

South Florida/Caribbean Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure CR24

iPad Preparation, Data Entry, and Download —Version 1.0

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Summary

The purpose of this SOP is to describe the preparation of the iPad and iDive for data collection, the steps for using the iPad in the field, and the steps taken to download and secure the files after data collection. The iPad and iDive are vulnerable to damage from flooding, or shock (by dropping or banging in a boat). They need to be treated with similar care as any sensitive electronic equipment or camera.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
2020	Jeff Miller Judd Patterson Mario Londoño	Detailed SOP written with current technology and software used.	Reflects iPad and iDive as the primary data collection device.	1.0

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Introduction

The primary method of collecting data on urchins (SOP CR02 *Counting long-spined sea urchin, *Diadema antillarum*, on coral reefs—Version 2.1*; SFCN 2025a), coral disease (SOP CR03 *Measuring coral disease—Version 2.1*; SFCN 2025b), coral colony counts (SOP CR04 *Conducting coral colony count—Version 2.1*; SFCN 2025c), coral species list (SOP CR05 *Collecting coral species diversity data on benthic transect—Version 2.1*; SFCN 2025d) and rugosity (SOP CR06 *Measuring rugosity on coral reefs—Version 2.1*; SFCN 2025e) is through a field database loaded onto an iPad. After initial preparations the iPad is loaded into the iDive for use underwater. A clipboard and camera are taken as backup equipment during the dive in case of iPad or iDive failure.

Data Collection App

The data collection app used is FileMaker Go, which runs a FileMaker Pro database that was designed on a desktop computer. The database has three major layouts:

1. Coral Switchboard – this holds general details about the date, park, site, and observer
2. Disease – this holds coral disease lesion information including the colony number, lesion letter, location along the transect, size and type of disease lesion, and a photograph.
3. Coral Species List – this allows the user to press “buttons” labeled with 4-letter coral species codes to signify their presence on the transect. The coral species are split onto two tabs. Both are presented in alphabetical order, but the most common species are on the first screen. The bottom of the screen also has a place for recording the *Diadema* urchin count, rugosity value (length of chain), and coral colony counts by both observers (as well as observers initials).

Overview of Steps

The iPad is loaded with the latest FileMaker Pro data collection database by connecting the iPad to iTunes through a computer. Collected data are offloaded after a day of diving for off-iPad storage, and long-term storage after monitoring is complete. This file is named and stored in the appropriate location on the server where it is reviewed by Data Management, QC'd by the diver collecting the data, and eventually integrated into the IRMA database.

iDive Housing

The iDive is attached to a low-pressure inflator hose off the diver's first stage. This is a second low-pressure hose and is not the LP hose used for BCD inflation. **Note: This hose needs to be connected prior to entry into the water to avoid flooding the iPad.** Using the iDive inflator button, the diver will add small amounts of air into the iDive case therefore allowing the touch screen to operate. The iDive manufacturer suggests the following:

Unless you are linking to Bluetooth or Wi-Fi enabled accessories, we recommend that you switch the iPad to airplane mode while underwater to maximize battery life. Airplane Mode can be activated in Settings and is the top setting on the left side of the screen. Note that you can activate Airplane Mode and then individually activate Bluetooth or Wi-Fi (located directly underneath the Airplane Mode panel).

Assistive Touch is a system feature built into all iPads and iPhones. It allows you to control all buttons via the touchscreen. This is very helpful in some situations: for example, if you want to adjust volume or turn the screen off while underwater with the iDive Housing. It also allows you to make multi-finger gestures on the iPad using a single finger. This is particularly useful if using thick gloves. To activate Assistive Touch, go to Settings -> Accessibility -> Assistive Touch.

Equipment

- iPad with working (if not most-recent) version of iTunes (please be sure to be familiar with the latest password required to get on this field device)
- iDive with low pressure inflator hose and 4 corner bumpers to secure the iPad
- Screw in 32mm corrective red filter for the iDive bezel lens port
- USB-C charging cable and power adapter
- Laptop computer

Preparations

Preparing the iPad

1. Using the USB cable, connect the iPad to the computer. iTunes should open when the iPad is detected by the computer. If not, open iTunes from the Start menu.
2. Within iTunes click on the small iPad icon. This icon is displayed near the top of the screen immediately below the Controls menu (Figure 1). The icon is also indicated by the yellow arrow in the image below. Clicking this icon will display the contents of the iPad in the left display column.

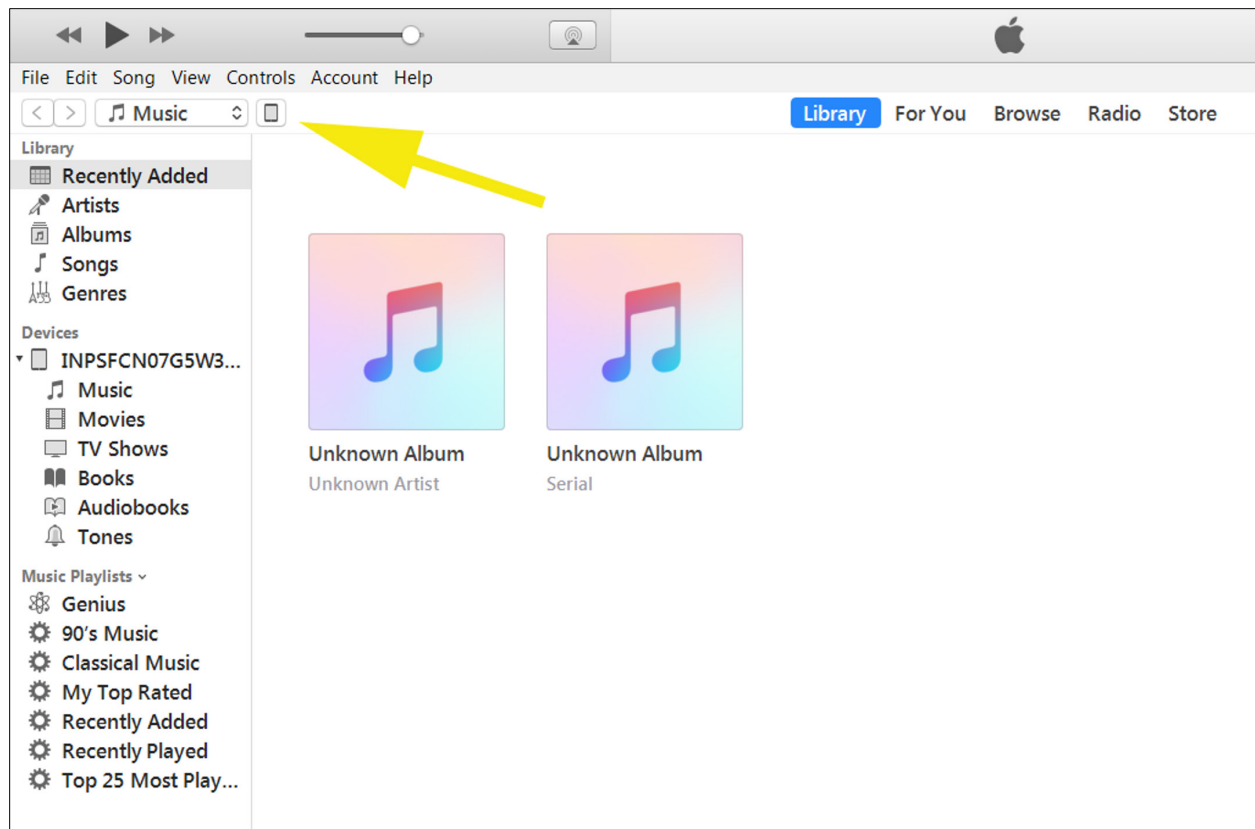


Figure 1. Screen capture showing iTunes icon to connect with iPad.

3. Select the File Sharing option on the left side of the display under the iPad settings. The FileMaker Go app is circled (Figure 2).

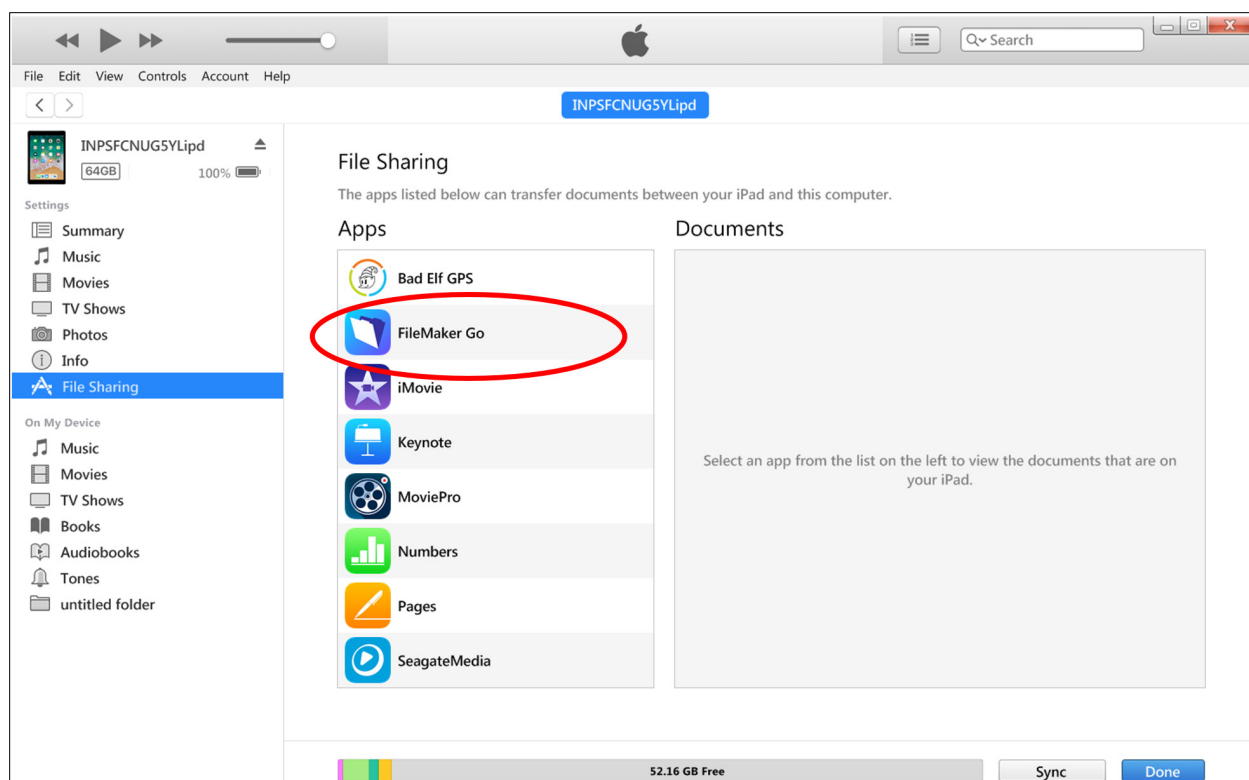


Figure 2. Screen capture showing iTunes file sharing display and FileMakerGo app (circled).

4. Select FileMaker Go from the list of Apps.

Loading the Database

This is done prior to monitoring activities to ensure that an empty copy of the latest FileMaker Pro database is loaded into FileMaker Go. The latest data collection database is an *.fmp12 file, stored at:

X:\SFCN\Vital_Signs\Marine_benthic_communities\CoralMonitoring\data\iPad\development\Coral_Combined_vX.XX.fmp12

1. Turn on the iPad by pressing and releasing the small power button on the top-right.
2. If prompted, enter the password
3. Connect the iPad to a computer, following steps 1-4 in section 'Accessing FileMaker Go App through iTunes' to navigate to FileMaker Go in iTunes.
4. If a previous version of the database is already on the iPad, it will need to be downloaded and deleted before a new version can be added. Extreme care must be taken to ensure that these download steps ('Downloading Collected Data' section below) have been followed prior to file deletion. There is no way to recover a deleted iPad database! If this is a new iPad, and no previous database exists, then skip to step 5.

- a. Select the file
 - b. Press the delete key on your keyboard
 - c. Select Sync from iTunes
 - d. This process will delete the data collection app file and all previous monitoring data from the iPad. This allows for a “clean slate” for the subsequent monitoring and data collection.
5. Upload the blank FileMaker Go data collection file/app.
 - a. In iTunes, select Add File
 - b. Navigate to the location of the blank file
 - c. Select OK
 - d. Select Sync from iTunes. Allow the blue bar representing the transfer progress to complete. This will load the blank file into the iPad.

Securing the iPad inside the iDive

1. Charge the iPad.
2. Assure the screen orientation is locked in the landscape view with the camera located on the back upper left.
 - a. If the screen doesn't change orientation when you move the iPad, it is locked. Also check by observing  in the upper right of the display (next to the battery symbol).
 - b. If the screen rotation is **not** locked, swipe down from the upper right corner to enter the control center. Tap the . This symbol will also appear in the status bar.
3. Thoroughly clean the iPad screen with a soft lint-free cloth.
4. Thoroughly clean the iDive O-rings and both sides of the soft plastic cover. Pay attention to the inside of the soft plastic that touches the iPad screen when it is depressed. Thorough cleaning of this feature will allow the iPad to function better through the case.
5. Insert the iDive corner bumpers in their proper orientation. Assure the camera lens is aligned with the lens opening of the iDive.
6. Close the iDive case over the housing and secure the four latches (Figure 3).



Figure 3. Preparing to load the iPad in the iDive.

7. Attach the low-pressure inflator hose to the first stage of an air source for the diver using the iDive.
8. Before entering the water, attach the low-pressure inflator hose to the iDive inflator valve. Test inflate the iDive.
9. Turn on the iPad, and enter the password to assure data can be entered.

Data Entry

Initial Data Entry for a monitoring event or site

Prior to entering disease or species data for a monitoring event, site level data are entered on the Coral Switchboard (Figure 4) including the park, site, date, what data will be collected, and by whom.

1. On the iPad select the FileMaker Go app.

2. Navigate to the Coral Switchboard screen and enter the requested information for:
 - a. Date
 - b. Park
 - c. Site
 - d. Observer
 - e. Purpose
 - f. Rugosity (Is this data being collected? Enter Yes or No)
 - g. *Note: the Lock button on the switchboard will prevent any other buttons from being pressed until unlocked (Figure 4).*
3. From this point data on either Disease or Species List/CDR survey can be entered.

5:19 PM Thu Apr 16 Coral_Combined_v1.92

National Park Service
Inventory and Monitoring Program
South Florida/Caribbean Network

Coral Switchboard
v1.92 (last updated 1/10/2020)

Lock

Date: 2/4/2020 (Today's Date)

Park: BUIS

Site: SFR

Observer: Miller, William

Purpose: Annual

Rugosity: YES

Create Disease Survey **Create Species List & CDR Survey**

Disease Lesions **Edit** **Summary**

Date	Transect	Site	Count
2/4/2020	1	SFR	1
2/4/2020	2	SFR	2
2/4/2020	2	SFR	2
2/4/2020	3	SFR	1
2/4/2020	4	SFR	1

Species Lists & CDR **Edit** **Summary**

Date	Transect	Site
2/4/2020	1	SFR
2/4/2020	10	SFR
2/4/2020	11	SFR
2/4/2020	12	SFR
2/4/2020	13	SFR

Figure 4. Screen capture showing Coral Switchboard home page.

Species List/CDR survey Data Entry

From the Coral Switchboard the data observer will navigate to the coral species data entry page where buttons labeled with the 4-letter species code will be activated to signify their presence in the transect. A bright green indicates present, and a red indicates absent from the transect. Tapping a button will toggle it between the two colors.

Additional information on *Diadema*, coral colony counts, and rugosity (if collected) are entered here. Divers need to be cautious that this screen is active. A button may be “pressed” by inadvertently bumping the iDive screen signifying an observation that isn’t accurate. Divers are encouraged to use the “lock” button to protect the data entry screen from accidental data entries.

1. Navigate to the Coral species list, data entry screen
2. Assess that the screen is reflecting the site name accurately
3. Enter the transect number
4. Depress the button labeled with the coral species that reflects an observation within the transect 10×2 meter (32.8×6.6 feet [ft]) belt (button will turn from red to green)
5. Colony count numbers, 2nd observer name and count, and *Diadema* numbers are also entered here
6. When data entry for this transect is complete, press the blue-shaded button “New Transect” (Figure 6) to move to the next transect for Species List/CDR data entry
7. Also note the location of the “Return to Switchboard” button (Figure 5). Use this button to:
 - a. Reach the lock button which can help limit inadvertent data entry/edits.
 - b. Navigate to the Coral Disease data entry screen.

5:20 PM Thu Apr 16 Coral_Combined_v1.92

Transect 6 Park BUIS Site SFR Date 2/4/2020 Observer Miller, William Purpose Annual

Species List Page 1 Species List Page 2 Return To Switchboard

ACER Acropora cervicornis	CNAT Colpophyllia natans	FFRA Favia fragum	MANG Mussa angulosa	MDEC Madracis decactis	OFAV Orbicella faveolata	PFUR Porites furcata	SINT Stephanocoenia intersepta
AFRA Agaricia fragilis	DCYL Dendrogyra cylindrus	HCUC Helioseris cucullata	MARE Manicina areolata	MFER Mycetophyllia ferox	OFRA Orbicella franksi	PPOR Porites porites	SRAD Siderastrea radians
AGAR Agaricia species	DLAB Diploria labyrinthiformis	ISIN Isophyllia sinuosa	MAUR Madracis auretenra	MLAM Mycetophyllia lamarckiana	ORBI Orbicella complex	PSTR Pseudodiploria strigosa	SSID Siderastrea siderea
ALAM Agaricia lamarcki	DSTO Dichocoenia stokesii	MALC Millepora alaicornis	MCAV Montastraea cavernosa	MMEA Meandrina meandrites	PAST Porites astreoides	SBOU Solenastrea boumoui	UAGA Undaria agaricites
APAL Acropora palmata	EFAS Eusmilia fastigiata	MALI Mycetophyllia aliciae	MCOM Millepora complanata	OANN Orbicella annularis	PCLI Pseudodiploria clivosa	SCOL Scolymia species	Notes

Stony Coral Count 72 2nd Observer Richter, Lee 2nd Stony Count 78

Diadema +1 Diadema -1 0 Rugosity (m) 15.05

Previous + New Transect Next

Figure 5. Screen capture showing the location of the “Return to Switchboard” and “+ new Transect” buttons on the coral species list page.

Disease Data Entry

From the Coral Switchboard, the data observer will navigate to the coral disease data entry page where data are entered, and photos can be taken. All data are filled in on this screen for each lesion, even if there are multiple lesions per colony. There are buttons that auto-fill previous information to expedite this process (Figure 6).

Divers need to be cautious that this screen is active. A button may be “pressed” by inadvertently bumping the iDive screen signifying an observation that isn’t accurate. Divers are encouraged to use the “lock” button on the “Coral Switchboard” to protect from accidental data entry/edits.

5:20 PM Thu Apr 16 15%

Coral_Combined_v1.92

Date 2/4/2020 Park Code BUIS Site SFR Observer Miller, William Purpose Annual

Survey Gen Photos Dis Ref Site Map Matrix 1-10 Matrix 11-20 Return To Switchboard

Transect Number

← Previous Transect
← Previous Transect & Colony

Disease Free?

☒ no
 ☐ yes

Colony #

+ Previous Colony + 1

Colony < than 4 cm?

☒ no
 ☐ yes

Length Along Transect (m)

Distance From Transect (cm)

Coral Species

Disease Code

Length (cm)

Width (cm)

Disease Photos

Click to Add Photo

Notes

← Previous
+ New Lesion/ Transect
→ Next

< ○ > + - ↓^a_z

Figure 6. Screen capture showing the disease data entry screen.

1. Navigate to the coral disease data entry screen
2. Assess that the screen reflects the site name accurately
3. Enter the transect number
 - a. Pressing “Previous Transect” inserts the same transect number as previous. This is useful when there are multiple colonies with disease on the same transect.
 - b. Pressing “Previous Transect & Colony” inserts the same transect number, colony number as previous. This is useful when multiple lesions are on the same colony.
4. **If there is NO DISEASE on the transect, select YES under Disease Free? If you are entering disease information about a lesion, select NO.**
5. Enter the colony number. Pressing “Previous colony +1” adds the next sequential number.

6. Enter if the colony is less than 4 centimeters (1.6 inches [in]; tap yes or no).
7. Enter the location of the diseased colony/lesion along the transect.
8. Select the coral species code affected from the pull-down menu
9. Select the abbreviation of the coral disease code from the pull-down menu
 - a. If the code is for a tissue loss disease, you will be prompted to enter the length and width of the lesion.
 - b. If the disease code is for a discoloration disease, you will be prompted to enter information on the Number of blemishes, and Percent discolored.
10. Click in the white rectangle “Click to add Photo” to activate the camera and take a photo of the lesion.
11. When all data have been entered appropriately (lesion information and photo taken, or selected Disease Free, YES) select blue New Lesion/Transect button and continue with Disease data collection.
12. Also note the location of the “return to switchboard” button. Use this button to:
 - a. Use the lock button to prohibit inadvertent data entry or changes.
 - b. Navigate to the Species List/CDR data entry screen.

Data Download

Downloading the iPad

These download steps are done after each day of diving to limit the risk of data loss due to a flooded or lost iPad.

1. From the iTunes File Sharing screen click on ‘FileMaker Go.’ Under the ‘FileMaker Go Documents’ box, select the file(s) you wish to transfer to the computer. If you are trying to select more than one file, hold the shift key while clicking to select. Select the ‘Save’ button (Figure 7).

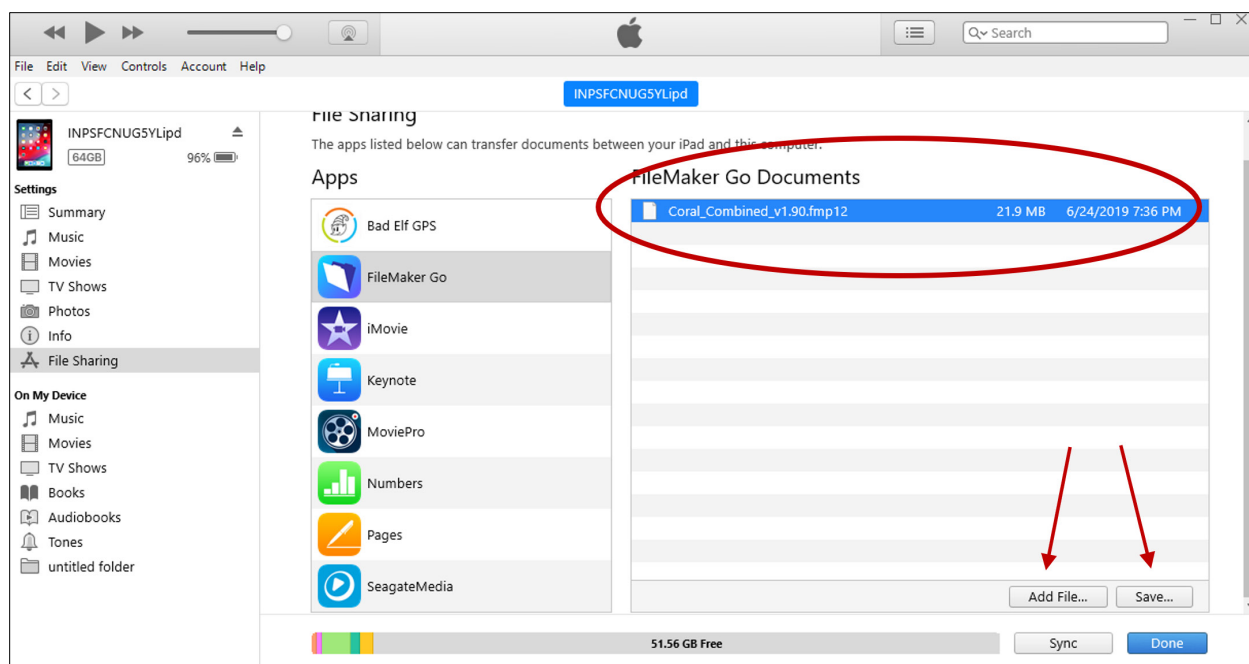


Figure 7. Screen capture showing iTunes FileMaker Go display, with Add File and Save options.

2. In the “Save” dialog box that opens, browse to the location where you want to save the selected file(s), and then press ‘Select Folder.’ The recommended saving location on the server is:

X:\SFCN\Vital_Signs\Marine_benthic_communities\CoralMonitoring\data\iPad\YEAR

3. Once the database has been saved to that location, rename the database with the following naming convention:
 - a. YYYYMMDD (based on the download date) Park Name_Original Filename.fmp12
 - b. For example: For data collected at South Fore Reef site and downloaded on February 17, 2017, the resulting file name would be 20170217_BUIS_CoralDisease_v1.2.fmp12.
4. Once the file exchange has taken place, the iPad is ready to use for the next monitoring event.

Exporting Data from the iPads

After the files have been downloaded to the server, Data Management will assist with extracting the data and photos. To do this, follow these steps:

1. Open the Filemaker Pro (*.fmp12) file with FileMaker Pro.
2. Click the “Scripts” menu and there will be four scripts with “Export” in the name.
 - a. The “Export Disease Photos” script extracts the photos one by one from the database, renames them using the available field data, and places them on the Desktop. After

extraction they need to be moved to the appropriate folder on the server:

X:\SFCN\Vital_Signs\Marine_benthic_communities\CoralMonitoring\images\disease
\PARK\XX\YYYYMM_XX

Note: Disease photos must be named following a very specific naming scheme in order to be viewed through the web application. Photos follow the format:

YYYYMM_Site_T##_dis##_##_jpg where the Site is the two or three digit site code, the digits after the “T” are for the transect (e.g. 01–20), and the final two digits are a sequential colony number. If there is more than one lesion per colony, an alpha-character is added at the end of the number (e.g a, b, c, d, etc.)

Example: 201906_LH03_T02_dis05a.jpg

- b. The three scripts with an .xlsx extension will create Excel files on the server in the same folder as the database (1 Excel file per script). These files then need to be individually opened and reviewed.
 - i. For Disease Export:
 1. Open, and resize the columns so A–I can be viewed simultaneously
 2. Select all (Ctrl + A) and turn on Filters from the Home menu
 3. Choose Custom Sort and Sort By Site, Transect, and then Colony_Num
 4. Ensure that all transects are accounted for in the file. For an index site this is transects 1–20. For extensive sites this is transects 1–4.
 5. For each line with no colony number, ensure that Transect_Disease_Free is set to ‘yes’.
 6. The lesion field must be filled in manually (with a letter...a, b, c, etc.) each time the colony number repeats on a transect.
 7. Highlight any rows/columns in yellow that look unusual so they can be reviewed by the diver.
 8. Save the file.
 - ii. For Species export:
 1. Open, and resize the columns so A–F can be viewed simultaneously
 2. Select all (Ctrl + A) and turn on Filters from the Home menu
 3. Choose Custom Sort and Sort By Site and then Transect
 4. If asked how to perform the sort choose to ‘Sort anything that looks like a number, as a number’
 5. Ensure that all transects exist. For an index site this is transects 1–20. For extensive sites this is transects 1–4
 6. Apply a conditional formatting with color coding for “Present” species to help reveal patterns in the data (completely blank rows, etc.)

7. Save the file.
- iii. For CDR export:
 1. Open, and resize the columns so A-I can be viewed simultaneously
 2. Select all (Ctrl + A) and turn on Filters from the Home menu
 3. Choose Custom Sort and Sort By Site and then Transect
 4. Ensure that all transects exist. For an index site this is transects 1–20. For extensive sites this is transects 1–4.
 5. Check for completeness, especially for transect count, diadema, stony counts (2 fields), and rugosity (collected every three or so years)
 6. When rugosity is blank, delete the rugosity observer values.
 7. Save the file.
 - c. Send the Excel files back to the person who did the data collection for review. Ideally this occurs within 1 week of data collection.
 - d. The species export needs to be imported into R for one final reformatting before it can be uploaded.
 - i. There is an R script on the server for this task:
X:\SFCN\Vital_Signs\Marine_benthic_communities\CoralMonitoring\data\iPad\iPad_SpeciesMelt_Script.R
 - ii. Once the R script is run successfully, a new melted xlsx file will appear on the server.
 - iii. The file needs to be opened, saved immediately, and then closed for the import to proceed cleanly.
 - iv. An archive folder is created to store the original Species export spreadsheet (pre-melted).
 - e. Now all three Excel files are ready to be imported into the SFCN Coral Reef Monitoring Application on IRMA (see SOP CR13 *Coral Reef Video Transect Database User's Guide—Version 3.0* [SFCN 2025f]).

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