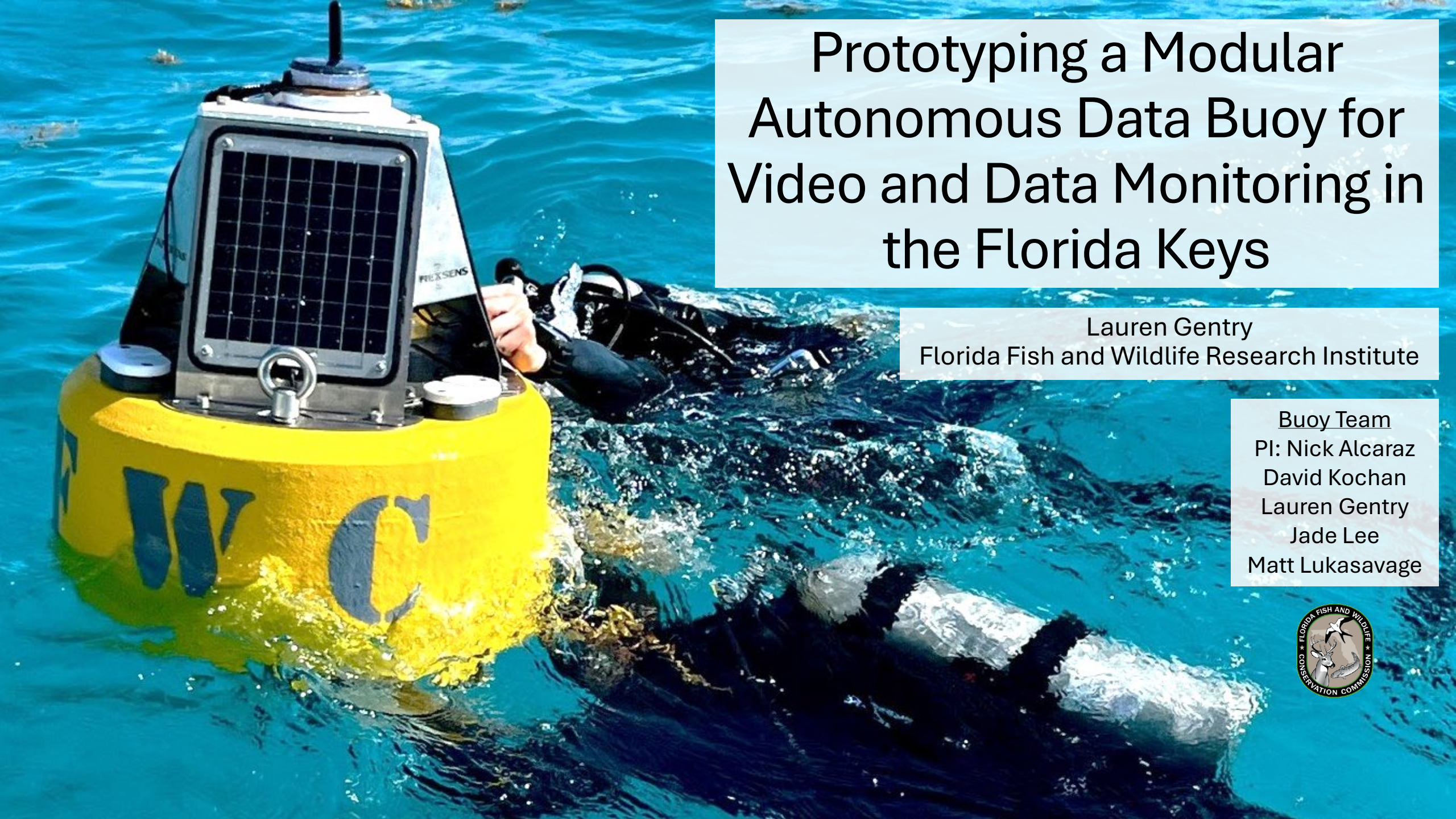




Prototyping a Modular Autonomous Data Buoy for Video and Data Monitoring in the Florida Keys

Lauren Gentry
Florida Fish and Wildlife Research Institute

Buoy Team
PI: Nick Alcaraz
David Kochan
Lauren Gentry
Jade Lee
Matt Lukasavage



Background

Coral spawning cameras at FLAQ

- Livestreamed for AI training platform

Additional idea: a multi-purpose in-situ prototype

- Problems:
 - ❖ Training data (videos) of wild coral spawning in the Keys is limited
 - ❖ Pre-made buoy systems are expensive
- DIY data buoy?

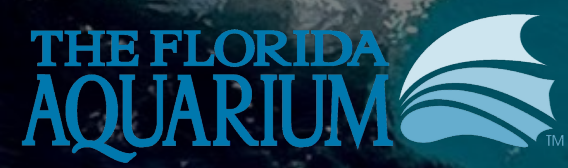
Florida Aquarium Coral Spawning Alert System

Project Methodology

An AI system for detecting coral spawning events at the Florida Aquarium.

[SIGN UP FOR ALERTS](#)

[MORE INFORMATION](#)

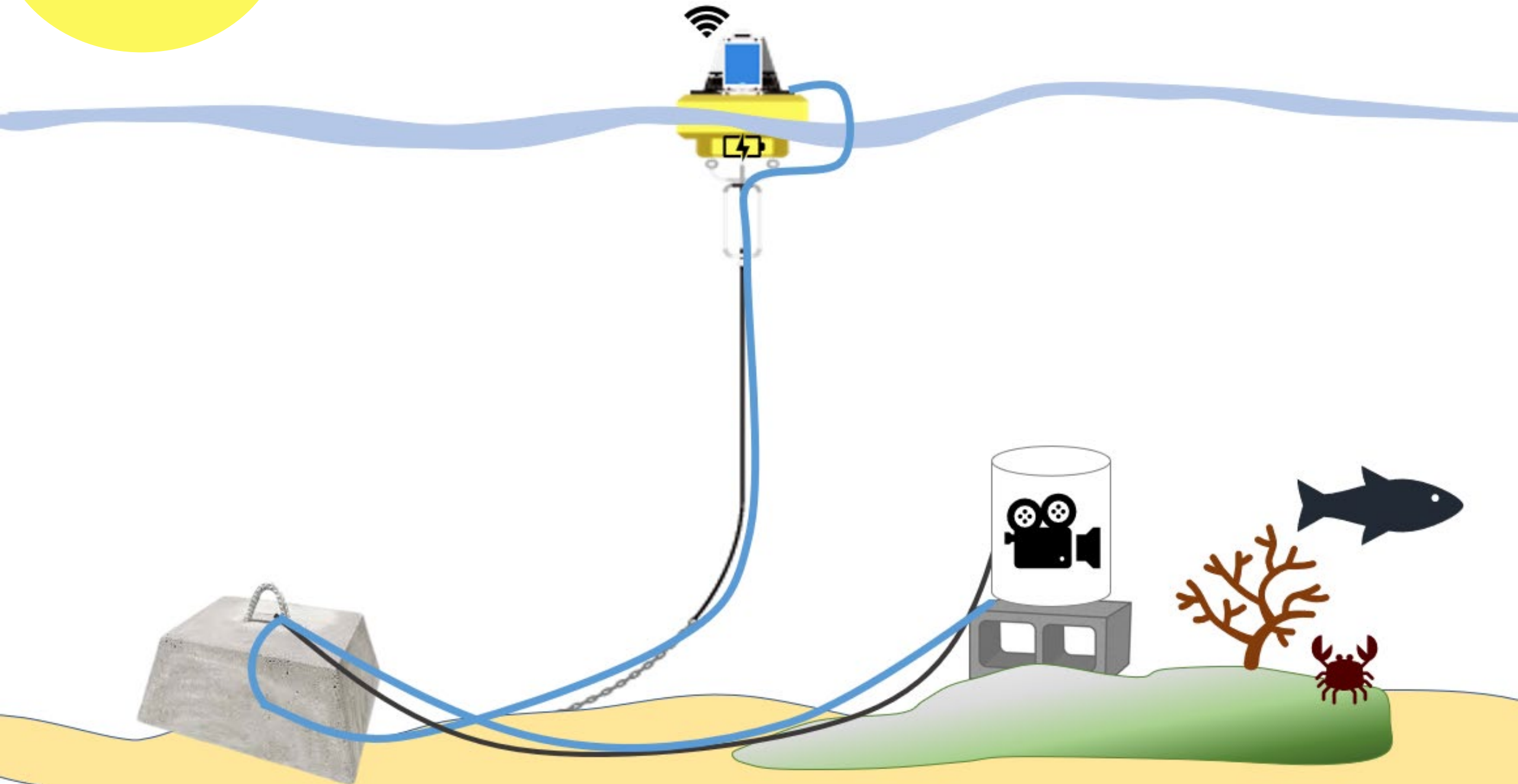


Components



How it works

*not to scale

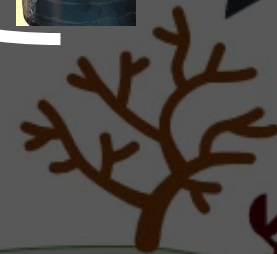
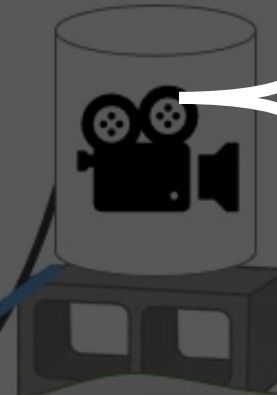
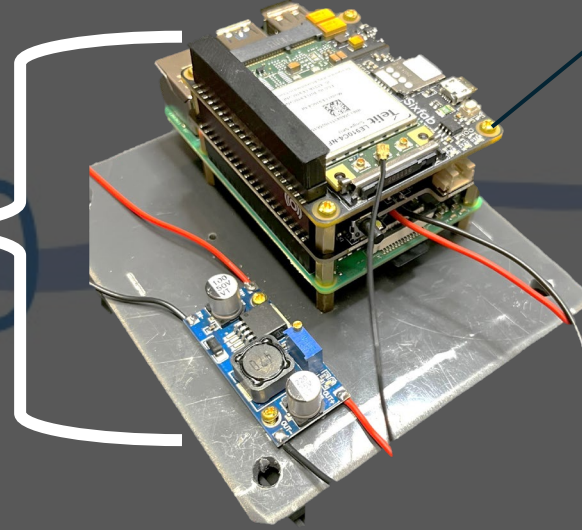
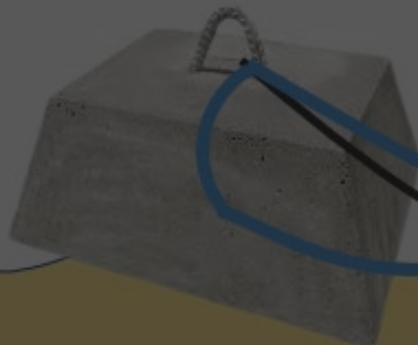


How it works

*not to scale

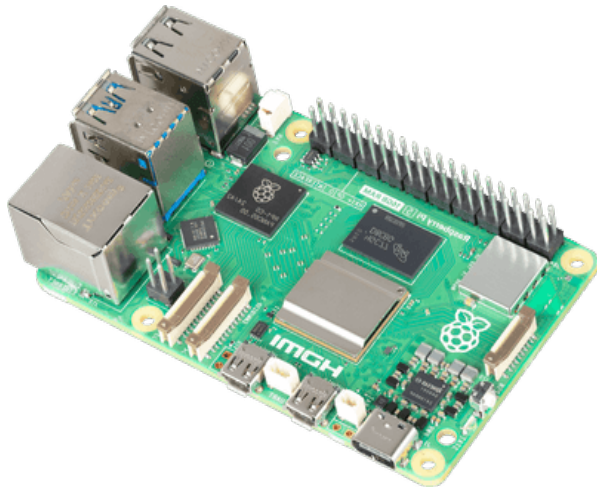
BuoyPi

CameraPi

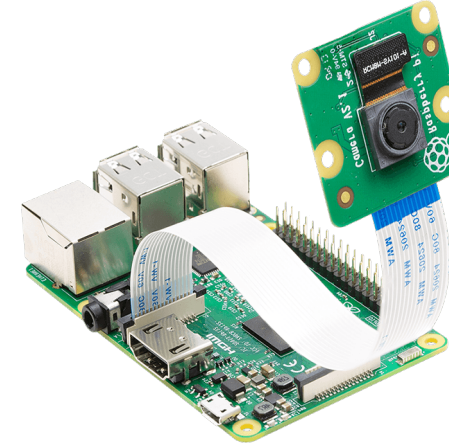


CameraPi: Parts and Programs

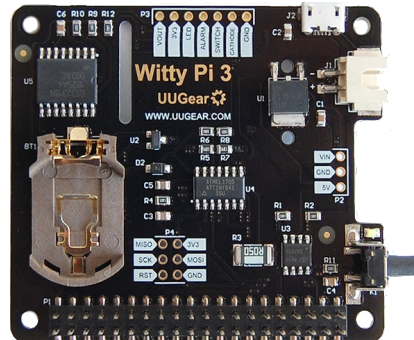
Raspberry Pi Board



Camera/Recording Program



Scheduling Board



Waterproof Tube



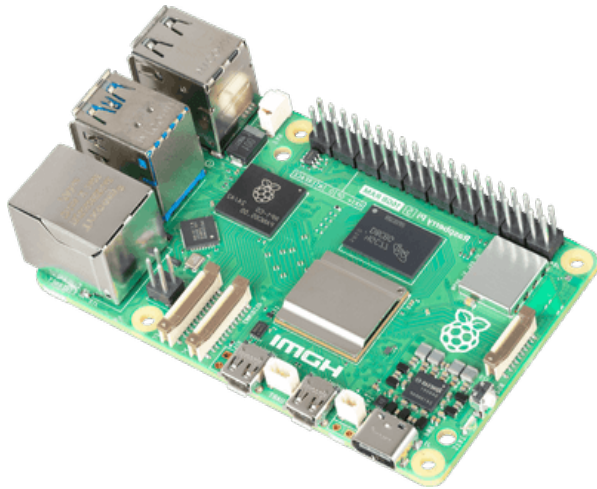
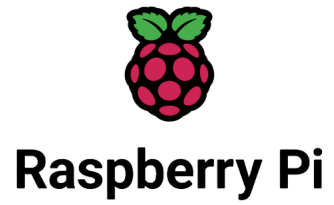
Log File with Video Pic

```
2025-05-21 09:17:49 Attempting to unmount camerapi...
2025-05-21 09:17:49 Mount point not active. Skipping unmount.
2025-05-21 09:17:49 Email part of script completed.
2025-05-21 09:18:27 38 second wait complete.
2025-05-21 09:18:27 Sync complete.
2025-05-21 09:32:26 Have slept until the end of the half hour, rebooting now
2025-05-21 09:47:49 Script started.
mount.nfs: Network is unreachable
cpi: cannot stat '/home/pi/MountedCameraPi/sharelog/run.log': No such file or directory
Could not find the host "smtp.gmail.com"
Could not send the message.
2025-05-21 09:50:16 Attempting to unmount camerapi...
2025-05-21 09:50:16 Mount point not active. Skipping unmount.
2025-05-21 09:50:16 Email part of script completed.
2025-05-21 09:50:54 38 second wait complete.
2025-05-21 09:50:54 Sync complete.
2025-05-21 10:04:53 Have slept until the end of the half hour, rebooting now
2025-05-21 10:20:40 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
2025-05-21 10:20:48 Attempting to unmount camerapi...
2025-05-21 10:20:48 Unmount successful.
2025-05-21 10:20:48 Email part of script completed.
2025-05-21 10:21:26 38 second wait complete.
2025-05-21 10:21:26 Sync complete.
2025-05-21 10:35:25 Have slept until the end of the half hour, rebooting now
2025-05-21 10:50:54 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
2025-05-21 10:51:33 Attempting to unmount camerapi...
2025-05-21 10:51:33 Unmount successful.
2025-05-21 10:51:33 Email part of script completed.
2025-05-21 10:52:11 38 second wait complete.
2025-05-21 10:52:11 Sync complete.
2025-05-21 11:06:10 Have slept until the end of the half hour, rebooting now
2025-05-21 11:21:42 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
```

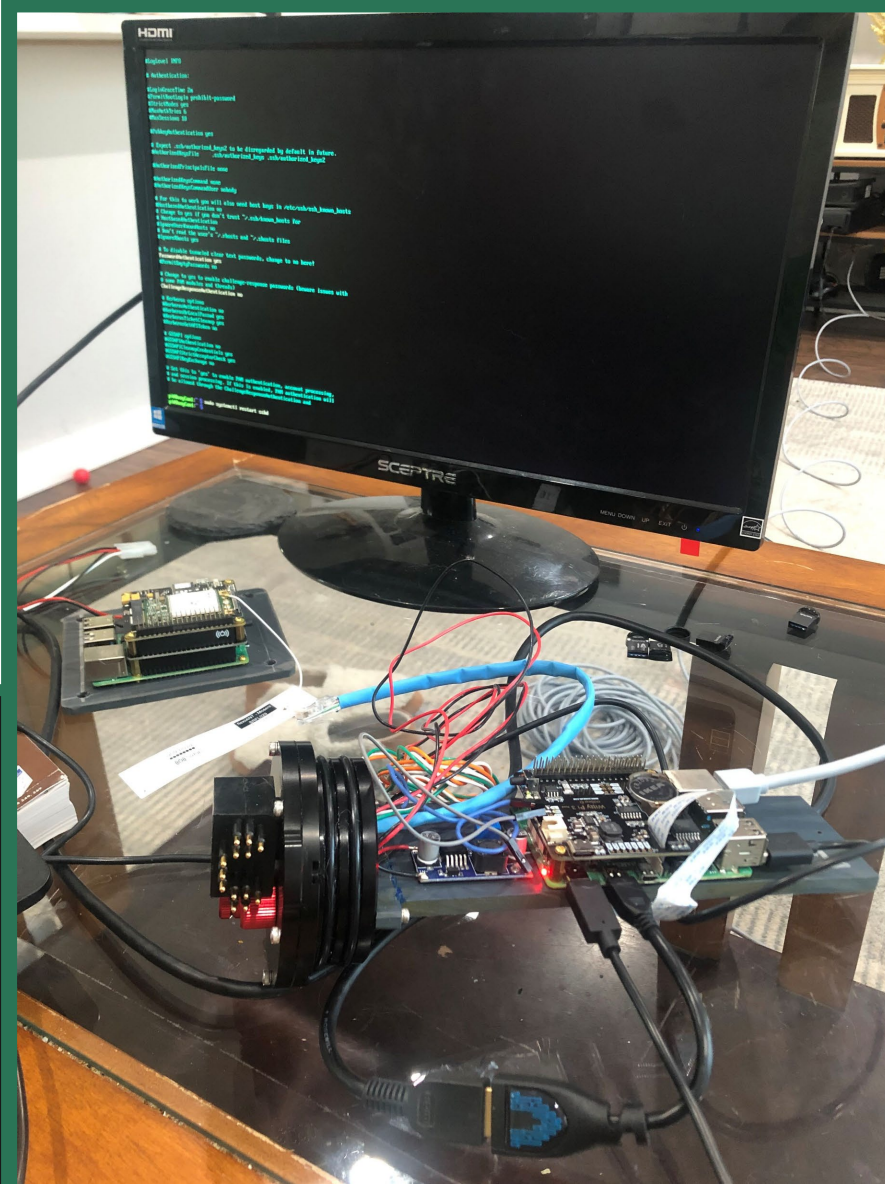
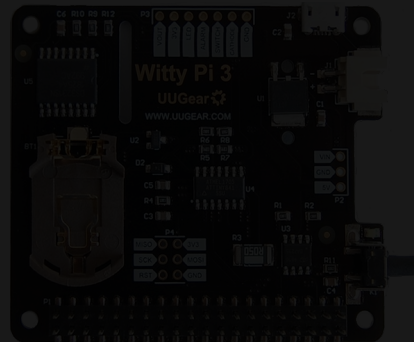


CameraPi: Parts and Programs

Raspberry Pi Board



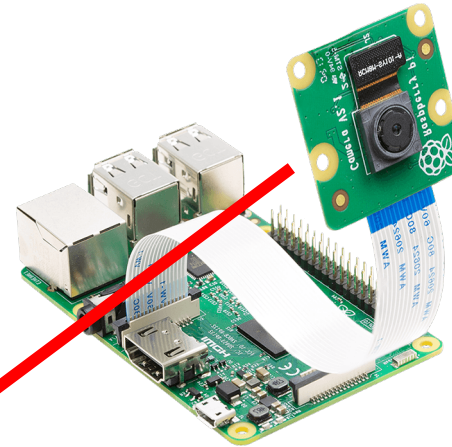
Scheduling Board



CameraPi: Parts and Programs

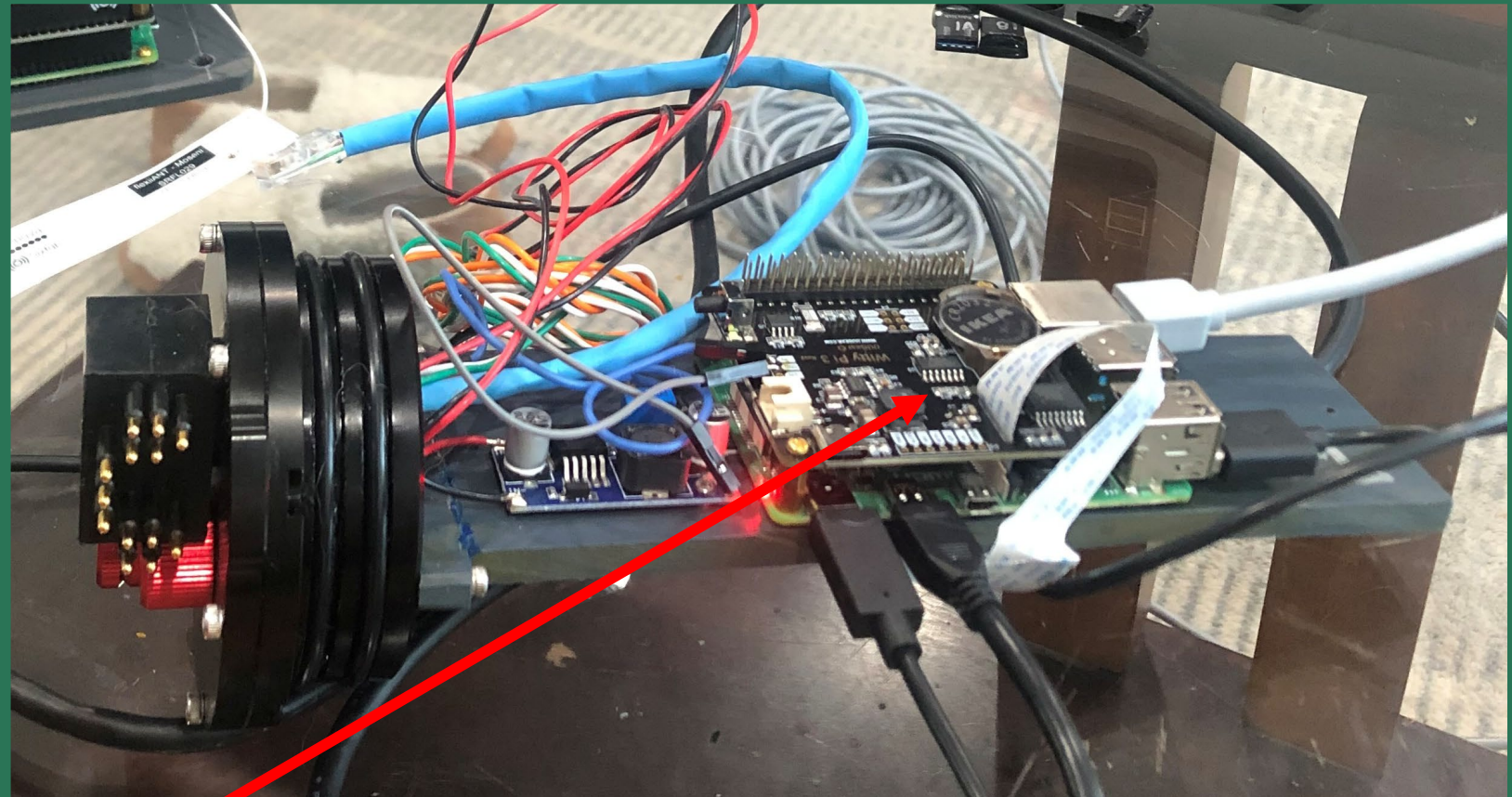


Camera/Recording Program

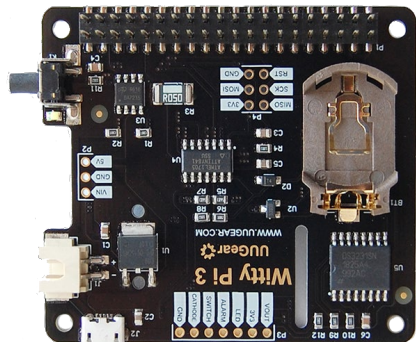


Author: Jack Butler

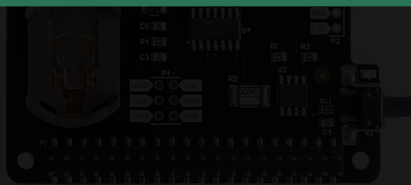
CameraPi: Parts and Programs



Scheduling Board



CameraPi: Parts and Programs



Waterproof Tube

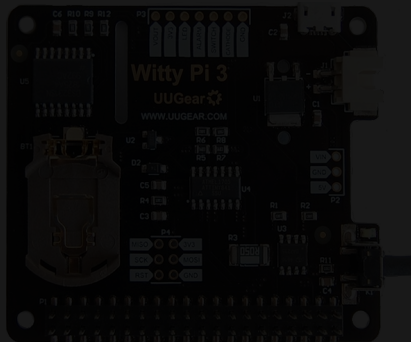


CameraPi: Parts and Programs

Raspberry Pi Board



Scheduling Board



Log File with Video Pic

```
2025-05-21 09:17:49 Attempting to unmount camerapi...
2025-05-21 09:17:49 Mount point not active. Skipping unmount.
2025-05-21 09:17:49 Email part of script completed.
2025-05-21 09:18:27 38 second wait complete.
2025-05-21 09:18:27 Sync complete.
2025-05-21 09:32:26 Have slept until the end of the half hour, rebooting now
2025-05-21 09:47:49 Script started.
mount.nfs: Network is unreachable
cpi: cannot stat '/home/pi/MountedCameraPi/sharelog/run.log': No such file or directory
Could not find the host "smtp.gmail.com"
Could not send the message.
2025-05-21 09:50:16 Attempting to unmount camerapi...
2025-05-21 09:50:16 Mount point not active. Skipping unmount.
2025-05-21 09:50:16 Email part of script completed.
2025-05-21 09:50:54 38 second wait complete.
2025-05-21 09:50:54 Sync complete.
2025-05-21 10:04:53 Have slept until the end of the half hour, rebooting now
2025-05-21 10:20:40 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
2025-05-21 10:20:48 Attempting to unmount camerapi...
2025-05-21 10:20:48 Unmount successful.
2025-05-21 10:20:48 Email part of script completed.
2025-05-21 10:21:26 38 second wait complete.
2025-05-21 10:21:26 Sync complete.
2025-05-21 10:35:25 Have slept until the end of the half hour, rebooting now
2025-05-21 10:50:54 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
2025-05-21 10:51:33 Attempting to unmount camerapi...
2025-05-21 10:51:33 Unmount successful.
2025-05-21 10:51:33 Email part of script completed.
2025-05-21 10:52:11 38 second wait complete.
2025-05-21 10:52:11 Sync complete.
2025-05-21 11:06:10 Have slept until the end of the half hour, rebooting now
2025-05-21 11:21:42 Script started.
Authenticating (PLAIN)...
Closing connection to imap.gmail.com...
```



BuoyPi: Parts and Programs

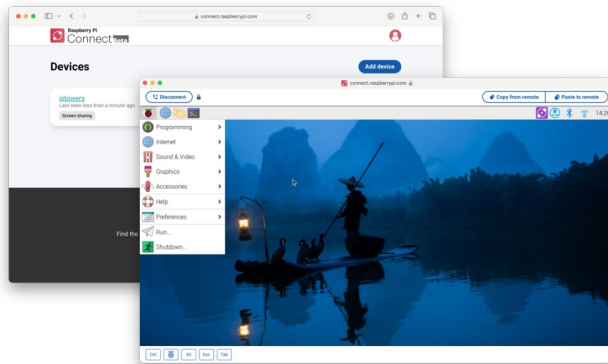
Raspberry Pi



SIM Board + Antenna



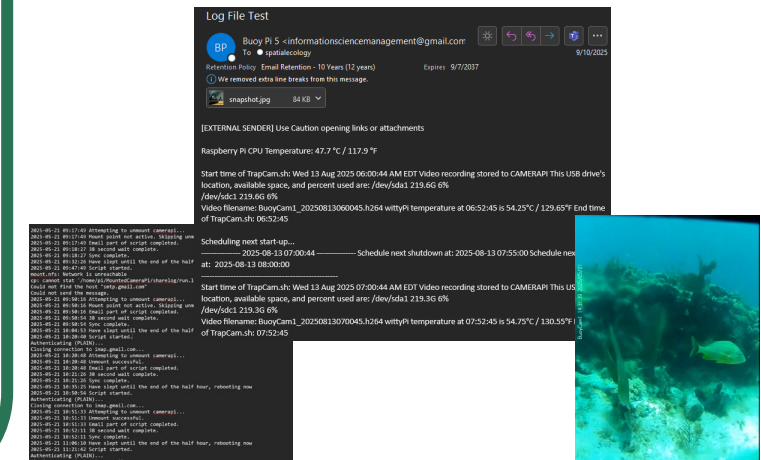
Remote Access



Local Network



Email log files and pic

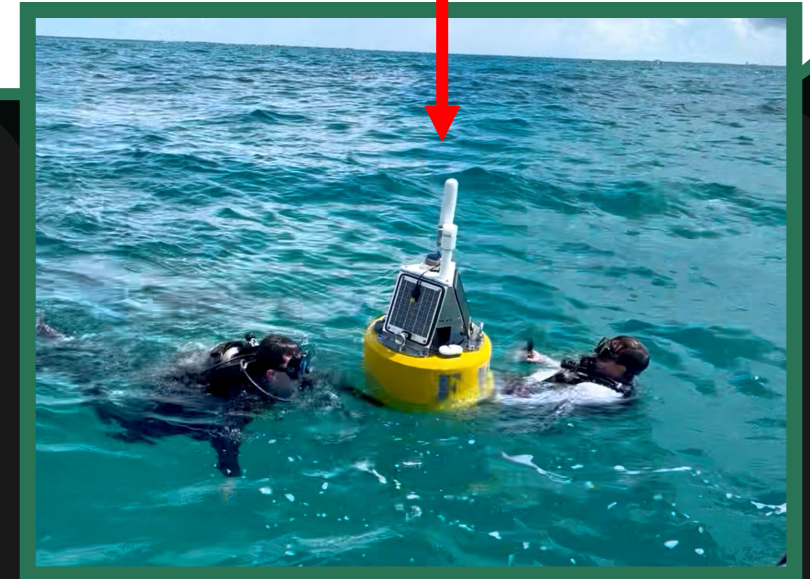
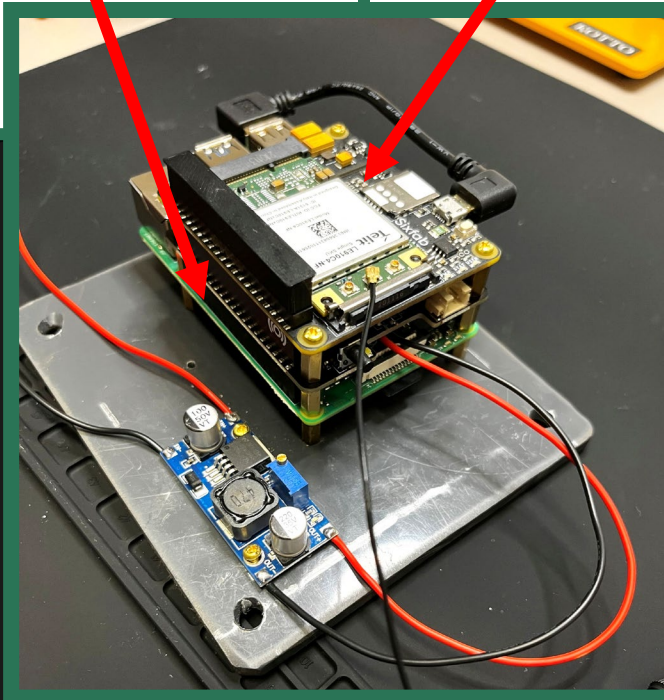
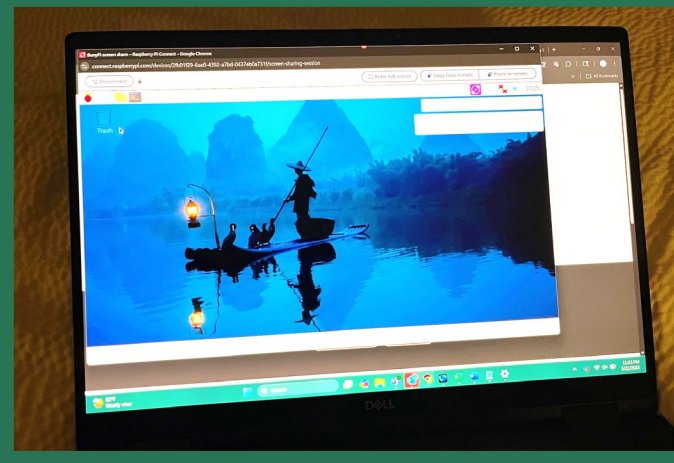


BuoyPi: Parts and Programs

Raspberry Pi



SIM Board + Antenna

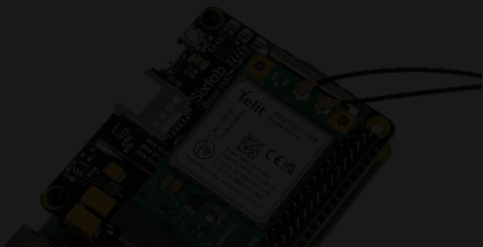


BuoyPi: Parts and Programs

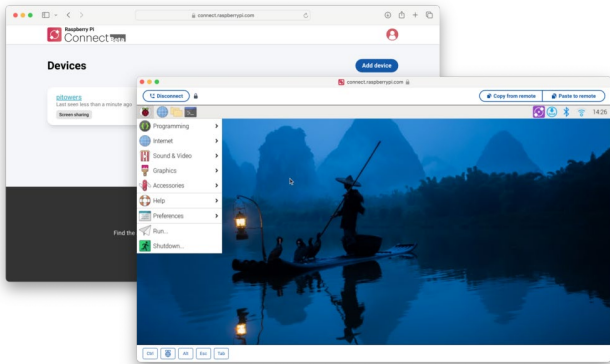
Raspb



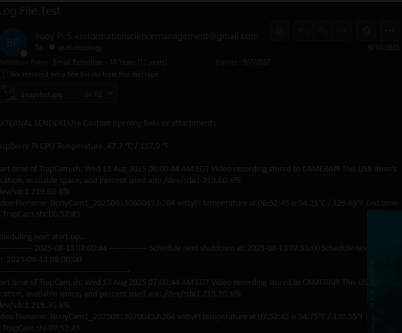
SIM Board + Antenna



Remote Access



mail log files and pic

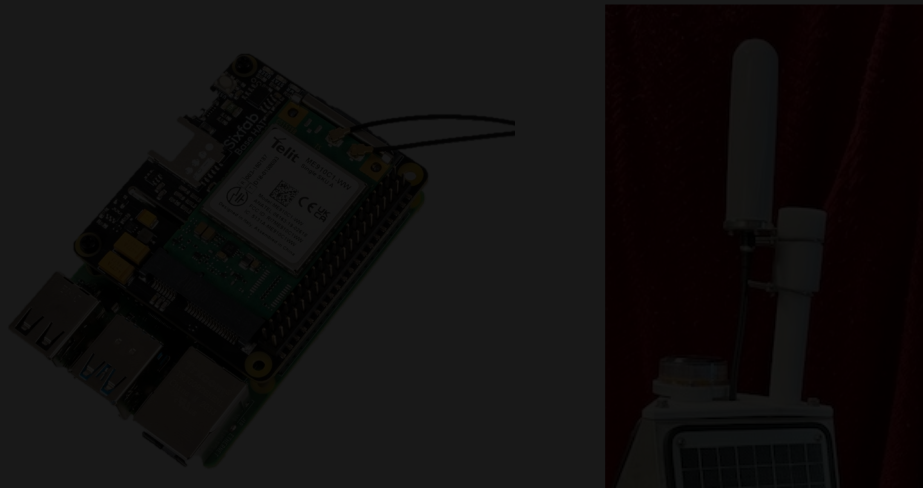


BuoyPi: Parts and Programs

Raspberry Pi



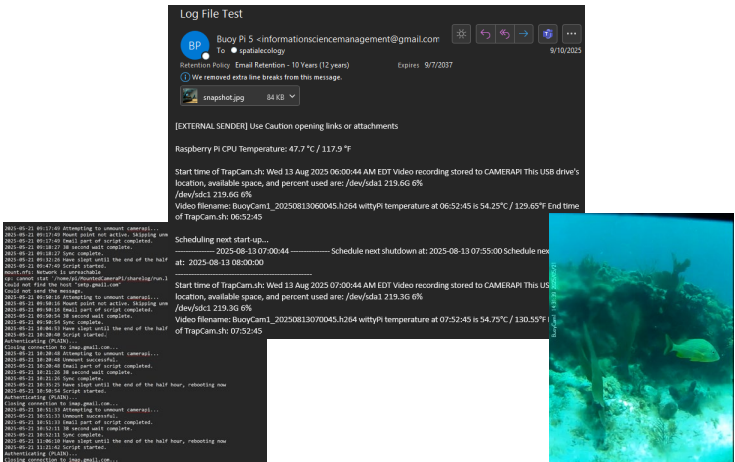
SIM Board + Antenna



Local Network

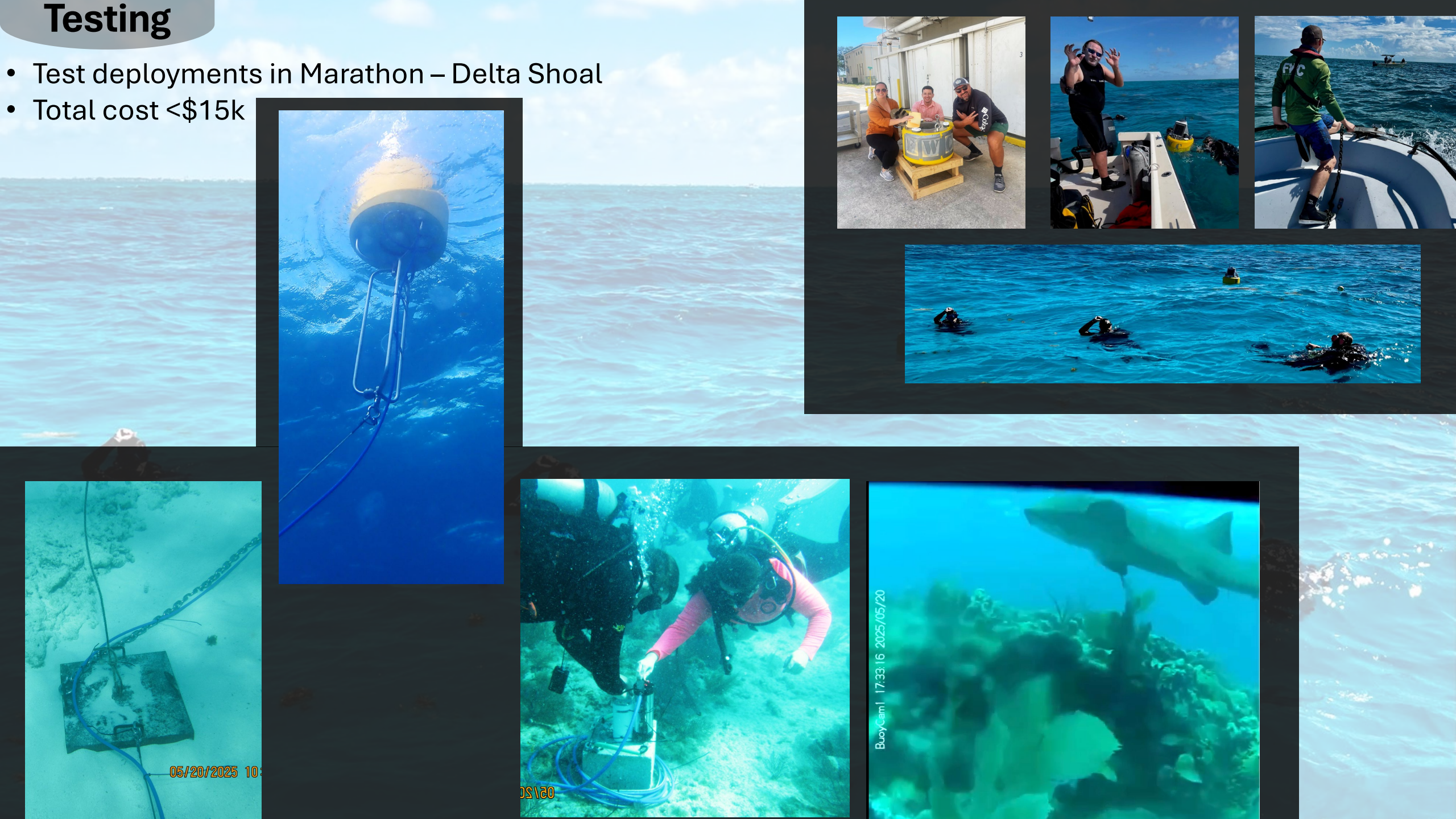


Email log files and pic



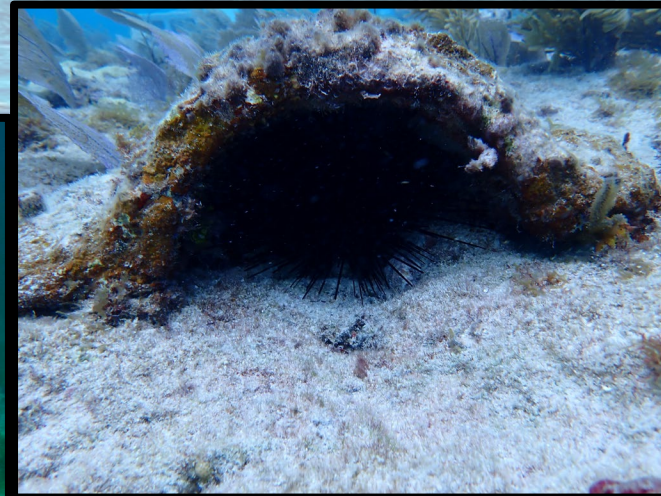
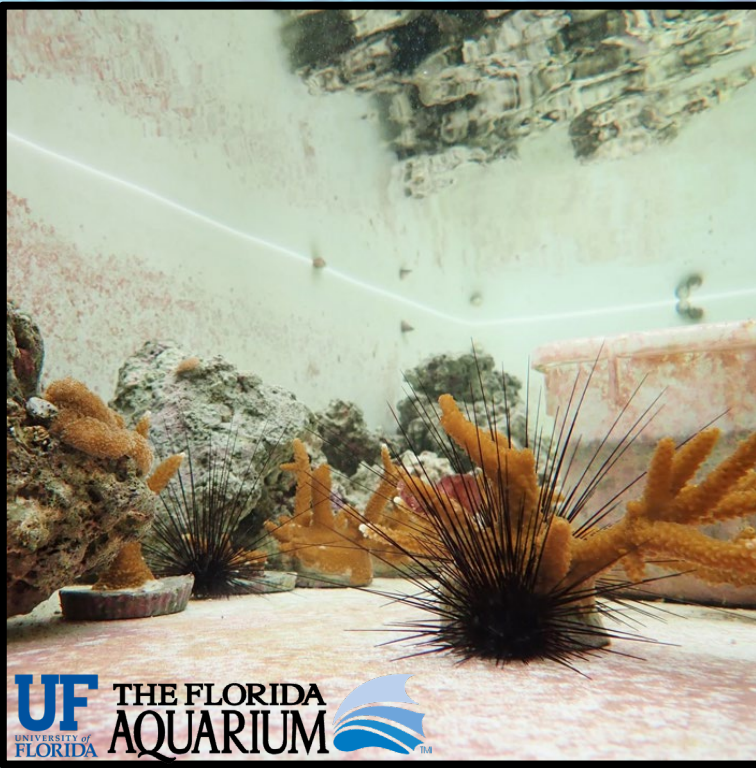
Testing

- Test deployments in Marathon – Delta Shoal
- Total cost <\$15k



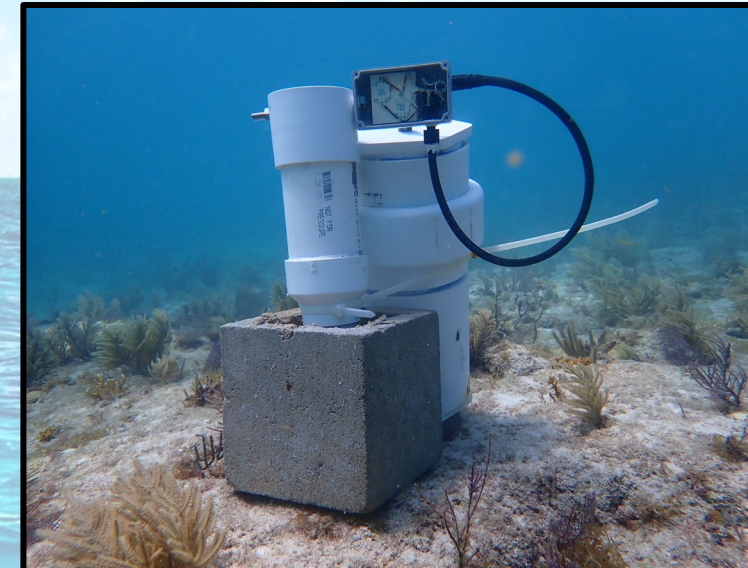
Urchins

- *Diadema antillarum* – long-spined sea urchin
 - Die-off in the '80s
- Captive aquaculture
 - Where are they going?



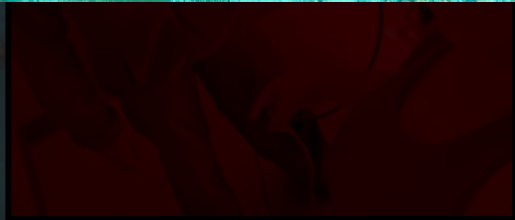
Urchins

- Built underwater red night lights for filming
 - Each light cost ~\$100
 - Powered by lithium-ion battery packs



Urchins

- Built underwater red night lights for filming
 - Each light cost ~\$100
 - Powered by lithium-ion battery packs



Urchins

- Low camera angle – needed taller stand
- Camera fell over
- Urchins didn't leave

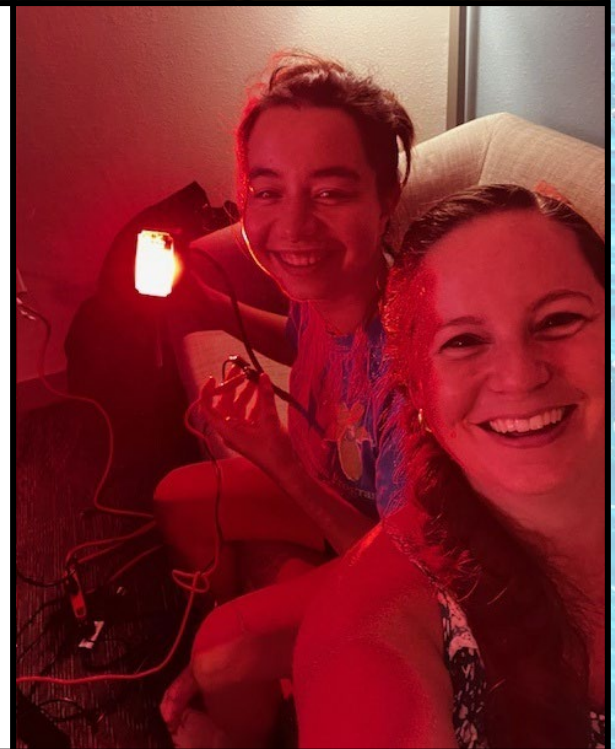


Too short

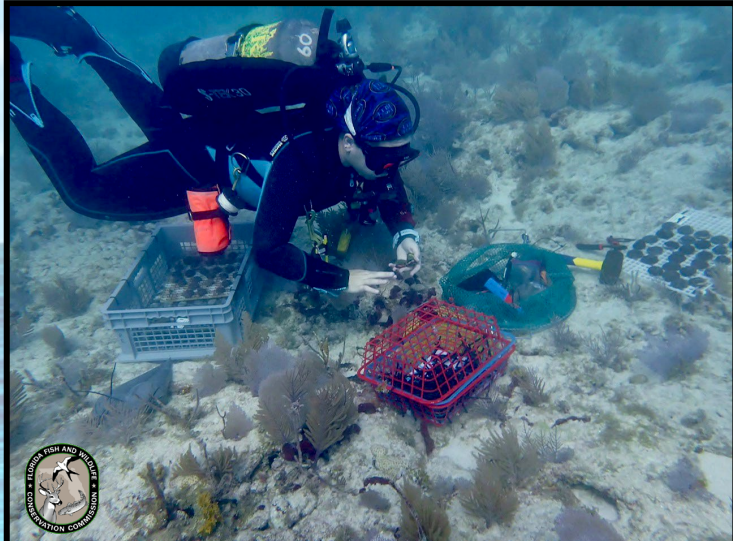


Next Steps

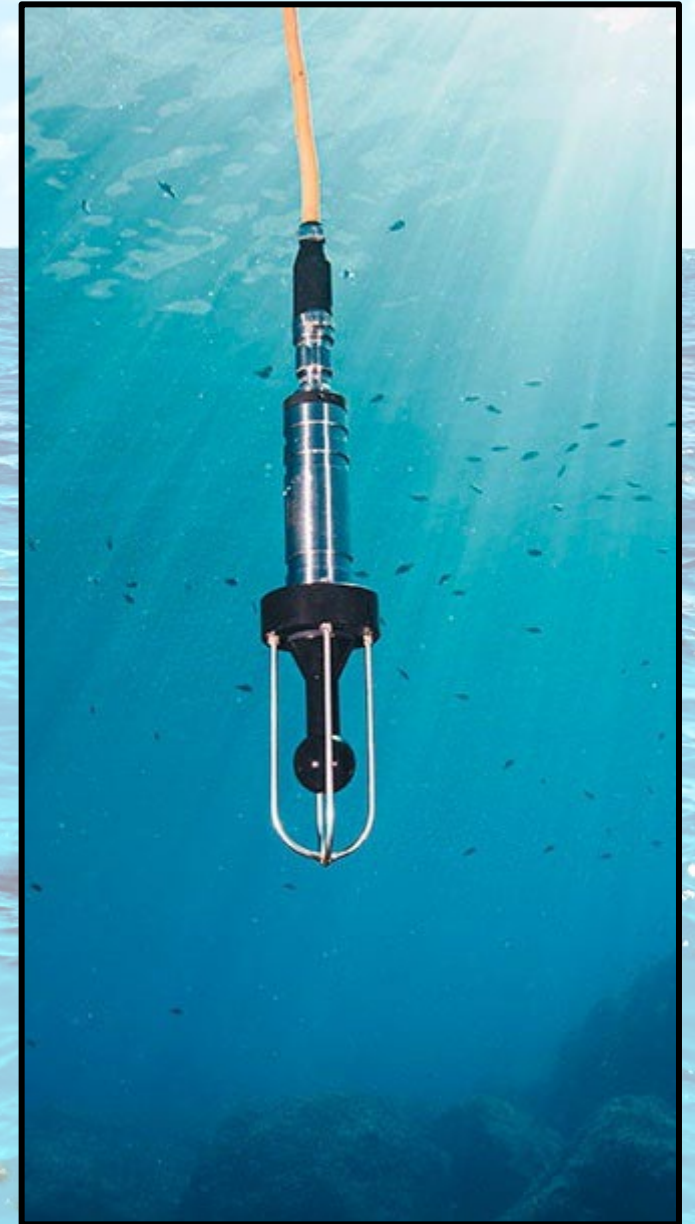
- Breadbaskets
 - Wider base
- Concrete jugs
 - Weigh down the camera and lights
- Frame
 - Help angle the camera
- More lights
 - No more shadows



Project Ideas



- Coral outplant predation
- Coral spawning (2.0)
- Fish counts
- Multi-modal data collection
 - Acoustic monitoring????



Lessons Learned

- Non-experts think outside the box
- Add IT as a team member
- Make everything fool-proof and field-proof



Thank you!

- For more information, contact
Lauren.Gentry@MyFWC.com
- How-to guide and publication forthcoming
- Wiring diagrams and schematics available

Special Thanks

Bill Sharp
Justin Voss
Lindsay Spiers
Gabe Delgado
Jack Butler

Casey Butler
Lauren Zitzman
Travis Lowkey
Tom Matthews

