Accessing NOAA Coral Reef Watch Time-Series Data Using ERDDAP

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One of the most common user requests that NOAA Coral Reef Watch (CRW) receives is for time-series data of our satellite-based products for a specific geographic location. This brief tutorial provides step-by-step instructions for accessing NOAA CRW time-series data as a downloadable, comma-separated file (.csv), for a single point, using an example Environmental Research Division's Data Access Program (ERDDAP) data server.

NOAA CRW products are gridded satellite data with a spatial resolution of 5km (or 0.05 degrees) and a daily temporal resolution. Data pixels (or data grids) are evenly spaced (meaning every pixel is the same size) and cover the entire globe. Longitude and Latitude represent the pixel centers. There are 7200 pixels in the Longitude dimension, ranging from -179.975 to 179.975. There are 3600 pixels in the Latitude dimension, ranging from 89.975 to -89.975. There is also a time dimension, with each time step representing 1 day (based on Coordinated Universal Time (UTC), also known as GMT time, Zulu Time, and Z Time). The time range for each product is from January 1, 1985 (or later in 1985; see below for product-dependent start dates) to the present. The most recent data are usually made available to users 1 day behind the current date, as pre-scheduled data processing occurs after the previous day ends.

NOAA CRW satellite-based products (also called variables) currently included in collaborators' ERDDAP servers are:

CRW_BAA (categorical) – Single-day Bleaching Alert Area

CRW_BAA_7D_MAX (categorical) – Rolling 7-day maximum Bleaching Alert Area

CRW_DHW (°C-weeks) – Degree Heating Week

CRW_HOTSPOT (°C) – Coral Bleaching HotSpot

CRW_SST (°C) – Sea Surface Temperature

CRW_SSTANOMALY (°C) – Sea Surface Temperature Anomaly

Click on each variable name to visit the CRW web page describing that variable. The single-day Bleaching Alert Area (BAA) and 7-day maximum BAA are described on the same page.

As noted above, the start date of the time-series data is product-dependent, as follows:

CRW_BAA	March 25, 1985
CRW_BAA_7D_MAX	March 31, 1985
CRW_DHW	March 25, 1985
CRW_HOTSPOT	January 1, 1985
CRW_SST	January 1, 1985
CRW_SSTANOMALY	January 1, 1985

Selecting Single or Multiple Variables, in one request, for one geographic point:

1.) From the NOAA CRW home page, click on the white "5km data" button to the left of the center map.

2.) On the NOAA CRW 5km data page, you will see links to access different ERDDAP data servers (examples are circled in red below). For this exercise, click on the "ERDDAP (data page)" link under **Data Access via Data Servers at NOAA CoastWatch West Coast Regional Node**. (Please feel free to explore the "ERDDAP (graph page)" options as well, as these contain additional graphic interfaces.)

Data Access via HTTPS Server:

NetCDF4 Data[+] BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)
Images (pixels) BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)
Images (browse) BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)

Data Access via FTP Server:

NetCDF4 Data[+] BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)
Images (pixels) BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)
Images (browse) BAA[*] (7-d max) | BAA (single-day) | HotSpot | DHW | SSTA | SST | SST Trend (7-day)

Data Access via Data Servers at PacIOOS[#]:
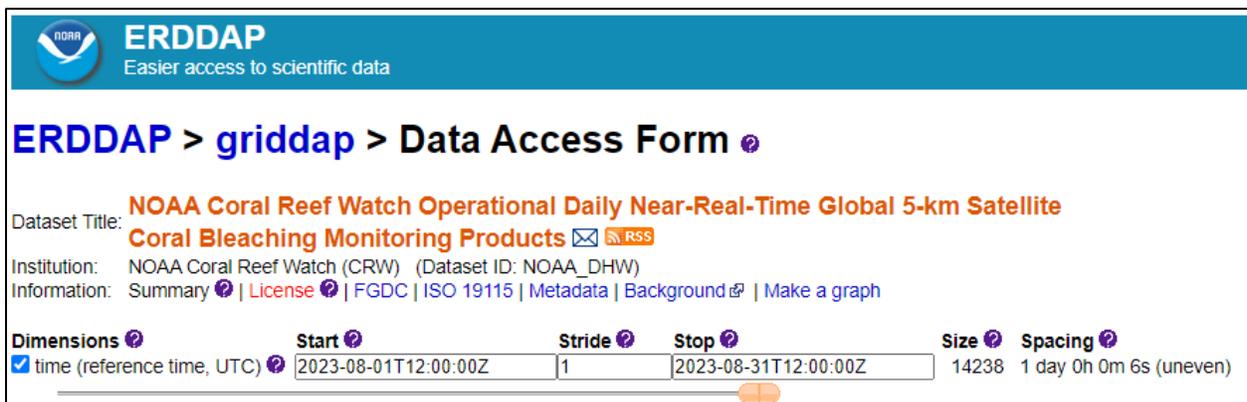
ERDDAP (data page) | ERDDAP (graph page) | THREDDS Data Server

Data Access via Data Servers at NOAA CoastWatch West Coast Regional Node:

ERDDAP (data page) | ERDDAP (graph page)

+ CDAT software to view CRW NetCDF data files.
* BAA: Bleaching Alert Area; DHW: Degree Heating Week; SSTA: SST Anomaly; SST: Sea Surface Temperature.
# PacIOOS: Pacific Islands Ocean Observing System.

3.) From the ERDDAP landing page, under **Dimensions**, for "time", enter Start and Stop times for the duration of the time-series of interest. For this example, the entire month of August 2023 is entered. For the Stride field, leave the default setting of '1'. (Note: the format of the date is important. NOAA CRW data are in 1-day increments. The only text that needs to change in the date fields is the year, month, and day. It is possible to select up to 1 year of data at a time, but the request may take a few minutes to process. If requesting a lengthy time-series dataset, you could experience a long delay in the data download, or the data server may become overwhelmed and reject the request. Please feel free to experiment with the temporal length of each data request, to find the most efficient download approach. However, please avoid submitting too many requests, one right after the other, to not overwhelm the data server.)

4.) For "latitude" and "longitude", under **Dimensions**, in the Start and Stop fields, enter the latitude and longitude of the geographic point of interest. For latitude, repeat the value in the Start and Stop fields; do the same for the longitude. For this example, a point near Key West, Florida is entered [24.522006, -81.774037].

(Note: The form will automatically find the nearest 5km satellite grid point to the location entered. If the point entered falls on land, the resulting data will be NANs, and a new point farther offshore will need to be entered. The default values for "latitude" and "longitude" show the valid range of allowable inputs.)

5.) Select the desired grid variables (CRW products) for the resulting time-series. The question mark icon next to each variable provides additional details about the variables. The core NOAA CRW satellite products are: **CRW_BAA, CRW_BAA_7D_Max, CRW_DHW, CRW_HOTSPOT, CRW_SST,** and **CRW_SSTANOMALY**. The missing data masks and sea ice can be ignored for most users. For this example, the masks and sea ice are unselected, leaving only the six standard products.

6.) Under **File type**, choose the desired data format. For this exercise, a comma-separated file (.csv) is selected, with line 1 of the file containing the names of each variable and line 2 containing the units. From here, click the **gray Submit button**, and a file download dialog box will open. Choose where to save the file on your machine. (Note: This step may take a while, depending on your internet connection and the size of the dataset requested. Also, the units [on line 2] for CRW_BAA and CRW_BAA_7D_MAX are categorical and therefore show up as "1" in the resulting file. See the "?" icon next to the BAA variables for additional information.)

File type: (more information)
.csv - Download a ISO-8859-1 comma-separated text table (line 1: names; line 2: units; ISO 8601 times).
Just generate the URL:
(Documentation / Bypass this form) ❓

Submit (Please be patient. It may take a while to get the data.)

7.) The locally downloaded file can now be opened in a program such as Microsoft Excel, Google Sheets, LibreOffice-Calc, Gnumeric, Apache OpenOffice Calc, or similar. The header and first few rows of the data table look like the following in Microsoft Excel. (Note: The default filename is a unique ID. We recommend renaming the file to better suit your needs, after download.)

	A	B	C	D	E	F	G	H	I
1	time	latitude	longitude	CRW_BAA	CRW_BAA_7D_MAX	CRW_DHW	CRW_HOTSPOT	CRW_SST	CRW_SSTANOMALY
2	UTC	degrees_north	degrees_east	1	1	Celsius weeks	Celsius	Celsius	Celsius
3	2023-08-01T12:00:00Z	24.525	-81.775	4	4	10.97	1.74	31.41	1.87
4	2023-08-02T12:00:00Z	24.525	-81.775	4	4	11.23	1.83	31.5	1.95
5	2023-08-03T12:00:00Z	24.525	-81.775	4	4	11.52	2.05	31.72	2.16
6	2023-08-04T12:00:00Z	24.525	-81.775	4	4	11.78	1.85	31.52	1.95
7	2023-08-05T12:00:00Z	24.525	-81.775	4	4	12.05	1.89	31.56	1.98
8	2023-08-06T12:00:00Z	24.525	-81.775	4	4	12.36	2.16	31.83	2.24
9	2023-08-07T12:00:00Z	24.525	-81.775	4	4	12.69	2.26	31.93	2.33
10	2023-08-08T12:00:00Z	24.525	-81.775	4	4	13	2.23	31.9	2.3

8.) The ERDDAP servers are also capable of extracting data for a larger geographic region. If you need regional data, please experiment with this feature by expanding the spatial range (Latitude and Longitude) from a single point to the desired spatial area. Please contact NOAA CRW at coralreefwatch@noaa.gov with any questions.