capital Asset Register for the TCI marine and coastal environment, incorporating outputs from the previous JNCC TCI Natural Capital Accounting – Initial review (Eftec & JNCC 2018, 2019), and drawing on tools already developed by JNCC.
- To undertake a systematic literature search to identify links between marine and coastal habitats (assets) present in the TCI and ecosystem services and benefits, using examples from the Caribbean where available.
- To develop ecosystem service maps using The Nature Conservancy habitat map and outputs from the TCI Asset Register for a minimum of three ecosystem services within the Provisioning, Regulation and Maintenance, and Cultural service categories.

These objectives are reported on in the following WP1 report:

- Hooper, T., van Rein, H., Day, J., Cordingley, A. & Lawson, J. (2021). Developing an asset register for the Turks and Caicos coastal-marine area. Report prepared as part of the Darwin Plus 119 project 'Technical assistance programme for effective coastal-marine management in the Turks and Caicos Islands'. [JNCC Report 692](#). JNCC, Peterborough, UK. ISSN 0963-8091.

#### 4.1.2 Knowledge Exchange Activities

##### 4.1.2.1 Online

An online knowledge exchange meeting was held on 20 June 2023 (see Appendix 1 for agenda). Participants primarily consisted of DECR staff members, but attendees also included stakeholders from non-governmental organisations (NGOs) (e.g. TCI Reef Fund) and other government departments (Appendix 3). This two-hour meeting aimed to provide an overview of WP1, focussing on the rationale and methods used. The event also had time assigned for in-depth discussion and feedback from participants. This online event was designed to prepare attendees and provide background context for the in-person activities, including an introduction to natural capital approaches and a more detailed examination of methods used in the project. Opportunities for active participation included in-depth discussion time, and brainstorming activities (using Slido).

##### 4.1.2.2 In-person

The in-person knowledge exchange meeting was held on 29 June 2023 in DECR's meeting room in Providenciales (Figure 3) (see Appendix 2 for agenda). Again, participants primarily consisted of DECR staff members, but attendees also included stakeholders from NGOs (e.g. TCI Reef Fund) and other government departments such as the Department of Fisheries & Marine Resources Management (FMRM) (see Appendix 3).

The goal of this meeting was to encourage an active, critical discussion of the WP1 findings with a focus on applications and next steps for natural capital approaches in the TCI. Using seagrass habitat as an example, we discussed the relevant ecosystem services and how these were pulled out of the literature review and asset-service matrix to contribute to ecosystem service maps. There was additionally a note-taking activity using large printed copies of the habitat and ecosystem service maps for participants to draw on and add comments. This was carried out in small groups of four, rotating through each map roughly every ten minutes.

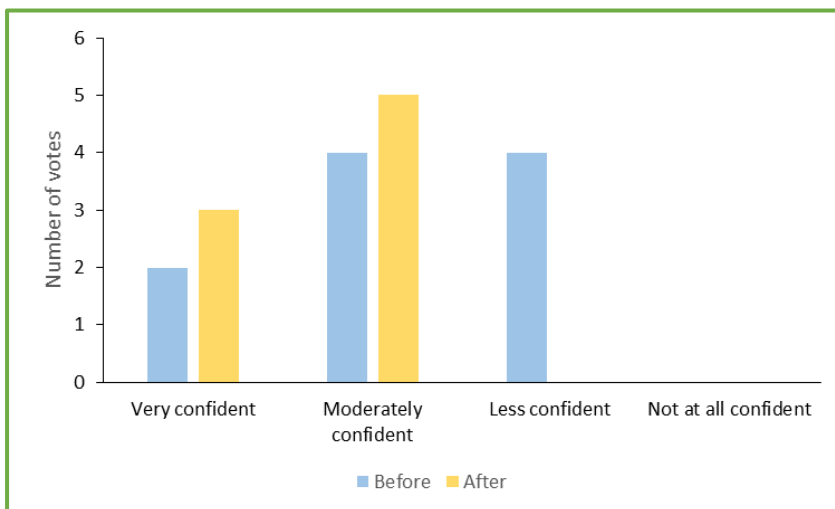


**Figure 3.** Participants at the WP1 in-person knowledge exchange event.

### 4.1.3 Key Findings

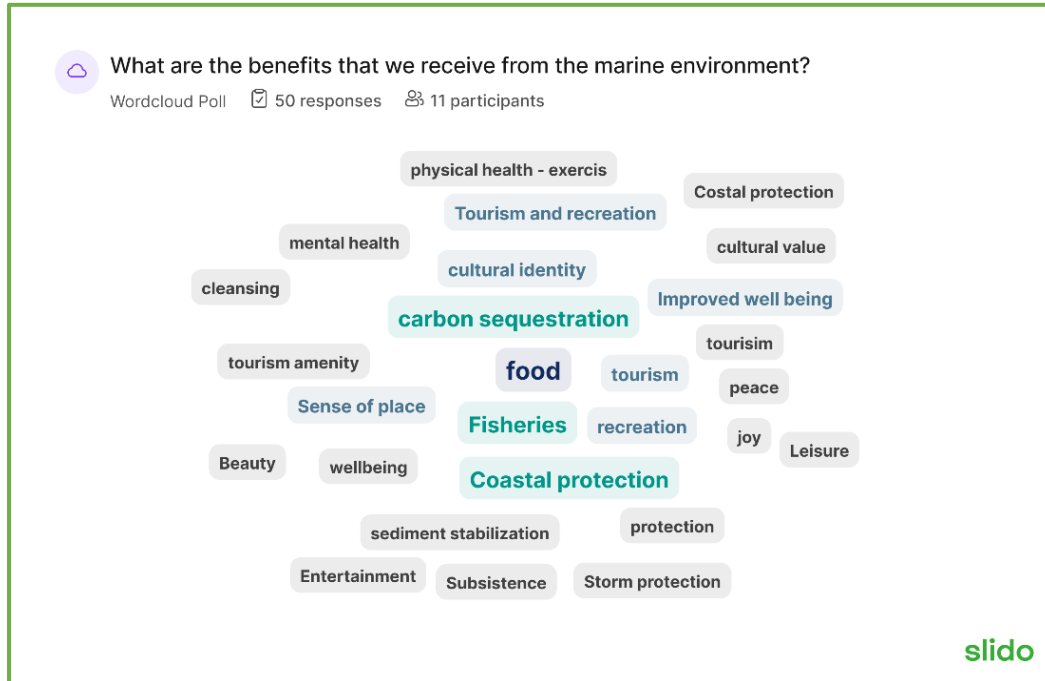
#### 4.1.3.1 Online

A Slido poll was used to gauge participant familiarity with the material at the beginning and end of the event. Eight out of 12 attendees participated in the poll (some attendees were JNCC staff supporting with event facilitation). All attendees expressed at least some confidence with natural capital approaches at the outset of the workshop, which was useful in generating discussion during the meeting. By the end of the workshop, all attendees expressed that they felt either moderately or very confident in their knowledge of natural capital approaches (Figure 4). No participants expressed that they were ‘not at all confident’ with natural capital approaches.

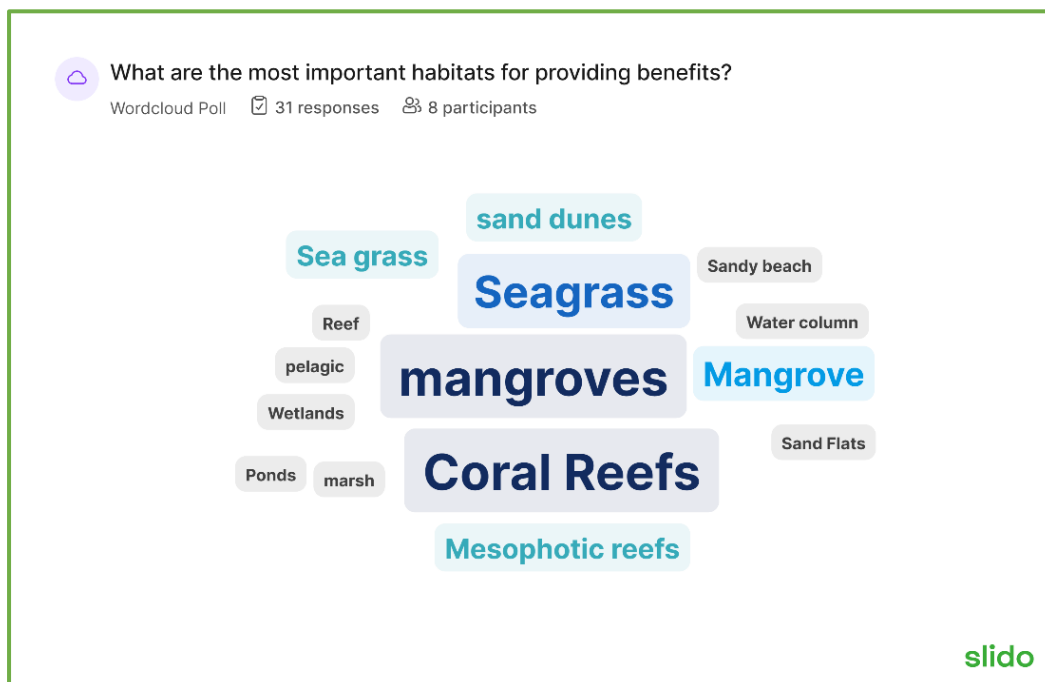


**Figure 4.** Participant responses to the question ‘How confident do you feel about natural capital approaches?’ before and after the online knowledge exchange event for WP1.

Slido was also used to facilitate word-cloud based participation activities. The first two activities were used to encourage participant brainstorming about ecosystem services and natural assets ahead of introducing natural capital-specific terminology (hence ‘benefits’ and ‘habitats’) (Figures 5 and 6). A final word cloud supported a discussion about how natural capital approaches may be taken forward in the TCI in the future (Figure 7).



**Figure 5.** Interactive activity: word cloud of benefits (ecosystem services) identified by participants as relevant to the marine environment in the TCI. 50 responses submitted by 11 participants.



**Figure 6.** Interactive activity: word cloud of key habitats (assets) identified by participants as providing benefits (ecosystem services) in the TCI. 31 responses submitted by 8 participants.



**Figure 7.** Interactive activity: word cloud of future avenues for natural capital approaches in TCI. 14 responses by 8 participants.

#### 4.1.3.2 In-person

Important elements of the discussion during the in-person events centred around the need for more up-to-date and adequately ground-truthed habitat maps to improve confidence in natural capital methods. We additionally discussed the role that monitoring programs can play in supporting these approaches, and how asset condition may mediate ecosystem service delivery. The distinction between potential and actual ecosystem service delivery (or ecosystem service realisation) was discussed in the context of tourism services and how built infrastructure may interact with natural assets for service realisation (e.g. how boat access or mooring facilities will influence whether tourism snorkelling activity is being delivered as a service, in addition to the presence and condition of relevant natural assets). Number of attendees fluctuated slightly through the day depending on people's availability but was approximately 12 participants.

#### 4.1.4 Next Steps

Next steps and areas for future work are discussed in more detail in the WP1 report (Hooper *et al.* 2021), and are summarised as:

- Updated, adequately ground-truthed habitat maps.
- Improved understanding of ecosystem services not considered in this project (e.g. disease control).
- Improved knowledge on seagrass bed density, species composition and condition.
- Exploration of synergistic, additive and negative habitat-habitat effects on service provision.
- Refinement of service provision to reflect sources of a given service (e.g. key taxa rather than habitat-wide assumptions).
- Improved understanding of potential versus actual service delivery.

## 4.2 Status and Vulnerability Assessments (Work Package 2)

### 4.2.1 Introduction

Work Package 2 (WP2) covered the outline & demonstration of techniques to understand habitat condition, based on 'proxy' measures by considering the level of human activity which might affect those habitats. The work had three related aspects:

- 1) Inventory and mapping of activities and determining which co-exist with specific habitats.
- 2) Assessment of sensitivity of three key habitats to pressures caused by those activities.
- 3) An assessment of the condition of those habitats by considering their vulnerability to those activities.

The purpose of this was to provide participants with a good understanding of the kinds of tools available to identify where the primary risks are to the health of specific habitats, and what else is needed to improve the understanding of how human activity (and infrastructure) affects the marine environment. A key part of this work package was to show how understanding of human activities might impact vulnerable habitats, and how this links to the location of natural assets in TCI waters. Work Package 3 (WP3) takes this theme and develops more robust indicators of health, where more data are needed to give greater confidence in the accuracy of the outcomes.

### 4.2.2 Knowledge Exchange Activities

This report focuses on the specific Knowledge Exchange events held in June 2023 with TCI stakeholders, building upon the previous on-line workshop on Activities and Pressures held in August 2021.

#### 4.2.2.1 Online

An online knowledge exchange meeting was held on 1 and 2 June 2023 (see Appendix 1 for agenda). Participants primarily consisted of DECRA staff members, but attendees also included stakeholders from NGOs (e.g. TCI Reef Fund) and other government departments (Appendix 3). The event was held over two days, so as to allow more time for assimilating the concepts and to re-introduce the outcomes of the previously held WP2 Activities and Pressures workshop. Day 1 opened with a general question of what the participants considered to be the health of the sea and the biggest problems facing marine systems of TCI. The remainder of the discussion covered the Activities & Pressures work, asking the participants to list the key activities they considered potentially harmful, and then to look at the list produced in the earlier workshop. A more detailed analysis was then presented of how to produce a scientifically robust assessment of sensitivity of key habitats, using literature review and comparison with similar examples in Europe (where appropriate). Day 2 covered how to combine the locations of key activities considered to cause damage, with the sensitivity measures of the habitats, to come up with an overall risk map. These risk maps are the building blocks for defining the state of the natural capital and used for zoning of protection in marine spatial planning.

#### 4.2.2.2 In-person

The in-person knowledge exchange meeting was held on 27 June 2023 in DECRA's meeting room in Providenciales (Figure 8) (see Appendix 2 for agenda). Participants primarily

consisted of DEC staff members, but attendees also included stakeholders from NGOs (e.g. TCI Reef Fund) and other government departments (Appendix 3). The subject matter was similar to that of the on-line workshop, except some of the more technical discussions (e.g. the process of evaluating sensitivity scores and their confidence levels) were not covered. Instead, a simplified approach was used of providing a set of 'playing cards' with different habitats and sensitivities to pressures, to engage members of the audience in speaking about what the card might be representing.

In this way a greater focus was deliberately placed on gathering views from the participants in terms of what they considered important, what kinds of activities were likely to impact the three key habitats (coral reefs, seagrass beds and sandy sediments), and where they were likeliest to occur. The methods of how to locate activities (e.g. by using grids or by "heat maps" to identify key locations) were discussed, and a poll taken on which approaches seemed to be most practicable for the TCI. Finally, a comparison was made of the outputs using the benthic habitat map with sensitivity scores, and likely areas of highest impact (as determined by workshop participants from all three workshops), to produce a predicted map of likely vulnerability to abrasion.



**Figure 8.** Participants of the WP2 knowledge exchange event undertaking interactive activities.

### 4.2.3 Key Findings

The participants were asked at different points about what they considered to be the most damaging activities in terms of protecting seabed habitats, both by questions in the interactive meeting and also by Slido questions being used in the online session. A range of activities were identified as having the potential to damage TCI seabed habitats. For seagrasses and coral reefs, it was felt that dredging and anchoring had the greatest potential to cause damage; while sand habitats may be most impacted by coastal development, sand mining and dredging (see Figure 9a).



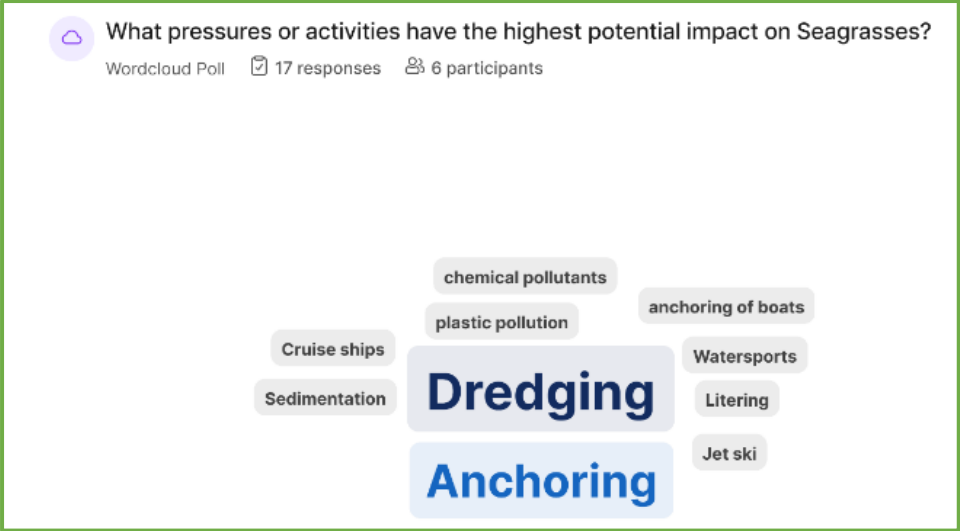
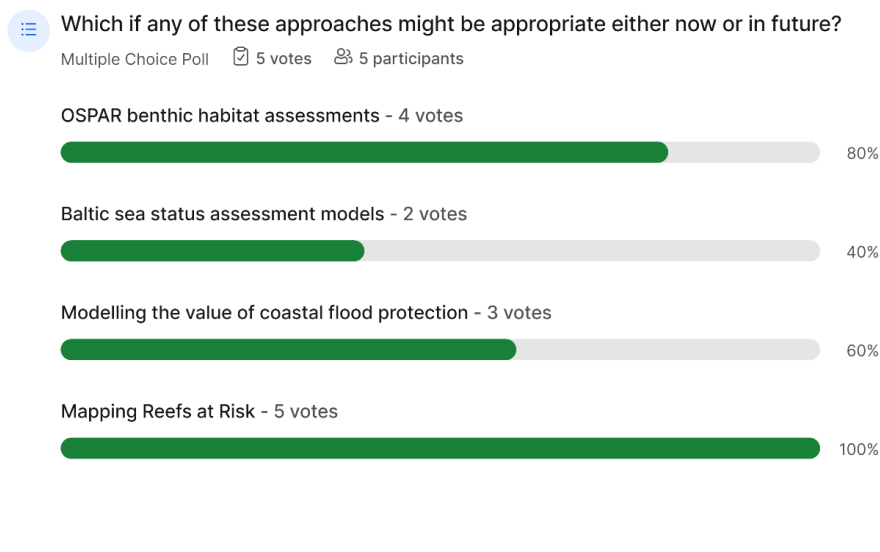


Figure 9a. Slido word-cloud results from the online knowledge exchange event, discussing damaging activities in terms of protecting: TCI coral reef (top), seagrass (middle), and sand habitats (bottom).

For identifying which methods were most appropriate for undertaking condition assessment of the seabed, a Slido poll was taken with online workshop participants (Figure 9b). This poll was taken following discussion of methods of assessing condition, about which of the globally available methods might be most appropriate for TCI. These ranged from examples in Europe focusing on seabed habitat assessments, to modelled approaches used in the Caribbean for assessing flood risk and also the general approach used by World Resources Institute for compiling the “Reefs at Risk” report. These findings were discussed further within the workshop although the overall conclusion was that at present, more data was needed to increase confidence in the assessments; methods with lower confidence such as “Reefs at Risk” were the main practicable solution at this point in time.



**Figure 9b.** Slido responses to a question on the potential value of different assessment approaches.

#### 4.2.4 Next Steps

The workshop session raised a number of questions primarily around collection, management and analysis of activities and other human impacts. Many of these are not specifically environmental (e.g. tourism activities, fisheries, land development) so the need to look at how to integrate TCIG data processing was highlighted.

The development of methods for assessing and presenting condition was discussed at length, particularly in how the state of these habitats might affect their ability to provide the necessary ecosystem services. This is an aspect where the participants saw a need to continue the work and support the improvement in accuracy of ecosystem accounts and supporting the current work on Marine Spatial Planning.

### 4.3 Marine Indicators (Work Package 3)

#### 4.3.1 Introduction

Work Package 3 (WP3) has explored potential options for marine biodiversity indicators, maximising the use of existing data, to support decision making. Indicators are tools and methods used to summarise and communicate aspects of ecosystem state (McQuatters-Gollop *et al.* 2019). Under WP3 a literature review was conducted to provide an overview of



marine ecological indicators and types of data required and a scoping document was produced, which identified a shortlist of potential indicators which could be applicable to TCI (Britton *et al.* 2021, 2022). An indicator approach for assessing seagrass habitat extent was piloted and options for assessing the condition of other marine habitats have been explored.

## 4.3.2 Knowledge Exchange Activities

### 4.3.2.1 Online

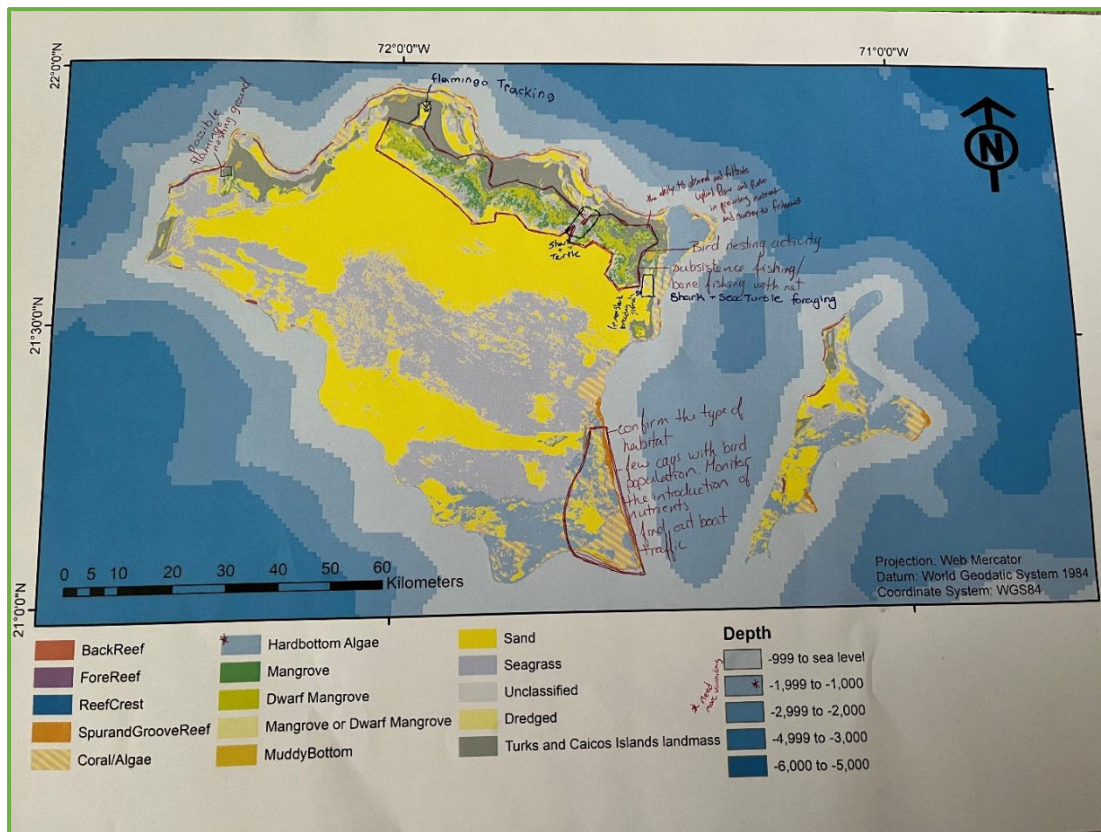
An online knowledge exchange workshop was held on 14 June 2023 (see Appendix 1 for agenda). Participants primarily consisted of DECRA staff members, but attendees also included stakeholders from NGOs (e.g. TCI Reef Fund) and other government departments (Appendix 3). This two-hour meeting aimed to provide an overview of marine biodiversity indicators, introduce the work conducted under WP3 and to better understand priorities for measuring marine ecosystem health. Links were also made to the other work packages (WP1 and WP2). Interactive sessions were built into the workshop, and these consisted of Slido polls, as well as the opportunity for participants to ask questions.

### 4.3.2.2 In-person

The in-person knowledge exchange meeting was held on 28 June 2023 in DECRA's meeting room in Providenciales (see Appendix 2 for agenda). Again, participants primarily consisted of DECRA staff members, but attendees also included stakeholders from NGOs (e.g. TCI Reef Fund) and other government departments such as FMRM (Appendix 3). The aims of this workshop were to discuss the work conducted under WP3 and identify priorities for future development of marine biodiversity indicators. There were presentation slides introducing marine biodiversity indicators and different assessment approaches, along with a discussion on how indicators can be used and applied. An overview of the work conducted under WP3 was provided, focusing on the indicator which had been piloted to assess seagrass extent.

There were four different interactive sessions where workshop participants worked in small groups to:

- Discuss the importance of seagrass habitats.
- Discuss which aspects of the marine environment that they would most like to measure the condition of.
- Use maps to identify which habitats and areas they would most like to measure the condition of (Figure 10).
- Discuss possible reasons for differences in seagrass density identified in The Nature Conservancy benthic habitat map.

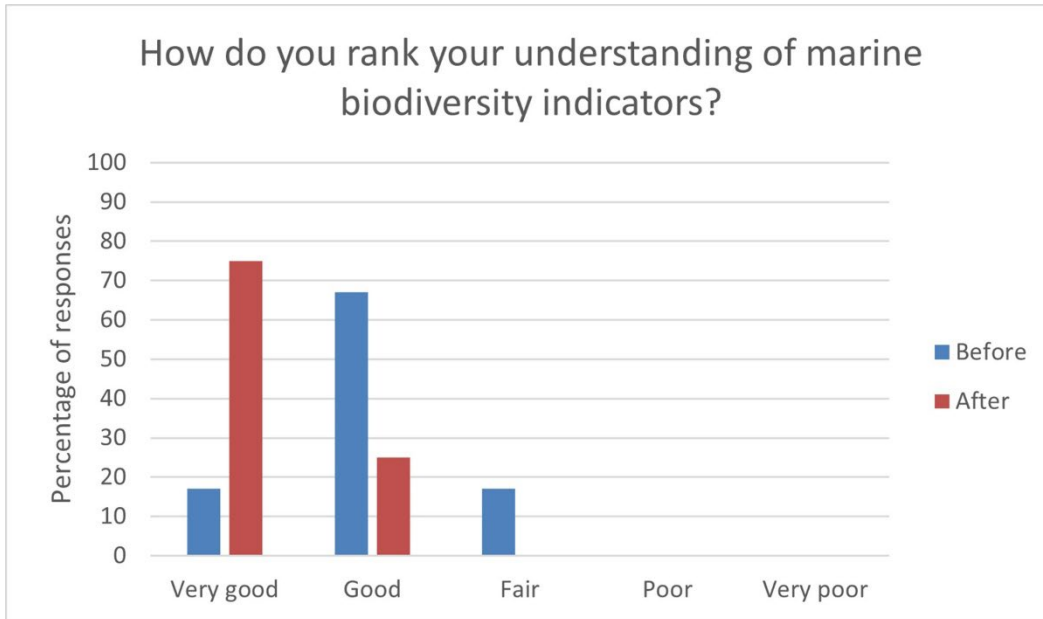


**Figure 10.** An example of an annotated map from one of the interactive sessions at the in-person workshop for WP3. Participants were asked to use the maps to write down what they would like to know about the habitat in the area and why.

### 4.3.3 Key Findings

#### 4.3.3.1 Online

A Slido poll was used to gauge participant understanding of marine biodiversity indicators at the beginning and end of the event. All participants expressed at least a ‘fair’ understanding of marine biodiversity indicators at the start of the workshop, with the majority (67%) having a ‘good’ understanding of marine biodiversity indicators (Figure 11). By the end of the event, the majority of participants (75%) had a ‘very good’ understanding.

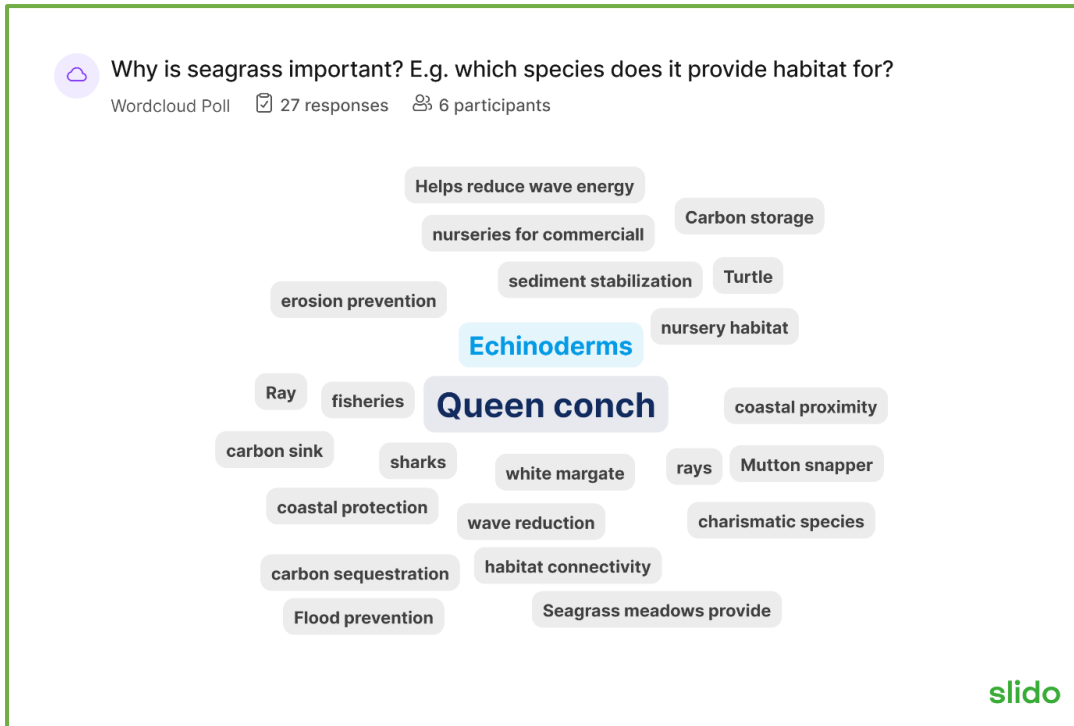


**Figure 11.** Participant responses to the question ‘How do you rank your understanding of marine biodiversity indicators?’ before and after the online knowledge exchange event for WP3.

Slido was also used to facilitate word-cloud based participation activities. The first question explored how indicator results could be used to aid marine conservation in the future. Legislative changes and protective area planning were identified as the most important (Figure 12). The second question explored the importance of seagrass, with a wide range of responses being submitted (Figure 13).

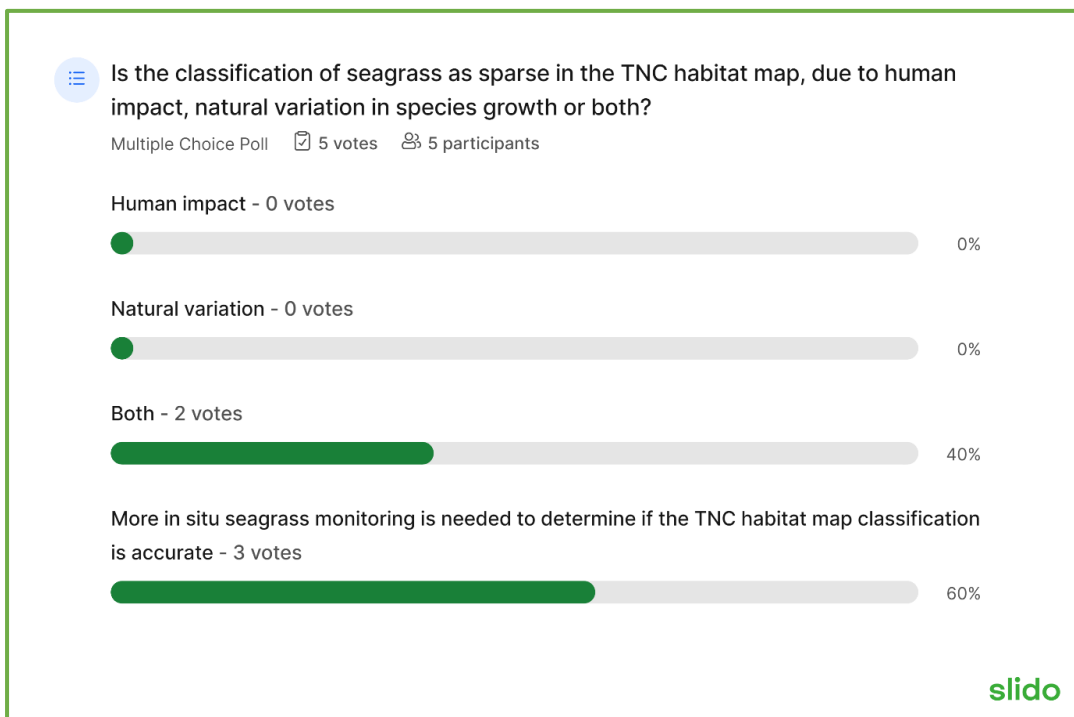


**Figure 12.** Interactive activity: word cloud of how indicator results can be used in the TCI to aid marine conservation in the future: 17 responses were submitted by 6 participants.



**Figure 13.** Interactive activity: word cloud of why seagrass is important: 27 responses were submitted by 6 participants.

In the final interactive activity, participants answered a question about reasons for the classification of seagrass as sparse in The Nature Conservancy (TNC) habitat map. The majority of participants thought that more in situ seagrass monitoring was needed to determine if the habitat map classification is accurate (Figure 14).



**Figure 14.** Participant responses to the question ‘Is the classification of seagrass as sparse in the TNC habitat map due to human impact, natural variation, species growth or both?’

#### 4.3.3.2 In-person

In the interactive discussions, seagrass was identified as being an important habitat because it provides many ecosystem services including, carbon storage, nutrient cycling, and providing a habitat for other species. Knowing about the extent and condition of seagrass was identified as being important for the following reasons; tracking change, monitoring environmental pressures, informing conservation planning, to improve modelling and to understand ecosystem service provision.

During discussions around which elements of the marine environment workshop participants would most like to measure, biodiversity was identified as the top priority, closely followed by water quality. Tracking the health of biodiversity was considered a top priority because of its links to understanding ecosystem service provision and its importance in identifying changes in the environment. Water quality was a priority because of its effect on many other aspects of the environment (e.g. vegetation growth).

Seagrass, corals and mangroves were identified as habitats that participants would most like to measure the condition of, with a desire to measure a range of different aspects such as density, diversity, carbon stores, fish biomass and water quality.

The need to ground-truth The Nature Conservancy benthic habitat map to understand the distribution of seagrass was also discussed.

The number of workshop attendees fluctuated slightly through the day depending on people's availability but was approximately fourteen participants.

#### 4.3.4 Next Steps

Some of the discussions held during the WP3 online and in-person workshops have helped to shape some of the recommendations and options for future indicator development. Next steps and areas for future work are discussed in more detail in the WP3 reports, and are summarised as:

- Updated, adequately ground-truthed habitat maps.
- Further development and testing of the pilot approach for measuring seagrass extent.
- Improved knowledge on seagrass bed density, species composition and condition.
- Discussions around how a seagrass condition indicator can be further developed in the future.
- Discussions around priorities for future indicator development.

## 5 Community Engagement (Work Package 4)

### 5.1 Introduction

The community engagement aspect of Work Package 4 (WP4) aimed to engage wider audiences in the project and the value of marine management tools being developed to manage the marine environment, as well as increase public awareness and appreciation of the services provided by the coastal and marine environment. Discussions with DECR identified that targeting youth groups would be the most effective means of engagement, as often general community meetings are not well attended and targeting youth groups allows empowerment of the next generation. The agenda for the community engagement events is provided in Appendix 4.

Additionally, two other community engagement events took place in which the project topic and purpose was introduced through existing events, an Environmental Awards ceremony delivered with DECR, and a hybrid online/in-person presentation through DECR's 'nature school.' These events target more environmentally engaged individuals, with a prevalence towards the waters sports sector.

### 5.2 Knowledge Exchange Activities

#### 5.2.1 Youth engagement

Three youth engagement sessions were delivered across different islands (see Appendix 4 for agenda). The sessions were held at Eliza Simons Primary School on Grand Turk (23 children), Providenciales Youth Centre (12 children), and Charles Hubert James Primary School on North Caicos (19 children). Each session started with a brief discussion about what activities the children enjoyed doing in nature, what habitats the children could name, and why nature is important to gauge the group's current understanding (Figure 15). The session ended with a similar discussion, testing the understanding of the children following each activity.

The youth engagement activities consisted of three games to introduce key concepts of the DPLUS119 project, including resource management, habitat mapping techniques, and ecosystem services and natural capital.

- a) For the common good (introduction to the 'Tragedy of the Commons' concept)
  - Students are able to take a shared resource, buttons, ("fish") from a central pot with the aim of collecting them and earning a reward (sweets). If everyone takes freely, they experience the "tragedy" of running out of their shared resource after a single round. Any buttons that remain after a round, is doubled for the next round.
  - They play again after discussing a strategy and work together to ensure enough resource remains to allow everyone to collect enough buttons for their reward.
  - Students learn that by setting rules for the group and working together, they can have a plentiful resource and enjoy the reward
- b) Marine habitat mapping
  - One student is the 'satellite', who uses a 'satellite image' to report the habitat types surrounding the island back to the other student (the 'scientist'), who draws a 'modelled' map of marine habitat types.



- c) Ecosystem Services Codebreakers
  - Students break a code of symbols, using the hidden ecosystem services clues around the room to reveal key marine ecosystems in the TCI. This is followed by a discussion about ecosystem services, and an introduction to the value of nature.



**Figure 15.** Youth engagement activities undertaken as part of the DPLUS119 Knowledge Exchange events on TCI.

### 5.2.2 Environmental awards

DECR held a mixer to recognise those who promote environmental stewardship and initiate positive change through education and action across the TCI (Figure 16). As part of this, JNCC presented a summary of key findings of the three technical work packages (WP1–3), highlighting the application of the tools delivered for sustainable marine management, and WP5, highlighting the importance of information management to support these tools. Maps used in the workshops were displayed, and attendees were able to discuss the project with the work package leads following the presentations.



**Figure 16.** SAERI, JNCC & DECR DPLUS119 team at evening exposition of the project to DECR contributors and supporters (left image © JNCC; right image © DECR).

### 5.2.3 Nature School

DECR hold ‘nature school’ on the last Thursday of every month. Targeted at local tour operators, but open to all the TCI population, nature school is a free, voluntary opportunity to increase understanding about biodiversity and vital ecosystems of TCI and the wider Caribbean region. The sessions are hosted in person in Providenciales, and online for participants to join from other islands allowing engagement of a wider audience.

A summary of the project and key findings was presented at nature school on Thursday 29 June 2023, allowing time for questions from attendees at the end. The session was recorded and will be shared with participants for future reference.

## 5.3 Key Findings

### 5.3.1 Youth Engagement

In each session, children responded to the discussion questions before the activities more generally and with some prompting required. After the activities, children responded more readily providing concepts that had been covered in the activities and some new ideas of their own. In general, understanding of the marine environment was relatively high in each youth engagement session, with levels of understanding appearing to be highest in North Caicos. In feedback provided to DECR, the sessions were described as informative and fun. Examples of some answers provided pre-and post-activities are detailed below:

Pre-activity questions and examples of answers given:

- What is your favourite thing to do in nature?
  - Going to the beach
  - Swimming
  - See friends
  - Go to the park
- Why is nature important?
  - Looks nice
- What different environments do you see on \*insert island\*?
  - The sea, the beach, the land, seaweed



Post-activity questions and examples of answers given:

- How do scientists get information about different environments to make their maps
  - Satellites
- How do we make sure there is plenty of fish left for everyone?
  - Do not take all the fish at once
  - Allow time for them to multiply
  - Do not take more than you need
- Can you name something good that mangroves do for us?
  - Provide protection from storms
  - Provides oxygen to breath
- Can you tell us three other habitats you might find in TCI?
  - Sand, sea grass, coral reefs
- Why do you like nature? What does nature provide?
  - Inspiration
  - Natural beauty
  - Art
  - Sport
  - Food

### 5.3.2 Environmental Awards and Nature School

The environmental awards were attended by approximately 25 people invited to the awards ceremony to recognise positive action for the environment from members of the community and particularly the water sports sector. Therefore, this event mainly targeted an audience with an existing interest in the environment. The mixer provided the opportunity for the public to understand how the project could link to existing environmental efforts in the marine space and attendees took the opportunity to discuss their thoughts with the Work Package Leads at the mixer. Positive feedback was provided to DECR, with attendees excited to hear about what DECR is doing to further conservation in the TCI. Follow-up questions were received about natural capital and the positive value that mapping adds to decision making.

### 5.3.3 Nature School

Nature school was attended in-person by one individual who was very engaged, providing insights and having a conversation post-session. Six people attended online, and the event received positive feedback. Nature School has a good reputation for enabling environmental education and awareness, targeted at adult audiences, in short convenient bites that is widely accessible due to the online option, allowing this engagement event to reach a broader audience.

### 5.3.4 Findings for maximising engagement

Targeting the 'next generation' of the TCI community, and individuals who are already 'environmentally minded' can result in higher levels of engagement, due to 'engagement fatigue' across the wider TCI community and limited time or interest to attend events.

It was recognised that visiting as many of the islands as possible across the TCI would reach the largest possible audience and that this is important to be provide opportunities across the TCI. Although due to the limited duration of the on-island visit meant that not all islands were able to be visited, engagement visits took place on Grand Turk, Providenciales, North Caicos and online (through Nature School).

## 6 Data Management (Work Package 5)

### 6.1 Introduction

The objective of Work Package (WP5) was to bring all the elements of data management together and see what could be improved to meet the requirements of the DECR. Building on this, lessons learnt and best practices from the experiences of DECR can be extended out to other Governmental departments, so that they too can make efficiencies and improve data management practices.

### 6.2 Current Data Management Practices

To get an understanding of current data management practices, a Digital and Data Solutions representative at JNCC spoke to several Directors and Deputy Directors from various departments to capture their concerns and what they would like to see in a Data Management strategy. Interestingly, their concerns and requirements broadly overlapped with common themes.

These included:

- **Data Governance:** Each department had its own way of dealing with data governance. The staff consulted identified the need for a common set of standards for collection, storage, use, and disposal of data.
- **Data Quality:** There was a risk that the data currently being used to inform department heads of decisions was not the latest or complete in some areas. Therefore, a standard system of Meta data tagging would help in this area.
- **Data Compliance:** There seemed to be some confusion about adherence to laws and regulations that govern the collection, storage, use, and disposal of data. Many staff would appreciate training in gaining knowledge of current compliance regulations and how to apply these rules to data they hold in their departments.
- **Data Access:** Many (not all) agreed that different departments held data that would be useful to other departments. A requirement for a centralized portal that could be accessed just from the internet with appropriate controls would be appreciated.
- **Data Security:** There was some concern over protection of data from unauthorized access, use, disclosure, disruption, modification, or destruction.

### 6.3 Recommendations

A [TCI Data Portal](#) already exists and is quite mature, and so this platform could be used as a mechanism to address some of the current issues and concerns that were captured. Further, there is a real opportunity to build out the portal to meet the developing needs identified when meeting with TCI Directors. Therefore, key recommendations that came out of the discussions are as follows:

- **Re-introduce TCI Data Portal:** Create a series of workshops to re-introduce the TCI Data Portal and explain what the benefits of the portal are. Even though this has been done in the past, the discussions suggested that many staff have either forgotten the portal exists or are not aware of the portal itself.
- **Capture Requirements:** Hold a workshop with Deputy Directors and Directors to further capture requirements for how the Data Portal can be developed to meet their ongoing needs. One of the objectives of the workshop is to get the departments and staff working together to understand how collaborating through one centralized data

repository can help maintain accuracy of data and reuse data that is already available, thus eliminating the need for duplicate data, thus saving costs.

- **Specialist Workshop with IT Department:** Have a specialist workshop with the IT department to build technical skills and devolve responsibility for the management and business continuity of the Data Portal to them.
- **Create Documentation for End Users:** Create documentation for end users that can be used as a reference for staff that will be using the portal emphasizing everyday activities that they may be undertaking when interacting with the portal.
- **Provide Training Session for New Incoming Data Manager:** Provide a training session for the new incoming data manager in best practice for data management principles and demonstrate how the use of the Data portal can help him to deliver standard Data Management principles.

As such, additional software or hardware is not currently the priority need for TCI. Instead, workshops and guidance development appear to be more beneficial as next steps, building on the work of the DPLUS119 project. Most of the work within the workshops would benefit from collaboration with SAERI, the builders of the portal and potential developers of it. However, the opportunity must be taken to hand over responsibility to the IT Department within TCI for ongoing development and management of the system and reduce dependency on a single supplier. Learnings from the TCI experience can also be taken into consideration and proposed to other Overseas Territories who may be having similar data-related issues.

## 7 Conclusions

The knowledge exchange events brought together key stakeholders to discuss methods, tools, and techniques developed during the project. Knowledge exchange encourages the sharing and discussion of ideas, data, experience and expertise to the mutual benefit of all participants. The discussions were well received, allowed for prioritisation of key habitats and the identification of where to focus work in the future. Key next steps highlighted across the work packages focus on ground-truthing current maps and increasing the scope of information through continued data collection and integrated data processing. Any further work would be greatly supported by improved data management systems that could be targeted specifically to the needs of the Turks and Caicos Islands.

In terms of delivery, the combination of online and in-person events worked well, with the online sessions providing a foundation on which to deliver the in-person events. Although workshop participation numbers were reasonable, future work could strive to bring in a greater number of key people, reaching a more diverse selection of stakeholders as needed. Additionally, a series of events focusing on different aspects of the wider community, particularly youth engagement, promotes the project further and introduces key marine and coastal management terminology to the 'next generation'.

## References

Britton, A., Smith, A., Pettit, L. & Vina-Herbon, C. 2021. Technical assistance programme for effective coastal-marine management in the Turks and Caicos Islands (DPLUS119). WP3: Marine indicators to monitor changes in marine-coastal natural capital – Review of indicators from the literature. *JNCC Report 693*. JNCC, Peterborough, ISSN 0963-8091.

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# Appendix 1: Online Workshops Programme and Agendas

## Online Workshops: Programme & Invitation

**Marine and Coastal Management Online Workshops**

Interested in learning how we can manage the rich and diverse waters of the Turks and Caicos Islands? Join this workshop series to find out about techniques for understanding, monitoring, and valuing marine resources, and develop the skills to apply these tools for effective marine management.

Marine and Coastal Management Online Workshop Series			
Date	Time (EDT)	Session Topic	Teams Meeting Link <small>(Download Teams   Join on the web)</small>
Thu 1 June	10:00-12:00	<b>Introduction - Sustainable marine management tools</b> <ul style="list-style-type: none"> <li>Introducing the Darwin Plus119 project and methods.</li> <li>Introducing marine pressure and sensitivity assessments.</li> </ul>	<a href="#">Click here to join the meeting</a> Meeting ID: 375 302 716 234 Passcode: 85LMSv
Fri 2 June	10:00-12:00	<b>Assessing how marine life is coping under pressure</b> <ul style="list-style-type: none"> <li>Introducing the role of marine biodiversity status and vulnerability assessments</li> </ul>	<a href="#">Click here to join the meeting</a> Meeting ID: 340 186 177 632 Passcode: iMohj8
Wed 14 June	10:00-12:00	<b>Tracking the condition of the marine environment</b> <ul style="list-style-type: none"> <li>Introducing marine biodiversity indicators.</li> </ul>	<a href="#">Click here to join the meeting</a> Meeting ID: 314 426 171 797 Passcode: 2RGAQ
Tue 20 June	10:00-12:00	<b>Mapping benefits provided by the marine environment</b> <ul style="list-style-type: none"> <li>Introducing the evidence-base and tools for mapping marine natural capital and ecosystem services.</li> </ul>	<a href="#">Click here to join the meeting</a> Meeting ID: 365 525 039 809 Passcode: TKGgWH

Hosted by the Joint Nature Conservation Committee (JNCC), TCI Government Department of Environment and Natural Resources (DECR), and the South Atlantic Environmental Research Institution (SAERI) as part of the Darwin Plus 119 project 'Technical assistance programme for effective coastal-marine management in the TCI', funded by the Darwin Initiative through UK Government funding.

## Online Workshop 1: Agenda

### 1 June 2023: Introduction – Sustainable Marine Management Tools (WP2)

## What we will cover today

- Who are JNCC
- Welcome to the workshop and introductions
- DPLUS119 project background
- Purpose of this workshop series
- Pressures and Sensitivity Assessments
- Links to Vulnerability Assessments
- Questions and close



## Online Workshop 2: Agenda

2 June 2023: Assessing how marine life is coping under pressure (WP2)

### Topics covered today

- Why worry about health of the sea
- Methods of condition assessment
- Examples from outside TCI
- How vulnerable are the 3 habitats at present?
- Examples of seagrass beds
- Moving forward ...



## Online Workshop 3: Agenda

14 June 2023: Tracking the condition of the marine environment (WP3)

### What we will cover today

- Overview of biodiversity assessments
- What is an indicator?
- Why are they important?
- How are they used?
- Some examples
- Indicator development
- Links to other work areas





## Online Workshop 4: Agenda

20 June 2023: Mapping benefits provided by the marine environment (WP1)

### Agenda

Item	Time (EDT)
Welcome and Introductions	9:30-9:40 (10 mins)
Introduction to Natural Capital and DPLUS119 WP1	9:40-9:55 (15 mins)
Project Methods	9:55-10:10 (15 mins)
Break	10:10-10:20 (10 mins)
Activity and discussion	10:20-10:35 (15 mins)
Summary and next steps	10:35-10:50 (15 mins)
<i>~wiggle room~</i>	<i>10:50-11:20 (30 mins)</i>
Final questions/comments and meeting close	11:20-11:30 (10 mins)



## Appendix 2: In-person Workshop Programme and Agendas

### In-person Knowledge Exchange Events Programme

#### Darwin Plus 119

Technical assistance programme for effective coastal-marine management in the  
Turks and Caicos Islands

#### Marine and Coastal Management Knowledge Exchange Programme

In-person Workshop and Community Engagement Sessions		
Dates	Time (EDT)	Session Topic
<b>Mon 26 June</b>	14:00 – 15:00	Meeting with Governor's Office
<b>Tue 27 June</b>	09:30 – 10:30	Welcome and introductions to the workshop
	10:00 – 12:30	Marine biodiversity status and the role of vulnerability assessments (WP2)
	12:30 – 13:30	Lunch
	13:30 – 14:30	Marine biodiversity status and the role of vulnerability assessments (WP2)
	09:30 – 11:30	Youth engagement Grand Turk
<b>Wed 28 June</b>	09:30 – 12:30	Marine biodiversity indicators (WP3)
	12:30 – 13:30	Lunch
	13:30 – 14:30	Marine biodiversity indicators (WP3)
	17:30 – 19:30	DECR Environmental Awards Mixer
<b>Thu 29 June</b>	09:30 – 12:30	Marine natural capital evidence base and tools (WP1)
	12:30 – 13:30	Lunch
	13:30 – 14:30	Workshop wrap-up
	15:30 – 17:30	Youth engagement Providenciales
	17:00 – 18:00	Nature School
<b>Fri 30 June</b>	10:00 – 11:00	Youth engagement North Caicos
<b>Tue 4 July</b>	13:00 – 14:00	Meeting with Premier's Office



## In-person Workshop Programme & Invitation

Are you interested in new sustainable management tools developed for key habitats in the waters surrounding the Turks and Caicos Islands? If so, join us for the:

### Marine and Coastal Management Workshop


Date	Topic	Programme
27 June	<b>Assessing how marine life is coping under pressure</b> - Marine biodiversity status and vulnerability assessments.	
28 June	<b>Tracking the condition of the marine environment</b> - Marine biodiversity indicators.	
29 June	<b>Mapping benefits provided by the marine environment</b> - The evidence-base and tools for mapping marine natural capital and ecosystem services.	

#### Key Information

**What?** These interactive workshops will deliver skills-based training on the development of sustainable marine management tools for TCI and how to apply or expand these in practice.

**When?** Tue 27, Wed 28, Thu 29 June 2023  
09:30 – 14:30 (EST), lunch provided

**Where?** DECR Conference Room,  
National Environmental Centre,  
Lower Bight Road, Providenciales.



Hosted by the Joint Nature Conservation Committee (JNCC), TCI Government Department of Environment and Natural Resources (DECR), and the South Atlantic Environmental Research Institution (SAERI) as part of the Darwin Plus 119 project 'Technical assistance programme for effective coastal-marine management in the TCI', funded by the Darwin Initiative through UK Government funding.

## In-person Workshop: Day 1 Agenda

### 27 June 2023: Assessing how marine life is coping under pressure (WP2)

#### Topics covered today

- Why worry about health of the sea
- What are risks of poor sea health
- Links to Marine Spatial Planning
- Examples from outside TCI
- Methods of condition assessment
- How sensitive are habitats to pressures?
- How vulnerable are they at present?
- Examples of seagrass beds
- Moving forward ...



## In-person Workshop: Day 2 Agenda

28 June 2023: Tracking the condition of the marine environment (WP3)

### What we will cover today

- Aims
- Introduction to marine biodiversity indicators
- Work conducted on marine biodiversity indicators under the Darwin Plus project.
- The importance of seagrass
- Measuring ecosystem health
- Habitats of interest
- Summary



## In-person Workshop: Day 3 Agenda

29 June 2023: Mapping benefits provided by the marine environment (WP1)

### Agenda

Item	Time
Welcome, Introductions and Icebreaker	9:30-9:45
Introduction to Natural Capital, DPLUS119 WP1	9:45-10:30
Examples	10:30-11:15
Break	11:15-11:30
Discussion and next steps	11:30-12:30
Lunch	12:30-13:30
Wrap-up	13:30-14:30
Meeting close	14:30



## Appendix 3: Participant Lists for Technical Workshops

**Table 1.** The total number of attendees and TCI government departments or external organisations that attended the Marine and Coastal Management Workshops, including both virtual and in-person sessions. The ‘total attendees’ number does not include JNCC staff.

<b>Workshop Session</b>	<b>Total attendees</b>	<b>Organisations in attendance</b> (number of attendees)
<b>Online 1</b> Introduction – Sustainable Marine Management Tools	<b>22</b>	Department of Environment and Coastal Resources (11) SAERI (3) Maritime Department (3) Department of Fisheries and Marine Resources Management (2) Department of Disaster Management and Emergencies (1) Eftec (1) TCI government - department not specified (1)
<b>Online 2</b> Assessing how marine life is coping under pressure	<b>20</b>	Department of Environment and Coastal Resources (6) Department of Fisheries and Marine Resources Management (4) Department of Disaster Management and Emergencies (2) SAERI (2) Maritime Department (1) TCI government – department not specified (3) Not stated (2)
<b>Online 3</b> Tracking the condition of the marine environment	<b>9</b>	Department of Environment and Coastal Resources (6) SAERI (1) Eftec (1) Turks and Caicos Reef Fund (1)
<b>Online 4</b> Tracking the condition of the marine environment	<b>9</b>	Department of Environment and Coastal Resources (4) SAERI (2) Eftec (2) Turks and Caicos Reef Fund (1)
<b>In-person</b> Marine and coastal management workshop	<b>~10</b>	Department of Environment and Coastal Resources Department of Fisheries and Marine Resources Management Department of Disaster Management and Emergencies Turks and Caicos Reef Fund

## Appendix 4: Youth Engagement Schedule



### DPLUS119 Knowledge Exchange, Youth Engagement schedule

27<sup>th</sup> – 30<sup>th</sup> June 2023

Sessions:

1x Grand Turk (27<sup>th</sup> June, 9.30-11.30am)

1x Providenciales (29<sup>th</sup> June, 3.30-5.30pm)

1x North Caicos (30<sup>th</sup> June, time 10am-11am)

#### 1. Intro (10–15 mins)

Questions to prompt discussion on environment, e.g.

- What is your favourite thing to do in nature?
- Why is nature important?
- What different environments do you see on \*insert island\*?
- [prompt: what about those you don't see, in the ocean?]
- What activities take place in \*insert environment\*?

#### 2. Activities (20 mins per activity)

- A. For the Common Good
- B. Marine Habitat Mapping
- C. Ecosystem Services Codebreakers

#### 3. Quiz (10–15 mins)

Testing of understanding based on the activity themes

- How do scientists get information about different environments to make their maps?
- How do we make sure there is plenty of fish left for everyone?
- Can you name something good that mangroves do for us?
- Can you tell us three other habitats you might find in TCI?
- Why do you like nature?