Science, Service, Stewardship

Advancing the use of NOAA's National Database for Deep Sea Corals and Sponges:

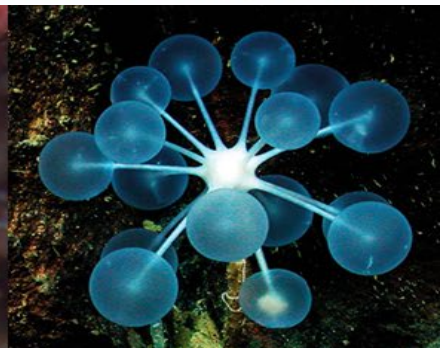
Leveraging R, RMarkdown, ERDDAP, and Leaflet interactive maps for enhanced data exploration, analysis, and reporting

Robert P. McGuinn

Northern Gulf Institute - NGI (a NOAA Cooperative Institute)

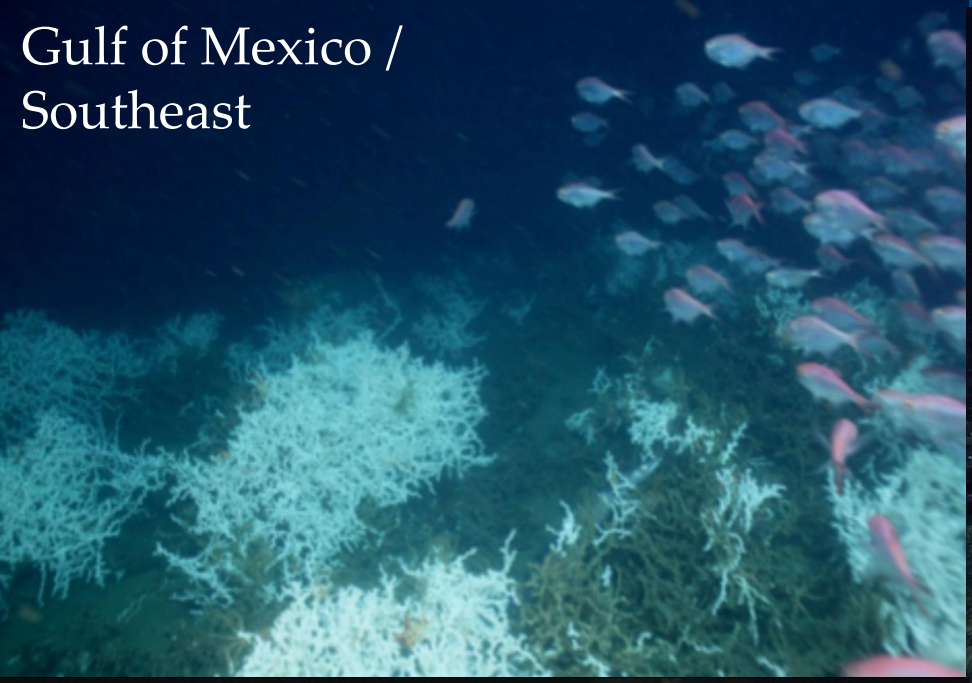
Co-Authors: Scott L. Cross (NOAA), David E. Sallis (NGI), L. Matt Dornback (NGI), Thomas F. Hourigan (NOAA)

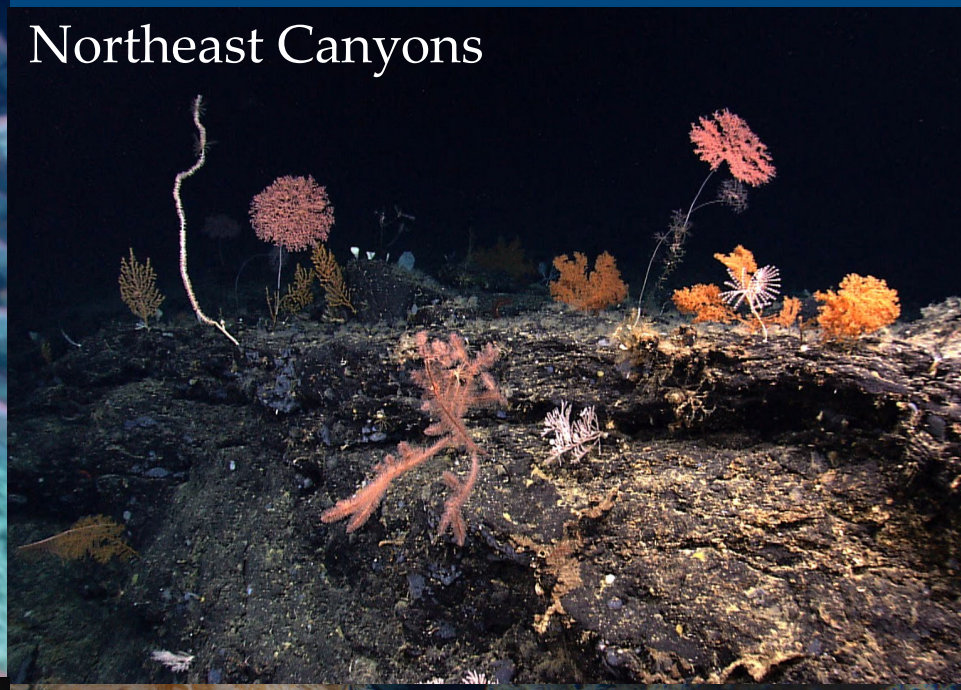
NOAA DEEP SEA CORAL Research & Technology Program

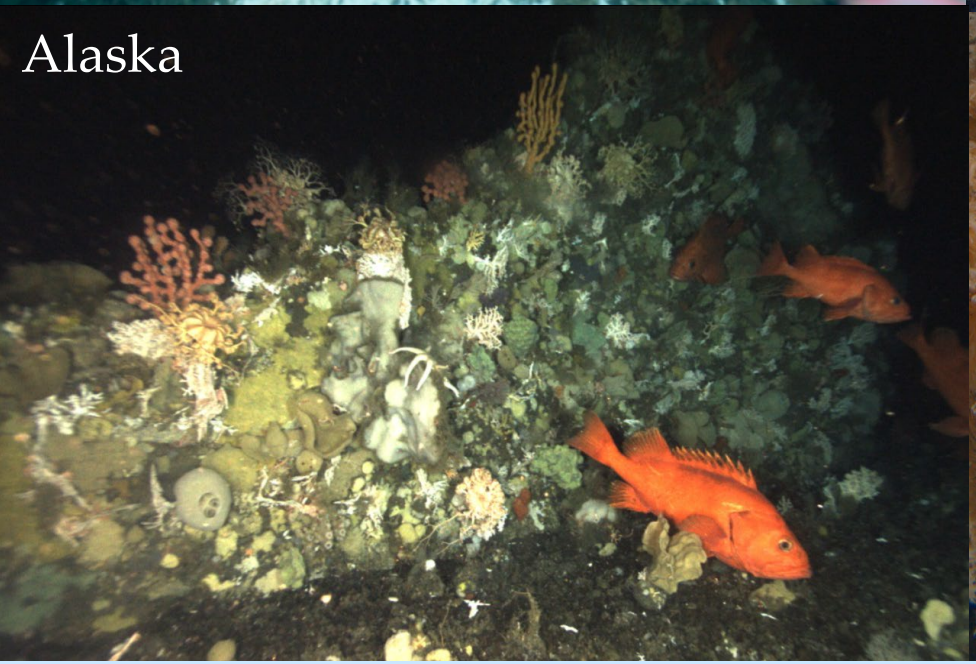


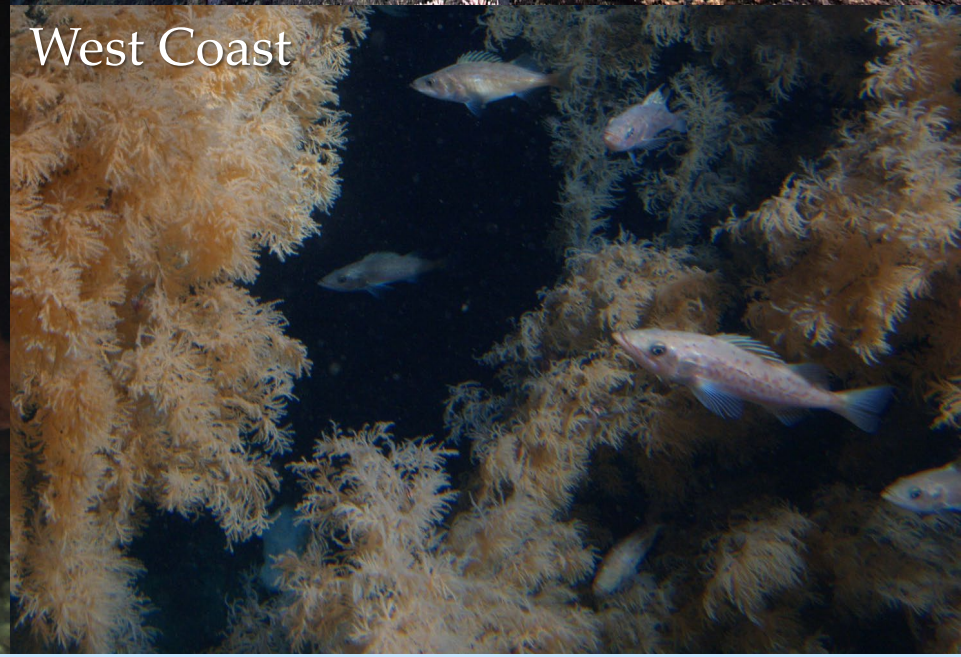
Objectives

- Briefly introduce deep sea corals and sponges.
- Summarize our data management activities.
- Describe how we use tools of R, R-Markdown, Leaflet, and ERDDAP in our data publication and analysis workflows.
- Show two example data-driven R-Markdown reports.
- Invitation to share / copy / collaborate at GitHub repository: 'deepseatools'


Gulf of Mexico /
Southeast

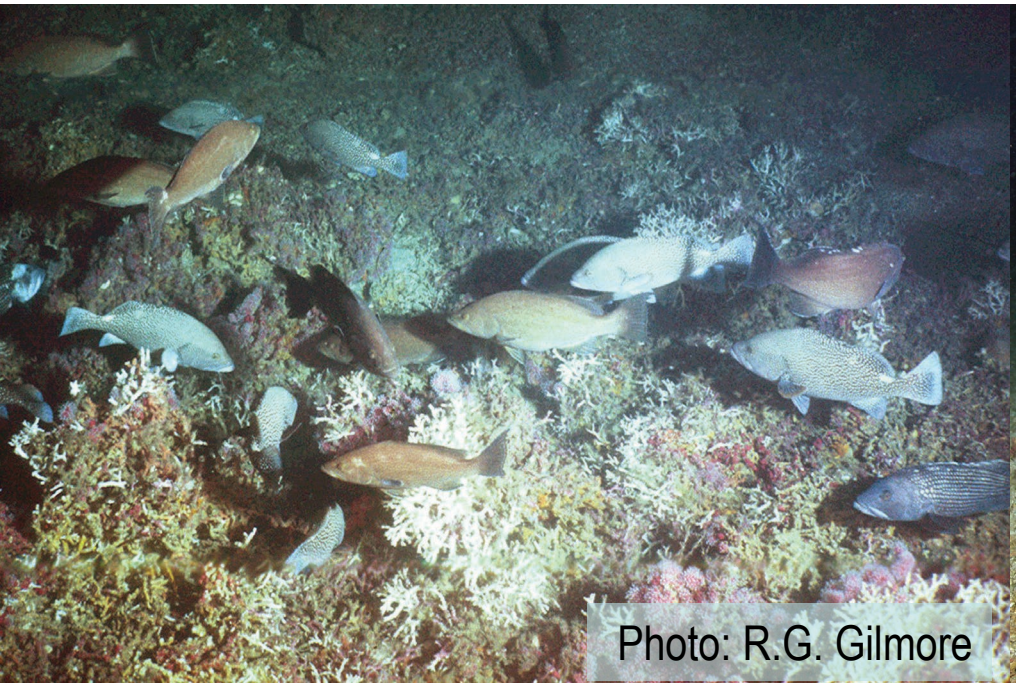

Northeast Canyons


Alaska

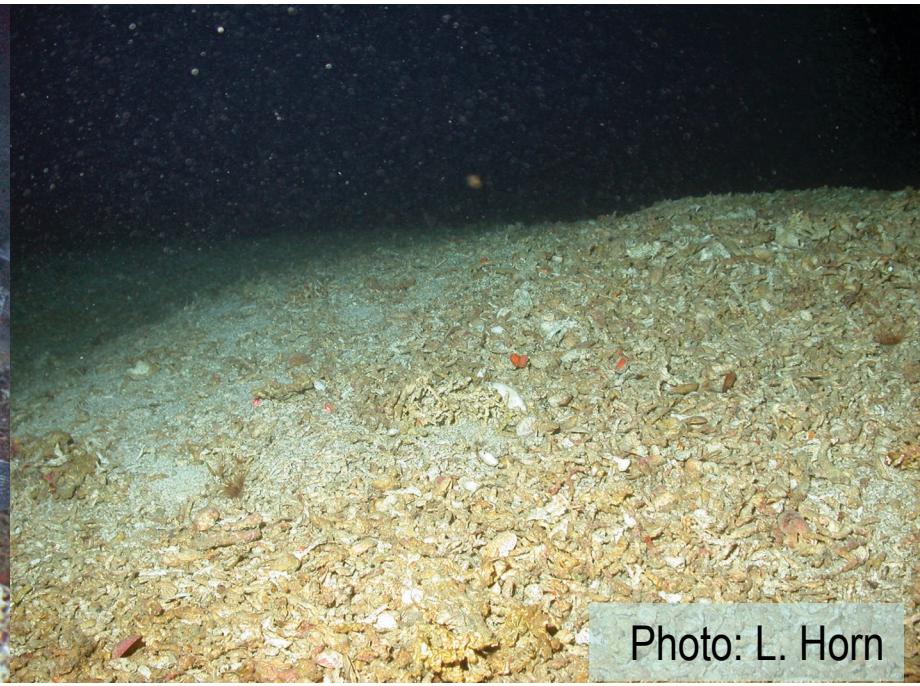

West Coast

Vulnerable Habitats

Untrawled



Trawled



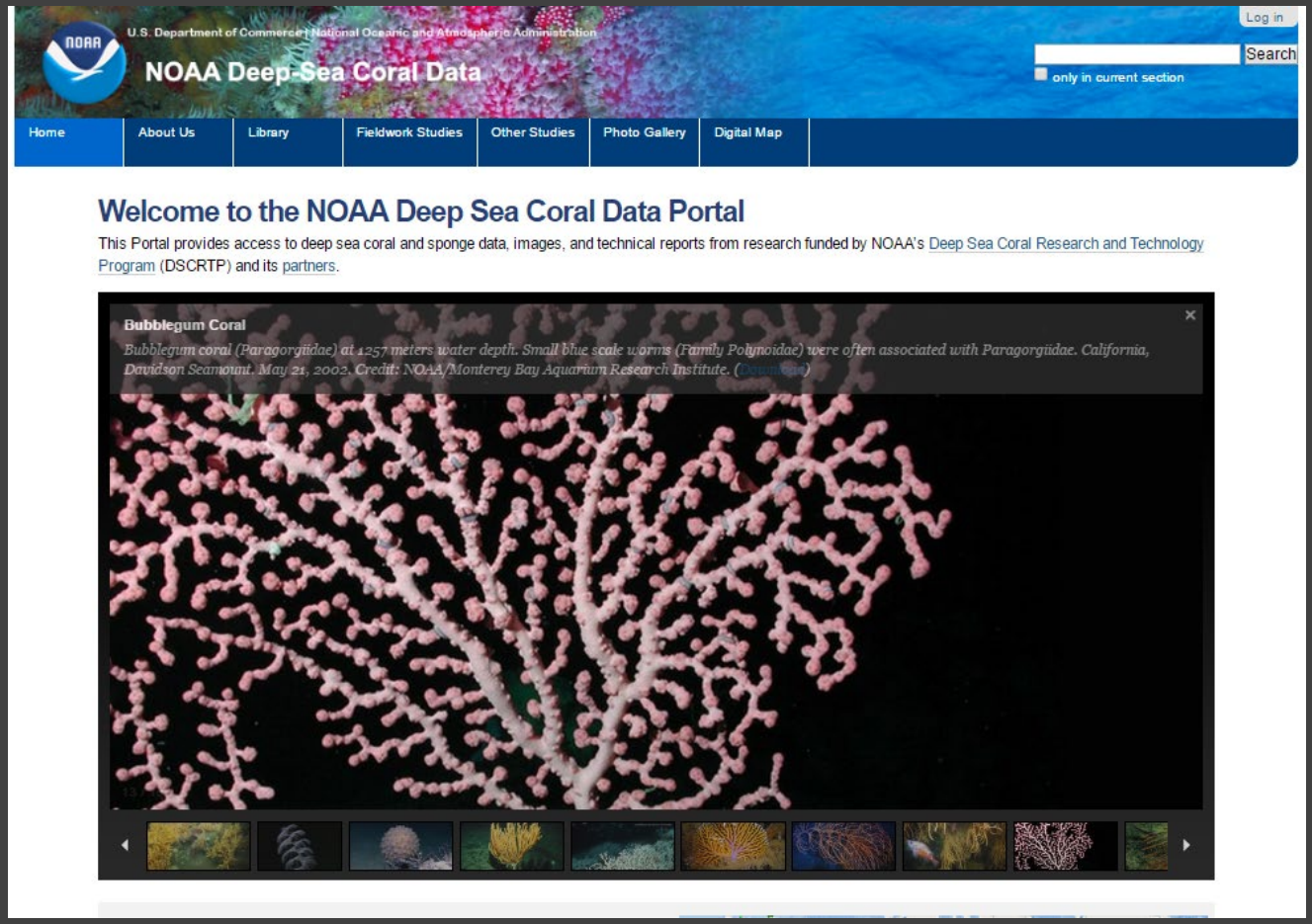
- Southeast: 90% of *Oculina* reefs have been lost to bottom trawling.

  Source: Koenig et al. 2005

- Aleutian Islands: 49% corals damaged in trawled area vs. 7% in untrawled area.

  Source: Heifetz et al. 2009

DSCRTP Data Portal DeepSeaCoralData.NOAA.gov



National Database

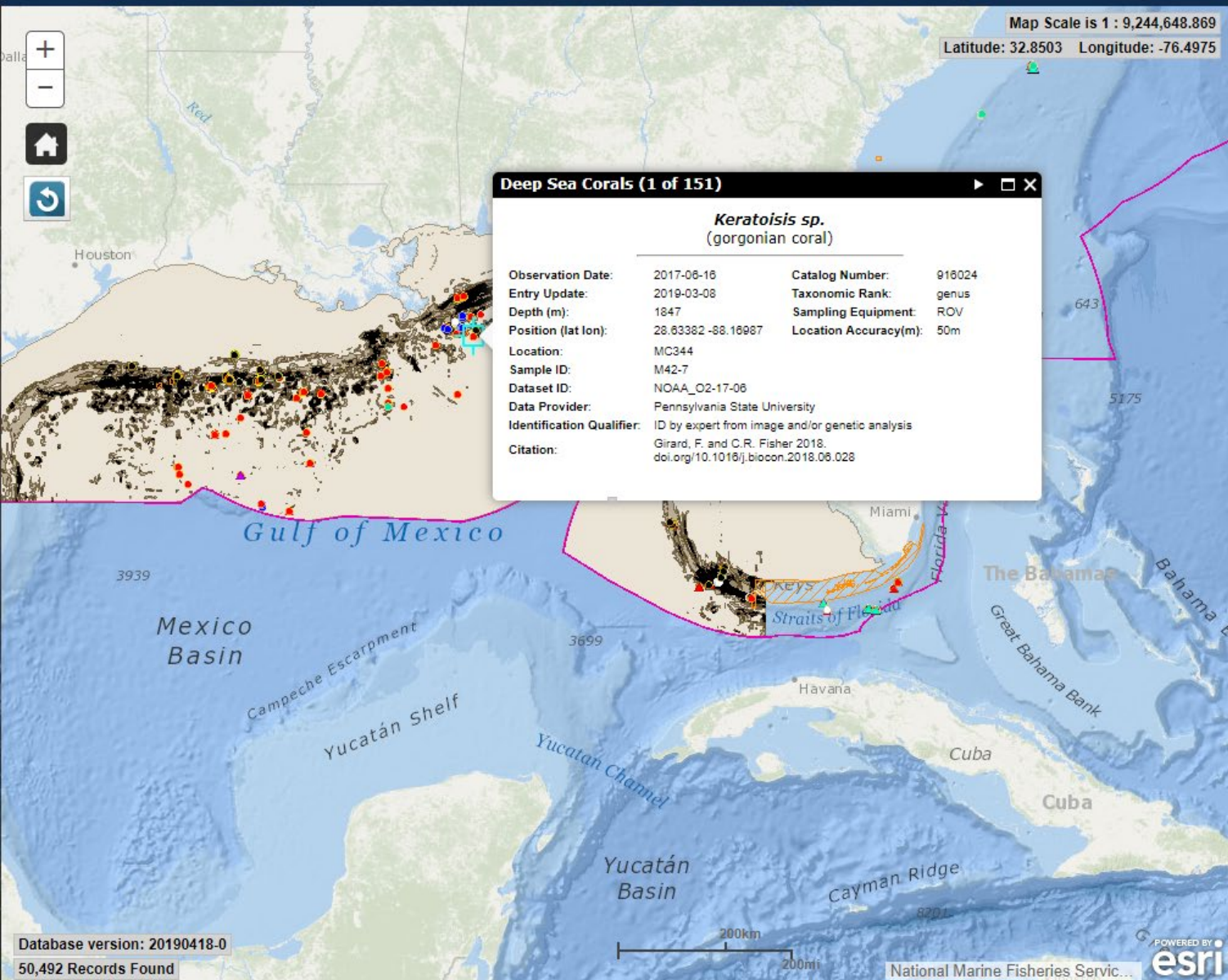
- Comprehensive nationally, contributes internationally
- Includes both specimen-based and image-based data
- Darwin Core compliant
- High degree of quality control
- Networked with other data providers (ERDDAP, WMS)
- Connections with key databases (OBIS, WoRMS, GenBank)

National Centers for Environmental Information
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NOAA Deep-Sea Coral & Sponge Map Portal

NOAA DEEP SEA CORAL Research & Technology Program

Zoom In | Zoom Out | Prev Extent | Next Extent | Pan | Stop Zoom | Geostatistics | Data Query | Data Download | Metadata



Deep Sea Corals (1 of 151)

Keratoisis sp.
(gorgonian coral)

Observation Date:	2017-06-16	**Catalog Number:**	916024
Entry Update:	2019-03-08	**Taxonomic Rank:**	genus
Depth (m):	1847	**Sampling Equipment:**	ROV
Position (lat lon):	28.63382 -88.16987	**Location Accuracy(m):**	50m
Location:	MC344		
Sample ID:	M42-7		
Dataset ID:	NOAA_O2-17-06		
Data Provider:	Pennsylvania State University		
Identification Qualifier:	ID by expert from image and/or genetic analysis		
Citation:	Girard, F. and C.R. Fisher 2018. doi.org/10.1016/j.biocon.2018.06.028		

Site Characterizations by US Region

Model Overlays

- NCCOS Models
  - Gulf of Mexico
    - Alcyonacea and Gorgonacea
    - Gorgonacea
    - Alcyonacea
    - Antipatharia
    - Gorgonacea Plexauridae *Bebryc*
    - Gorgonacea Primnoidae *Callogc*
    - Gorgonacea Ellisellidae
    - Gorgonacea Gorgoniidae

Map Layers

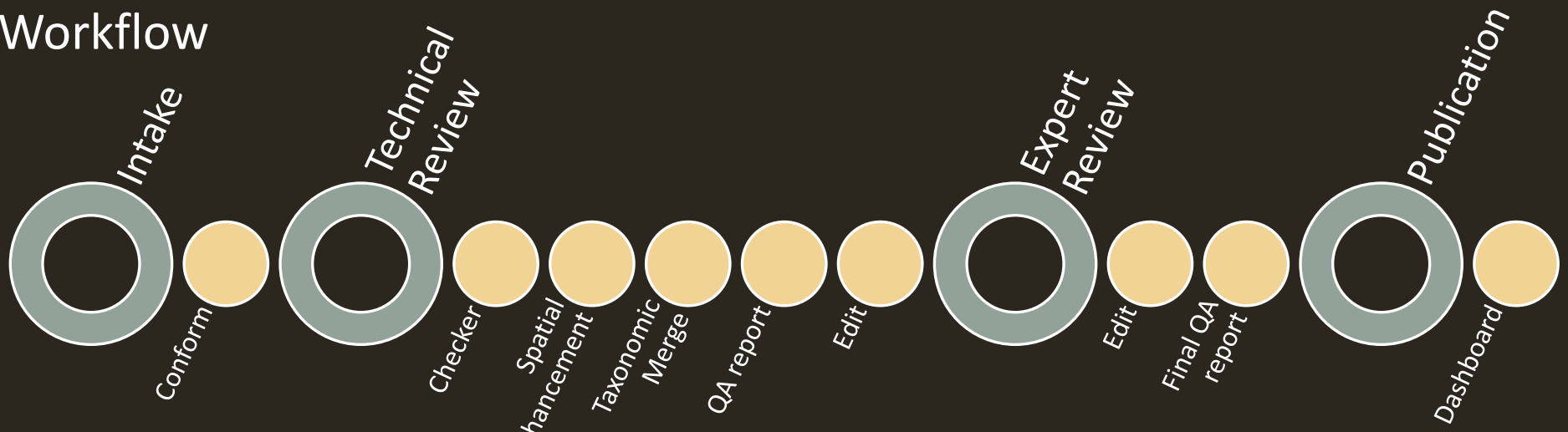
Legend | Model Legend | Photo

Full Resolution Image

Biological Observations Workflow

Communications and Storage

Workflow



Tools

Why use R and R Markdown?

- Increased transparency, extensibility, traceability, and reproducibility in QA and analysis.
- RMarkdown = 'literate analysis' and reporting.
- Rmarkdown + 'bookdown' package + GitHub pages = living tutorials! (LINK)

Please Reach Out and Collaborate!

Robert.McGuinn@noaa.gov

(843)-460-9696

Portal: DeepSeaCoralData.NOAA.gov

New GitHub repository: 'deepseatools'

R Tutorial (in active development):
https://robertmcguinn.github.io/deepseatools

ESRI ArcGIS Pro Tutorial:

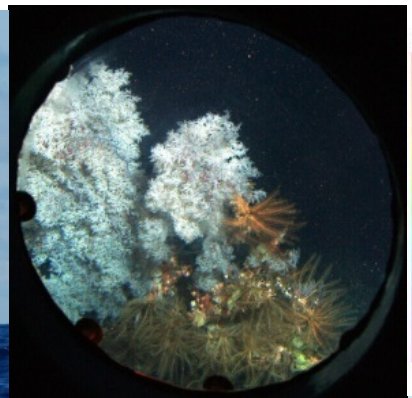
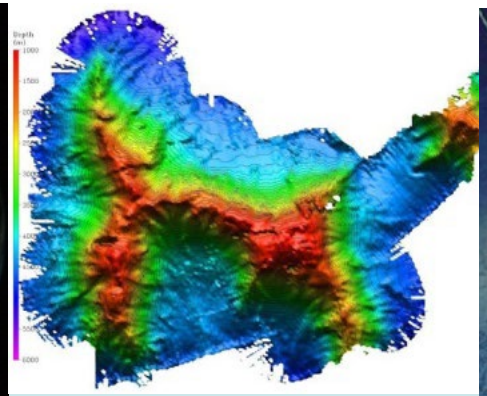
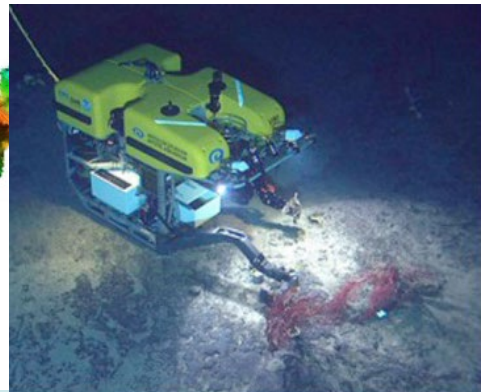
https://preview.tinyurl.com/deepseatools

For more information:
https://deepseacoraldata.noaa.gov/library/seminar-videos

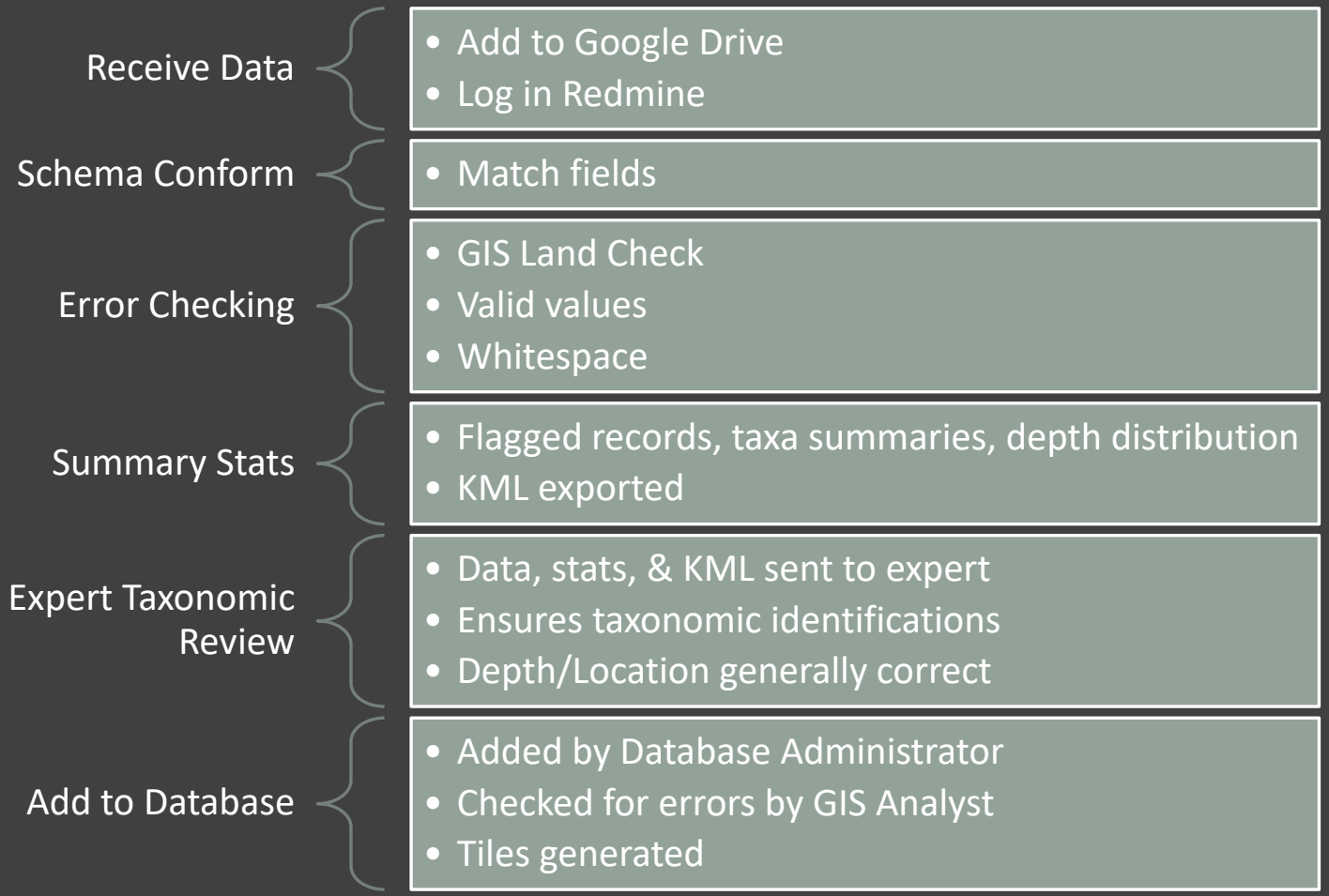
EXTRA SLIDES

Deep-Sea Coral Research & Technology Program

- Established to serve Councils in 2009 with latest Magnuson-Stevens Act reauthorization
- Integrates expertise and resources across NOAA
- Research to locate and understand corals/sponges, address fishing and other threats
- Spatially explicit modeling, visualization, analysis

Data Ingest Process



ERDDAP

Environmental Research Division Data Access Program

- ERDDAP is a data server framework used widely in NOAA and beyond (LINK). Over 60 servers currently.
- Simple, consistent way to download subsets of gridded and tabular scientific datasets
- OPeNDAP: discipline-neutral Data Access Protocol
- Access data through R using 'rerddap' package!