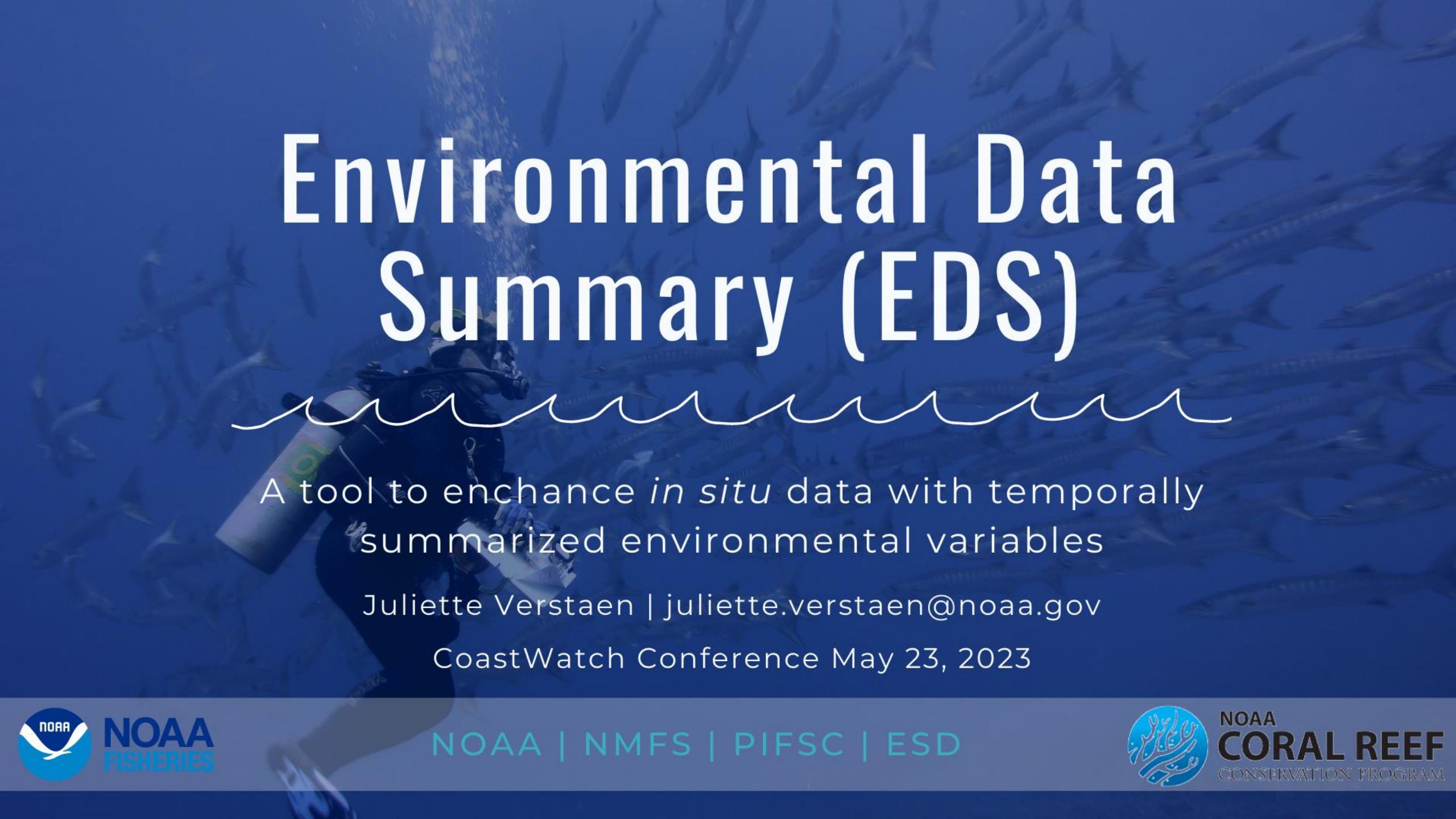


Environmental Data Summary (EDS)



A tool to enhance *in situ* data with temporally summarized environmental variables

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CoastWatch Conference May 23, 2023



NOAA | NMFS | PIFSC | ESD



Environmental Data Summary (EDS)



WHAT IS IT?

an R-based program to **enhance *in situ* data** with gridded external environmental data at different temporal scales



Environmental Data Summary (EDS)



WHAT IS IT?

an R-based program to **enhance *in situ* data** with gridded external environmental data at different temporal scales

WHAT DOES IT DO?

download and extract **temporally-summarized** satellite and modeled oceanographic data by point and time



Environmental Data Summary (EDS)

WHAT IS IT?

an R-based program to **enhance *in situ* data** with gridded external environmental data at different temporal scales

WHAT DOES IT DO?

download and extract **temporally-summarized** satellite and modeled oceanographic data by point and time

HOW IS IT USEFUL?

- **efficiency**
- data summaries specific to point locations
- subsequent **correlative & statistical analyses**

NOAA EDS Team

- Originally conceptualized and developed by Tom Oliver
- Revised and maintained by:

Tom Oliver



Kisei Tanaka



Jessie Perelman



Juliette Verstaen



- QA/QC archived on NOAA InPORT (#65209)

The history of EDS



Tom Oliver creates EDS

build an in-house repository of gridded satellite data for the PI region & provide end users with temporally summarized remote data paired with in situ survey data

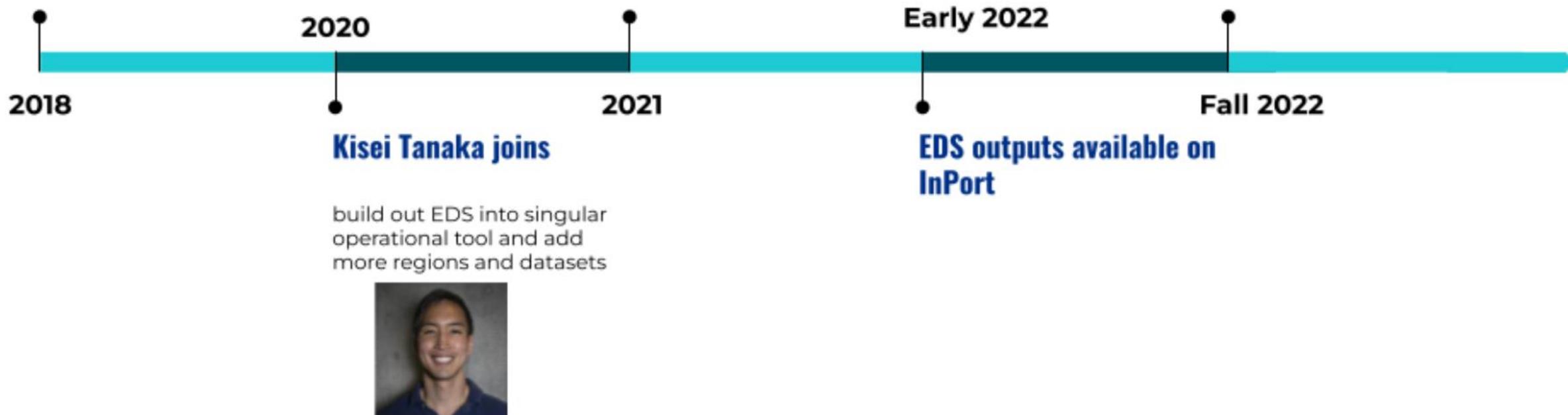
submitted to NCEI

first version of EDS is submitted and archived



Jessie Perelman and Juliette Verstaen join

continue the work with Kisei





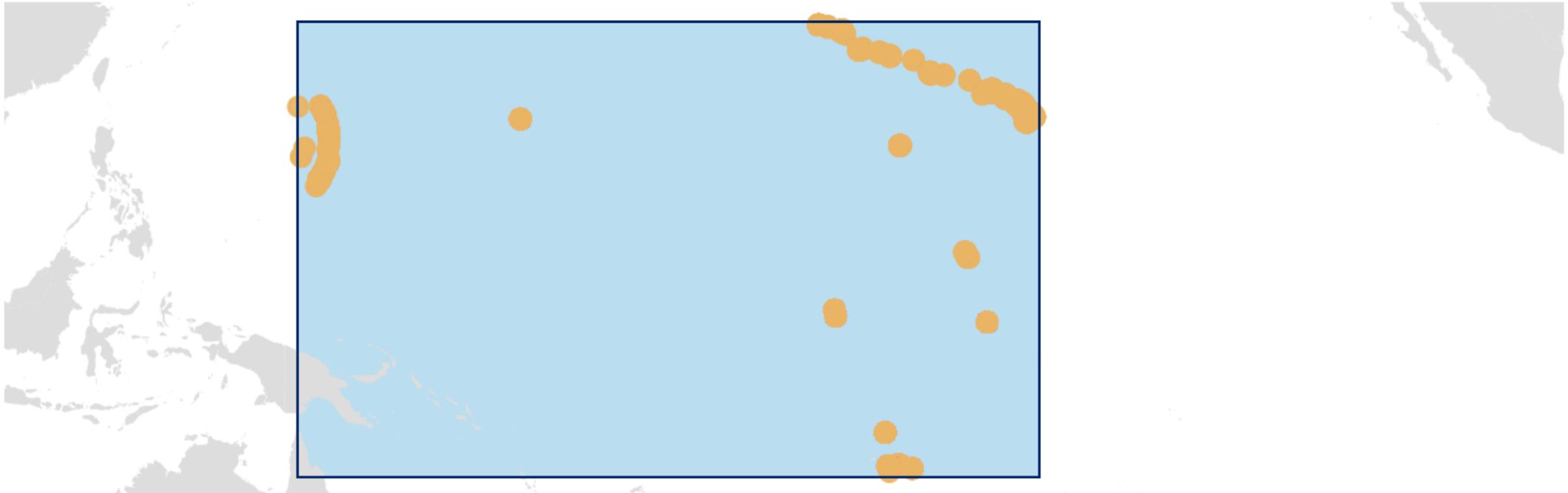
What data does EDS use?

- Currently EDS pulls 3-D data from ERDDAP (lon, lat, time)
- In the works:
 - Other servers
 - THREDDS
 - OpenDAP
 - 4-D data sets (lon, lat, depth, time)
 - GLORYS - a global biogeochemical model
 - Pacific Islands ROMS*

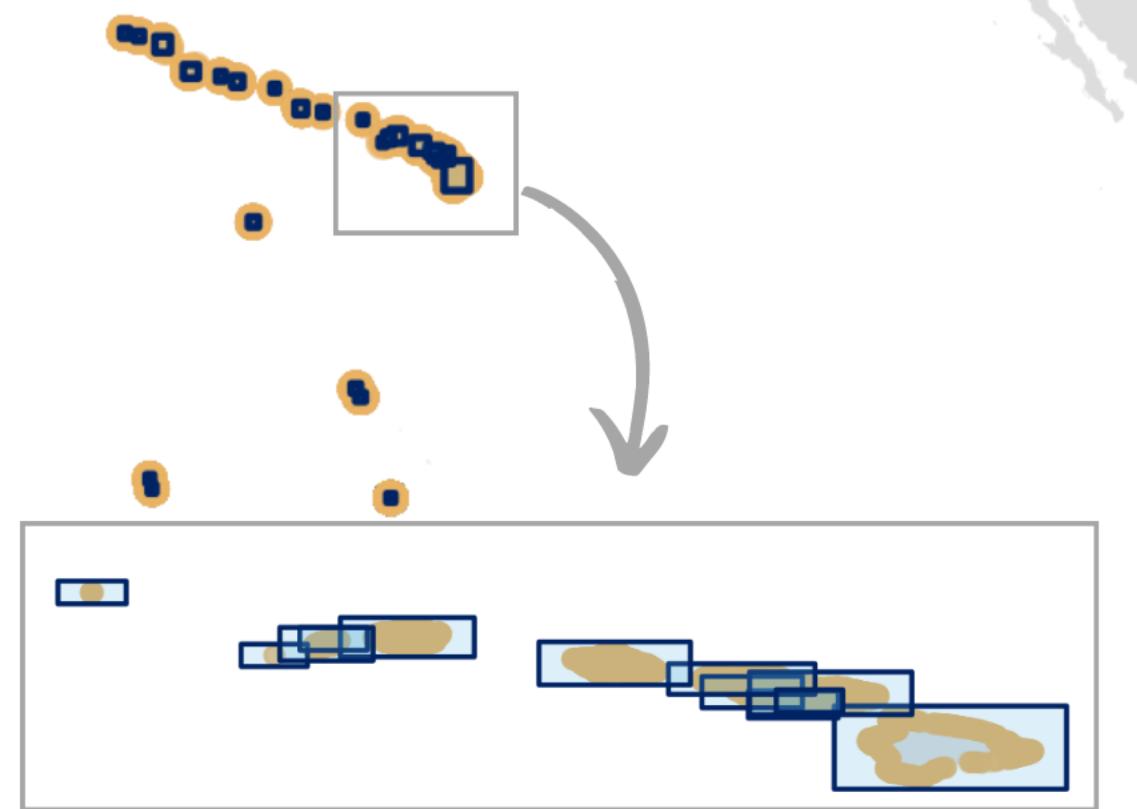
Conceptualization of EDS



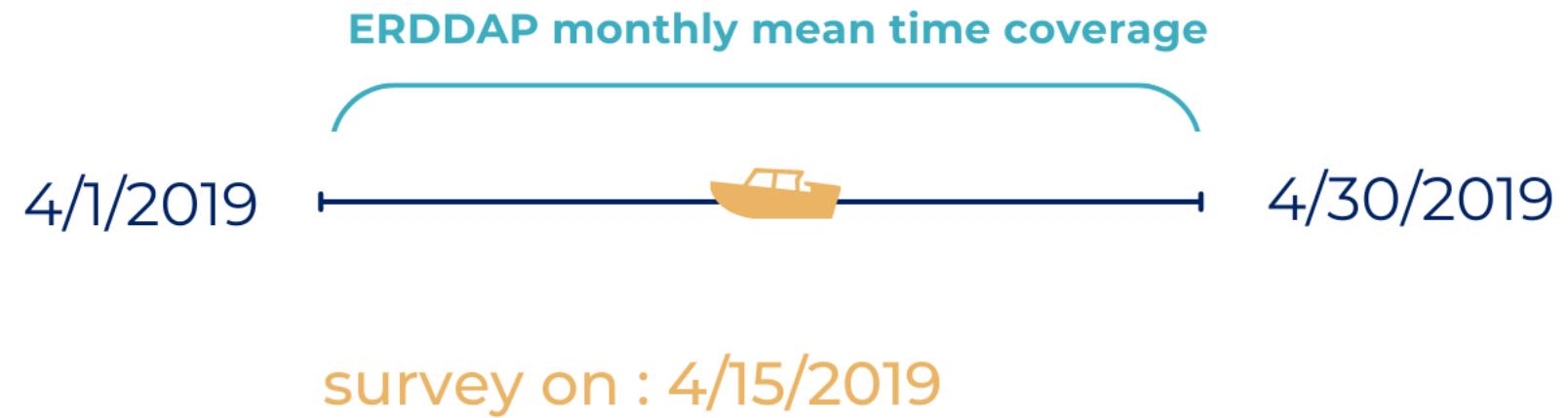
Conceptualization of EDS



Conceptualization of EDS

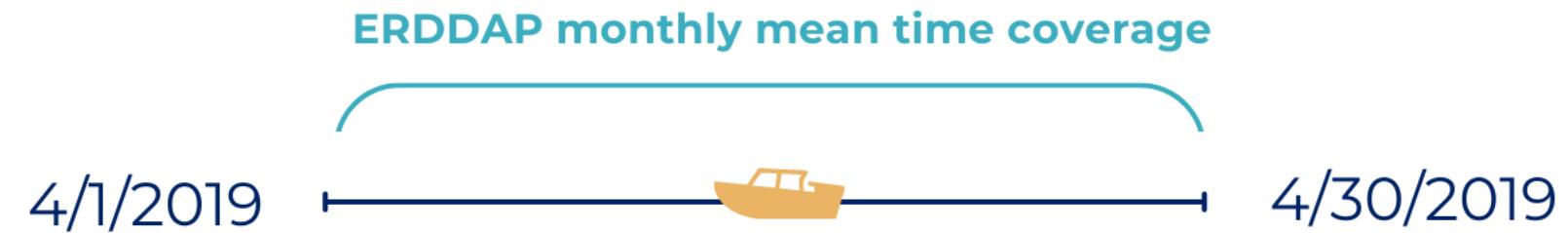


ERDDAP: provides data based on calendar timescales



ERDDAP: provides data based on calendar timescales

EDS output: provides temporal summaries based on your survey date



survey on : 4/15/2019



EDS monthly mean time coverage

Available EDS Summaries:

- Mean
- Min and max
- Standard deviation
- Q05 and Q95
- Mean ranges

Timescale of Summaries:

These summaries are calculated for whatever time scale of interest: daily, monthly, 3 month, 6 month, annual, 3 year, 10 year, and all time.

EDS prerequisites and returns

ENVIRONMENTAL VARIABLES

Can be any gridded products from ERDDAP servers (ex: OISST, or VIIRS)



SURVEY DATA

Any georeferenced and time-stamped in situ data

EDS prerequisites and returns



Observations



Site	Lat	Lon	Time	CPUE
A	19.5	-154.8	15-Aug-22	3.2
B	19.5	-154.8	16-Aug-22	5.5
C	19.5	-154.8	17-Aug-22	2.1

Observations

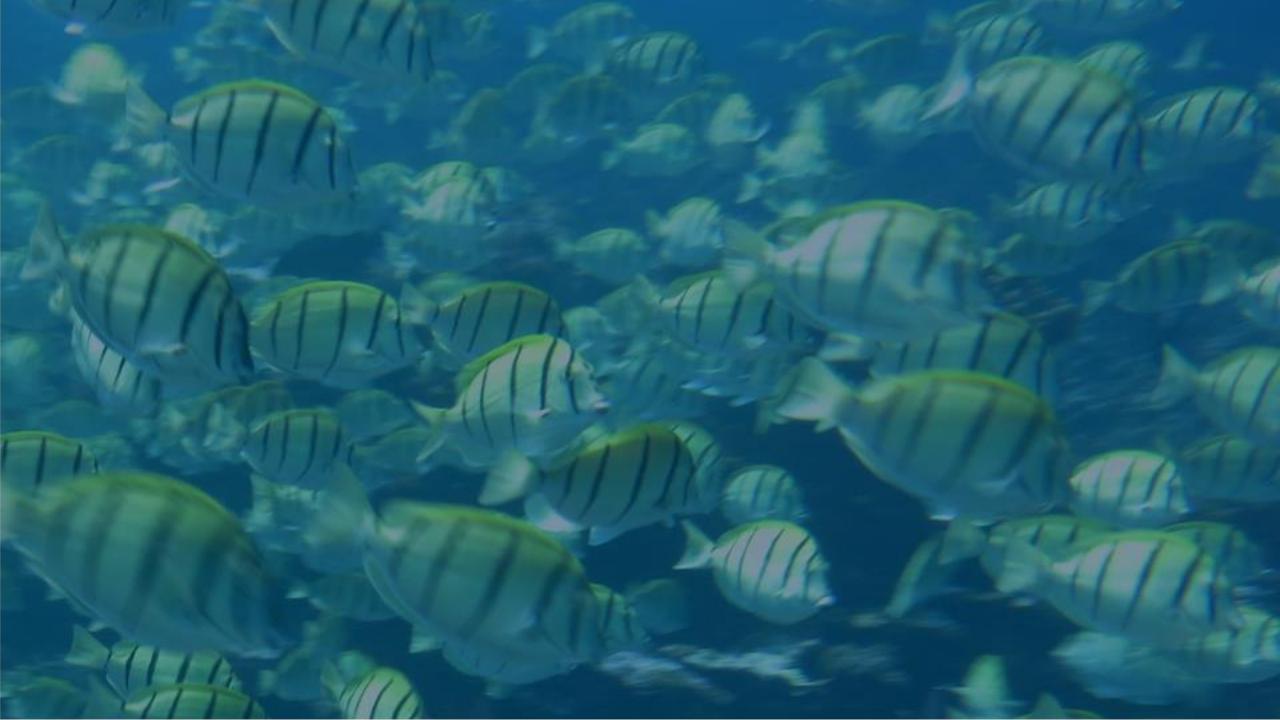
EDS Outputs

Site	Lat	Lon	Time	CPUE	Daily SST	Monthly Mean SST	Monthly SD SST
A	19.5	-154.8	15-Aug-22	3.2	24.61	25.04	0.28
B	19.5	-154.8	16-Aug-22	5.5	24.61	25.08	0.29
C	19.5	-154.8	17-Aug-22	2.1	24.75	25.08	0.28



How do you start using EDS?

contact Jessie Perelman, Kisei Tanaka,
or myself to help you get up and
running



Who has used EDS so far?

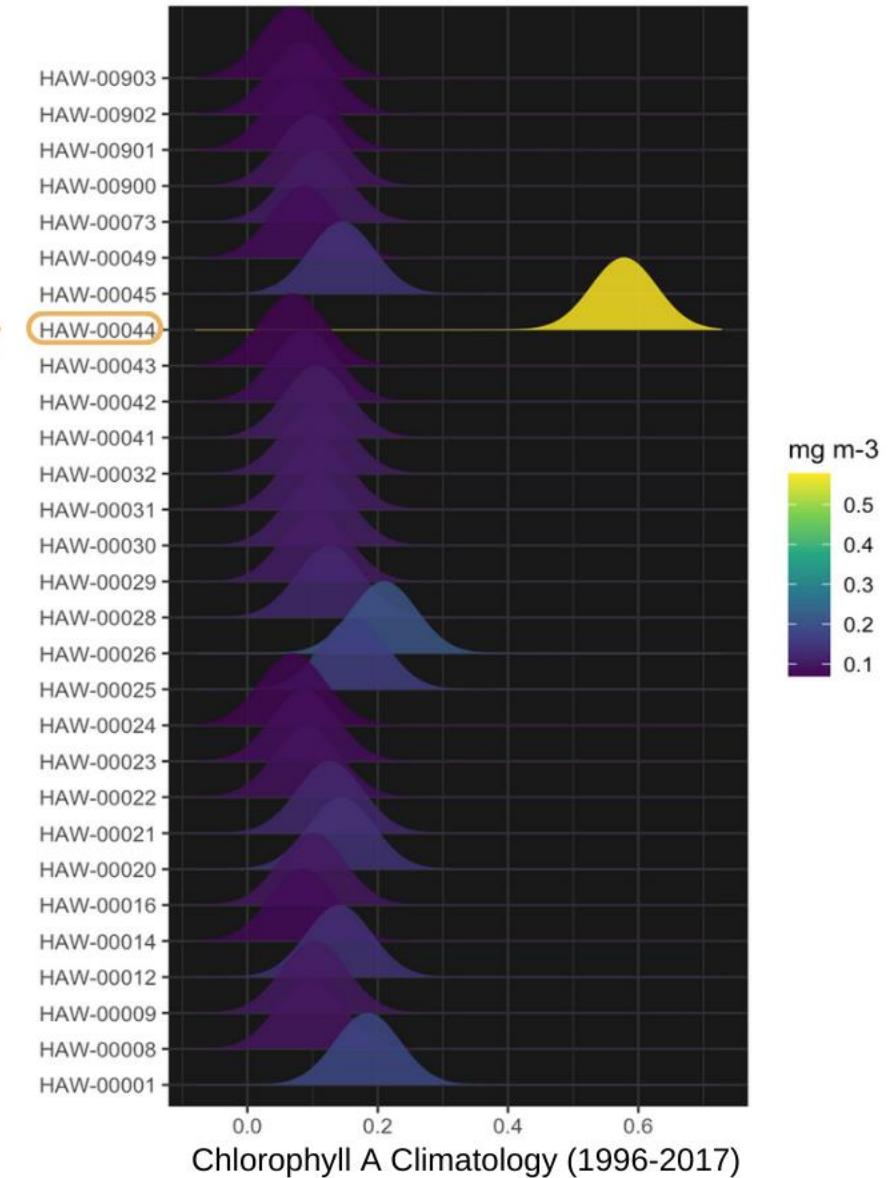
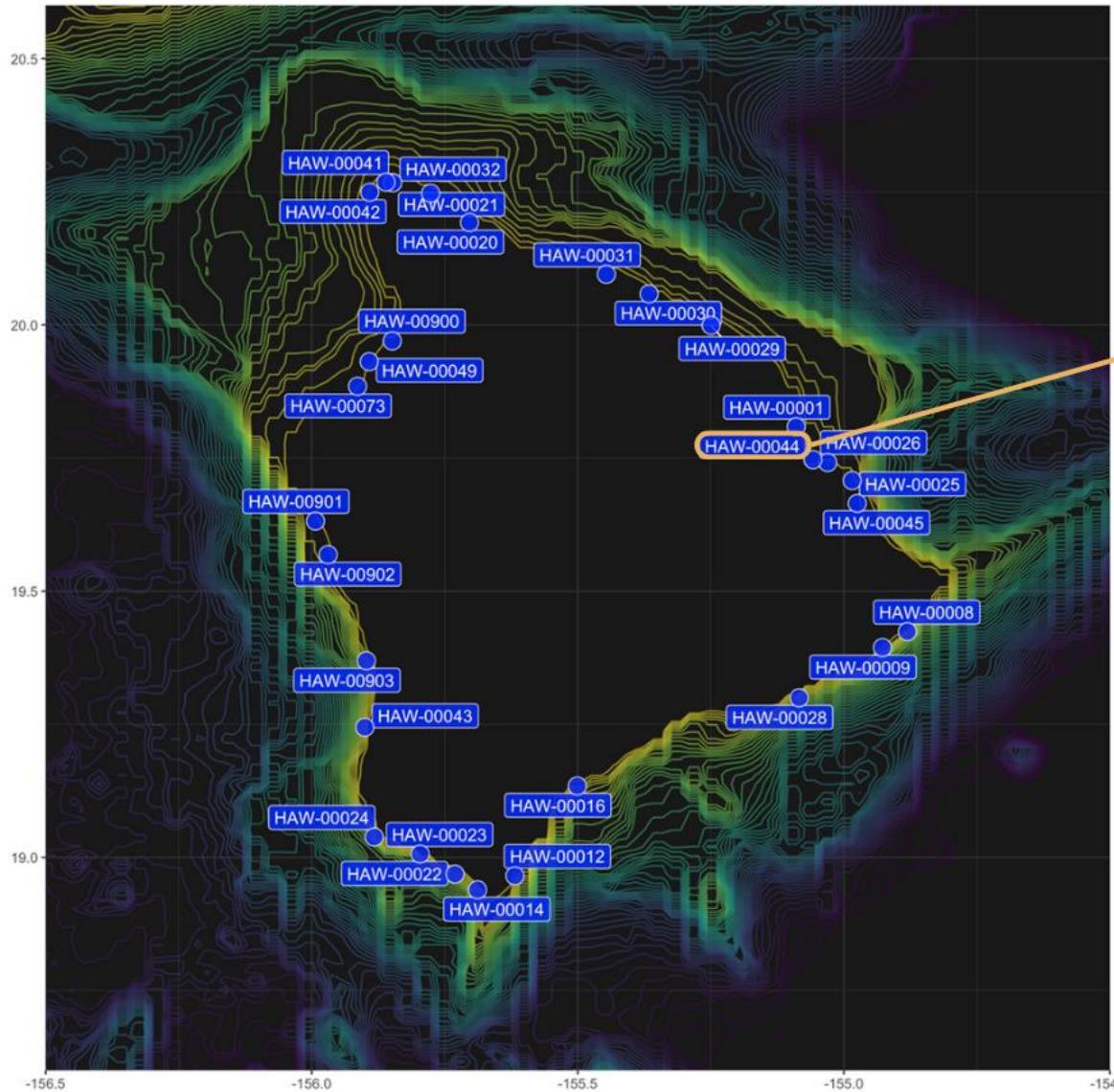
Groups include: NOAA, DAR, State
of Guam, UH, etc





Let's dive into some EDS applications!

Chlorophyll A Climatology Data on Hawai'i



Effects of environmental factors in juvenile coral abundance

Couch *et al.* used EDS to obtain summaries for chlorophyll-a, SST, and degree heating week at 1,405 National Coral Reef Monitoring Program survey sites across 34 islands, atolls and reef systems.

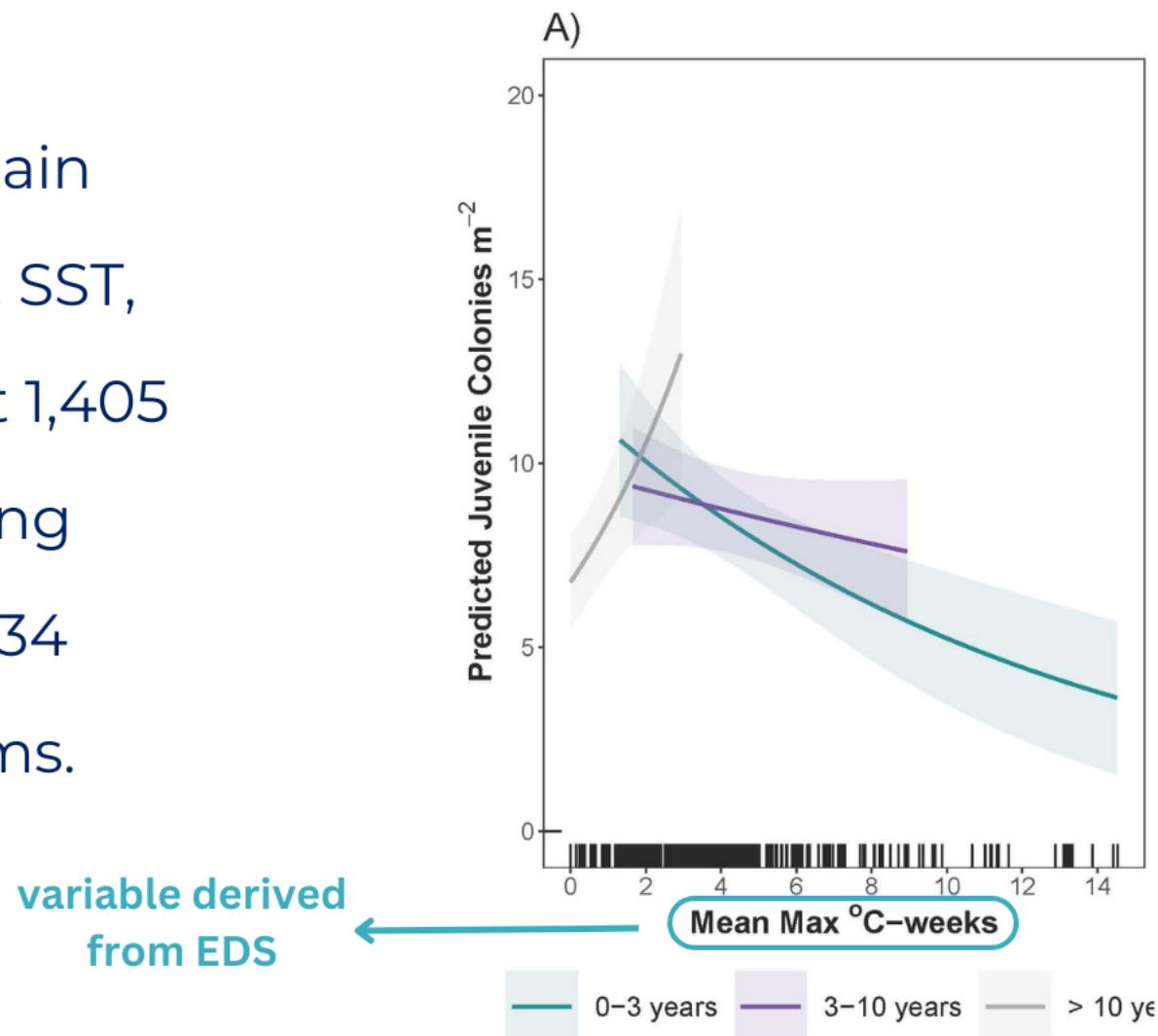
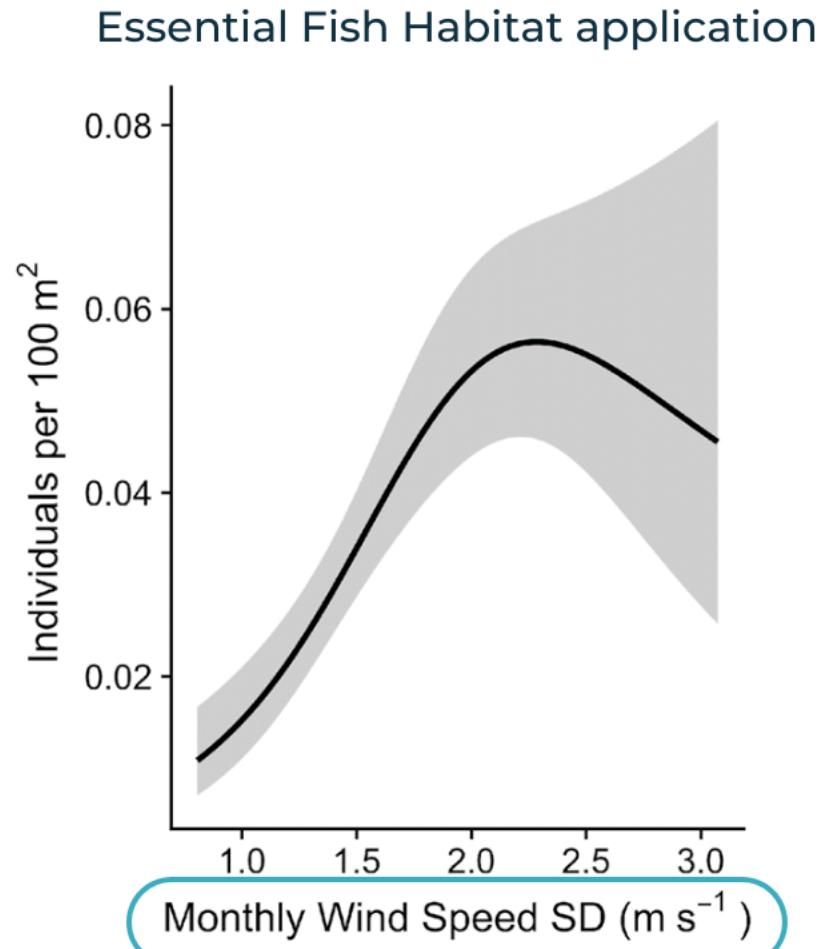


Fig5A: Couch *et al.* (in review)

Develop and utilize EBFM relevant data and modeling tools



Tanaka and Oliver used EDS to enhance field observations of uku with spatiotemporally matching satellite data of monthly wind speeds.

EDS Take Aways

Allows users to download, filter, extract and summarize large amounts of gridded and tabular data given user-defined time stamps and geographical coordinates.

The various external environmental data summarized at select survey sites & areas can aid scientists to assess and understand how living marine resources are impacted by the environmental variabilities.

Thank you!

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kisei.tanaka@noaa.gov
thomas.oliver@noaa.gov



The background of the slide is an underwater scene. At the top, a scuba diver is visible, wearing a black wetsuit, red fins, and a green and yellow tank. Below the diver, there is a sandy ocean floor with some low-lying marine plants. In the foreground, there is a large, textured coral formation with a reddish-pink hue. The water is a clear blue.

Supplemental Slides

How to tell EDS what you want

Information needed in parameters file for downloading from servers

PARAMETER.NAME	DOWNLOAD	SENSOR_DATASET	FREQUENCY	URL	DATASET.ID	GRID.VARIABLE	START_DATE	STOP_DATE	TIMESTEPS	BLOCKSIZE	Summaries	MaskForOceanColor
Chlorophyll_A_ESAOCCCI_8Day	YES	ESA OC CCI	8day	https://oceanwatch.esa-cci-chla-8d-v5-0	chlor_a		9/4/1997	10/28/2018	965	10000	mean;q05;c	TRUE
Chlorophyll_A_ESAOCCCI_Clim	YES	ESA OC CCI	Climatology	https://oceanwatch.esa-cci-chla-1998-2017-clim	chlor_a		CumMean	CumMean_1	1	99999999	NA	TRUE
SST_CRW_Clim	YES	Coral Reef Watch	Climatology	https://oceanwatch.CRW_sst_v1_0_1985-2018-clim	analysed_sst		CumMean	CumMean_1	1	99999999	NA	FALSE
SST_CRW_Monthly	YES	Coral Reef Watch	Monthly	https://oceanwatch.CRW_sst_v3_1_monthly	sea_surface_temperature		1/31/1985	3/31/2021	435	10000	mean;q05;c	FALSE
NOAA Coastal Relief Model	YES	NGDC	Climatology	https://coastwatch.usgsCeCrm10_Lon0360	topo		Bathy_M	Bathy_M	1	99999999	NA	FALSE
Bathymetry_SRTM15	YES	srtm15plus	Climatology	https://coastwatch.srtm15plus	z		Bathy_M	Bathy_M	1	99999999	NA	FALSE

** details for how to fill these columns out are located in the GitHub README

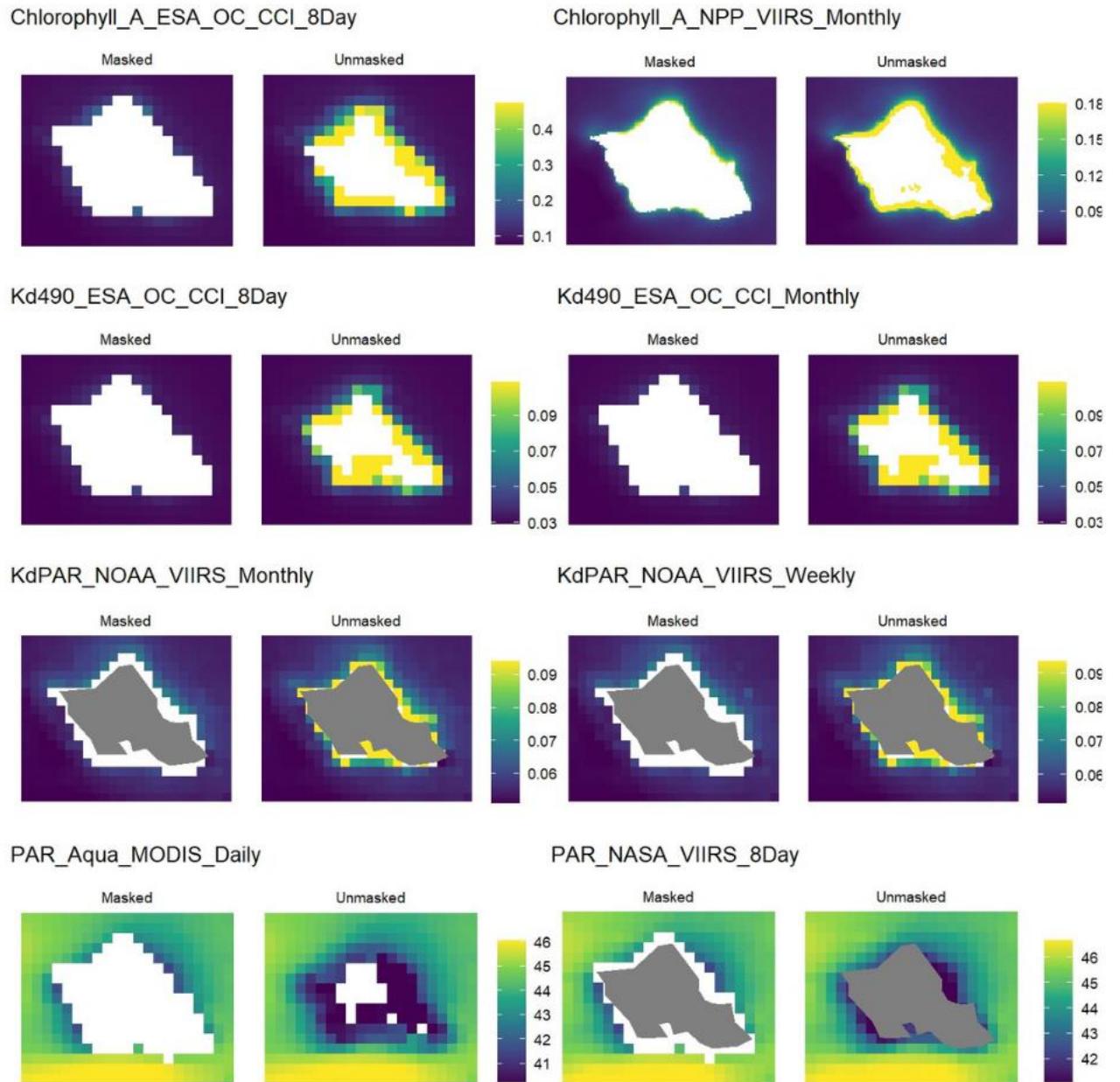


Masking

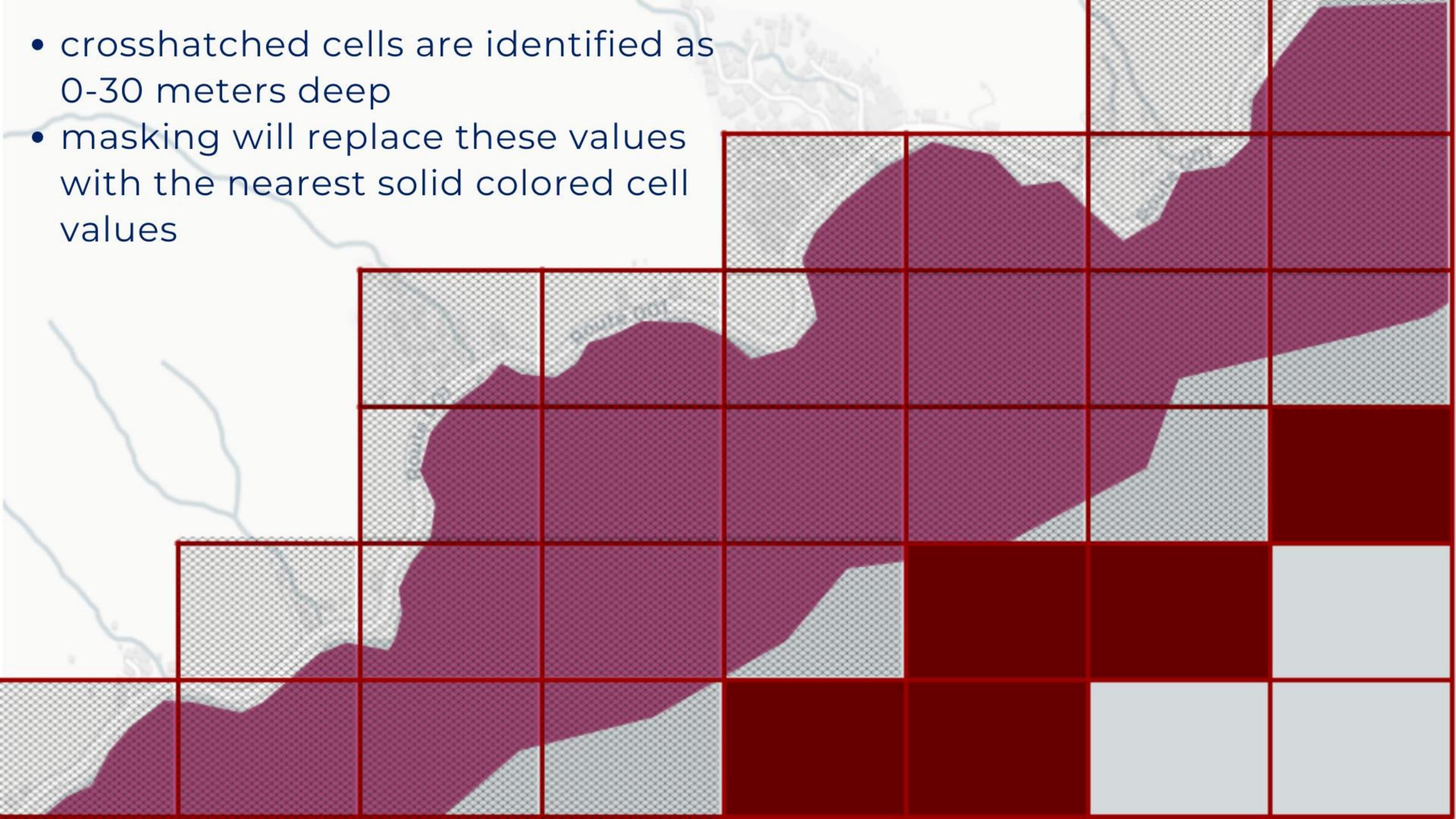
working with ocean color datasets in EDS

- Why mask: when satellites can see bottom of the ocean, the data is not as reliable
- Our solution:
 - We overlay rasters with bathymetry datasets at 15 arc seconds
 - Any pixels that are 5% or more of the pixel is 30 m or shallower, it is removed and assigned the neighbor pixel color

Masked versus unmasked ocean color data sets



- crosshatched cells are identified as 0-30 meters deep
- masking will replace these values with the nearest solid colored cell values





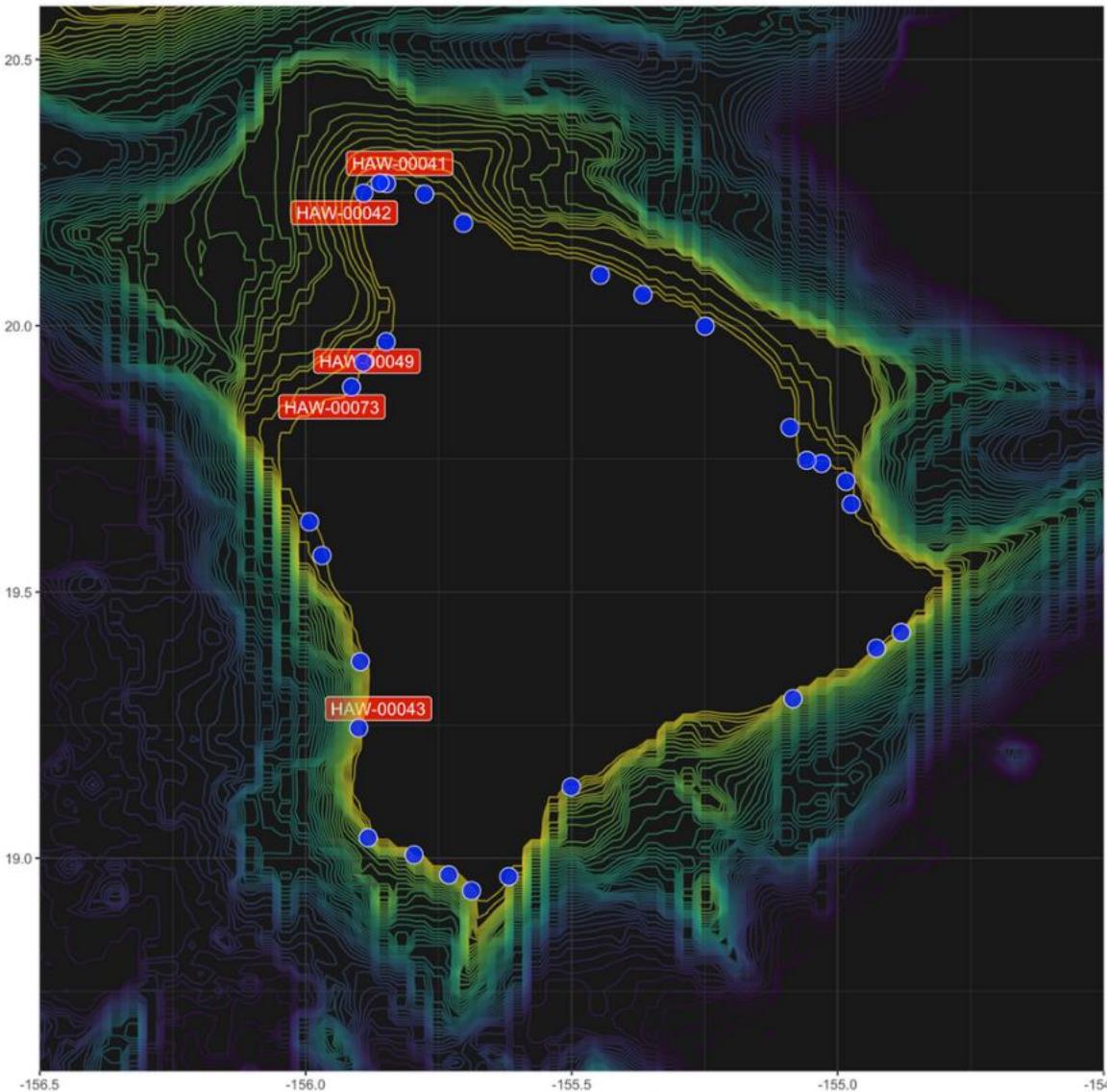
Citations

Couch, S.C, Oliver, A.T, Dettloff, K., Huntington, B. Tanaka, R. K., Vargas-Angel, B. In Review. Juvenile Corals Linked to Depth, Coral Cover, Heat Stress, Suitable Substrate, and Human Densities across the U.S Pacific

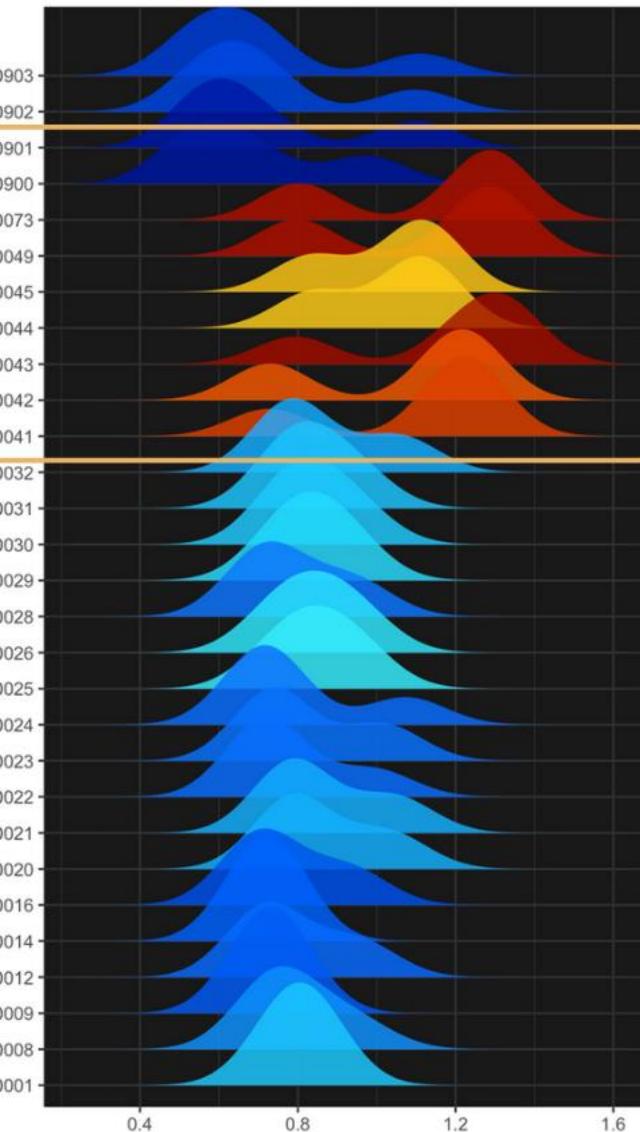
Tanaka & Oliver: <https://repository.library.noaa.gov/view/noaa/45102>

All photos taken by NOAA Pacific Islands Fisheries Science Center

SST Climatology Data on Hawai'i



Obs specific SST sd year_1



How EDS works - in situ records with no environmental data

Site	Lat	Lon	Time	CPUE
A	19.5	-154.8	15-Aug-22	3.2
B	19.5	-154.8	16-Aug-22	5.5
C	19.5	-154.8	17-Aug-22	2.1

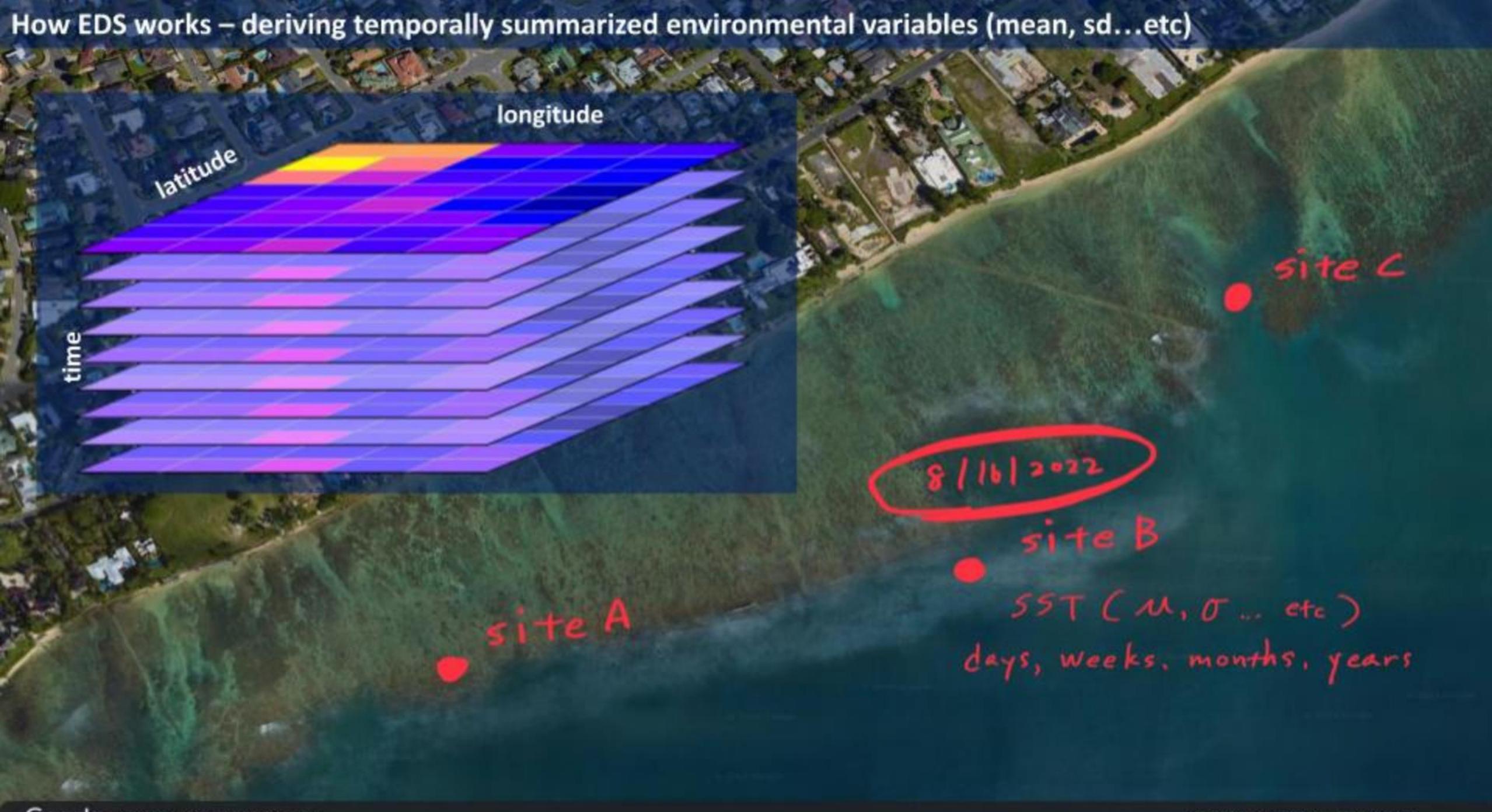


How EDS works - in situ records with **spatiotemporally matching** environmental data

Site	Lat	Lon	Time	CPUE	Daily_SST
A	19.5	-154.8	15-Aug-22	3.2	24.61
B	19.5	-154.8	16-Aug-22	5.5	24.61
C	19.5	-154.8	17-Aug-22	2.1	24.75



How EDS works – deriving temporally summarized environmental variables (mean, sd...etc)



How EDS works – extracting temporally summarized environmental variables

Site	Lat	Lon	Time	CPUE	Daily_SST	Monthly_Mean_SST	Monthly_Max_SST	Monthly_Min_SST	Monthly_SD_SST
A	19.5	-154.8	15-Aug-22	3.2	24.61	25.04	25.57	24.78	0.28
B	19.5	-154.8	16-Aug-22	5.5	24.61	25.08	25.63	24.78	0.29
C	19.5	-154.8	17-Aug-22	2.1	24.75	25.08	25.61	24.77	0.28

