



BeachCOMBERS
Coastal Ocean Mammal and
Bird Education and Research
Surveys

*NEW Data Portal and
Data Products*



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What is CeNCOOS?



CeNCOOS
CENTRAL & NORTHERN
CALIFORNIA OCEAN
OBSERVING SYSTEM

1 of 11 Regional Associations → IOOS (NOAA)

Focus:

- **Forecasting (Models)**
- **(Near) Real Time Oceanographic Data Collection**
- **Providing access to data and value-added products**

Ocean Data Management

Providing tools for wide range of Stakeholders (You All!)

What is CeNCOOS?

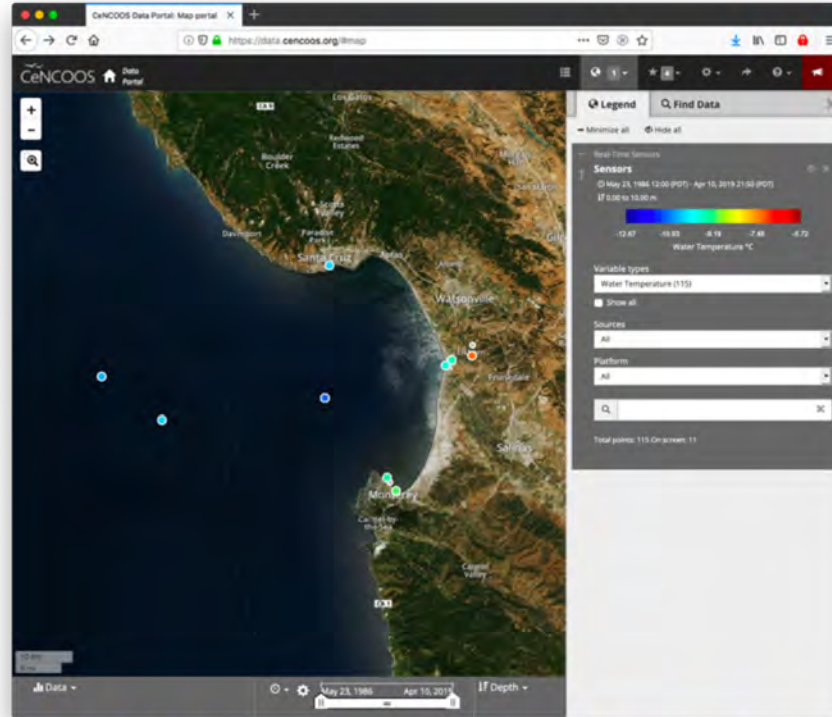
The CeNCOOS Data Portal data.cencoos.org

What the Portal is:

1. A place to **Discover/Access/Download** data
2. A place to **monitor real-time** data
3. A place to develop **routine analysis**

What the Portal is Not:

1. A place to do GIS analysis
2. A place to run complex statistics (with some exceptions)



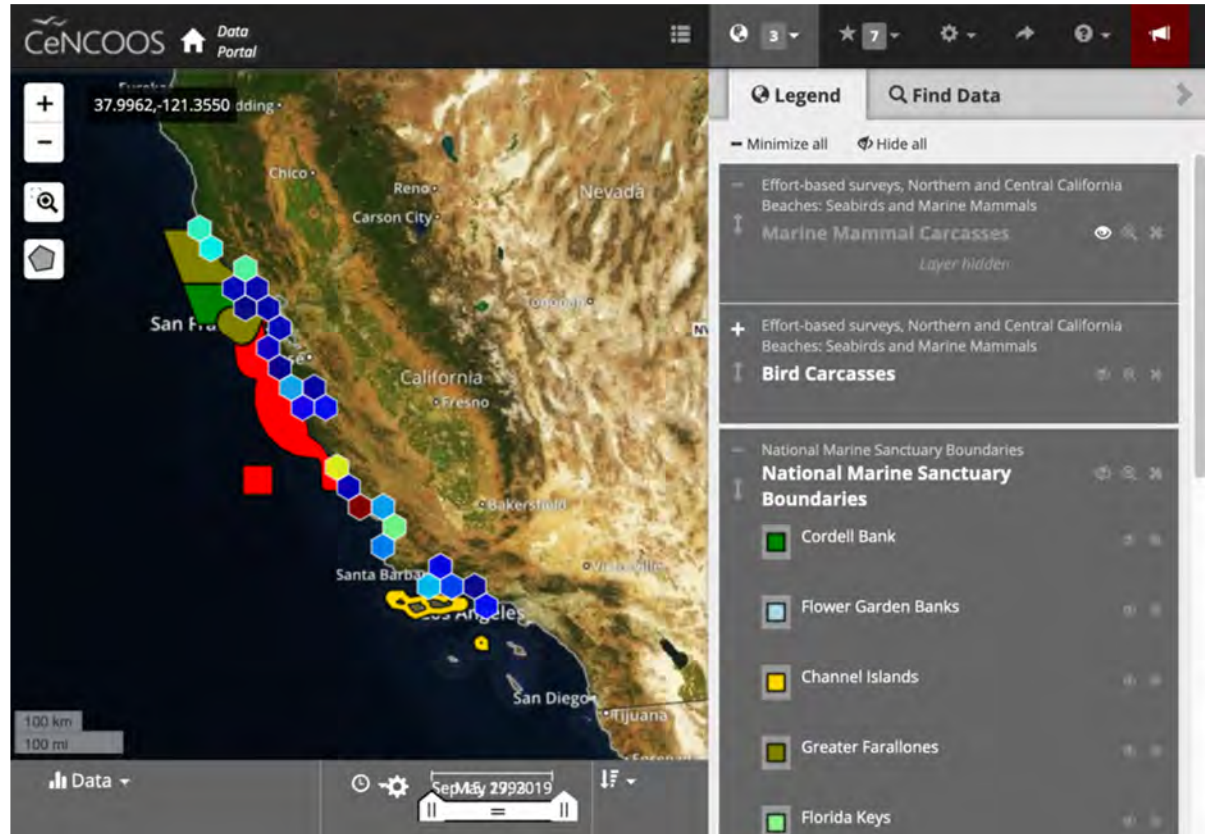
**All of the Sensors reporting Water Temperature
in the past 24 hours**

MBON / CeNCOOS Data Portal

BeachCOMBERS data in portal

CeNCOOS Data Portal

<https://www.cencoos.org/combers-tutorial>

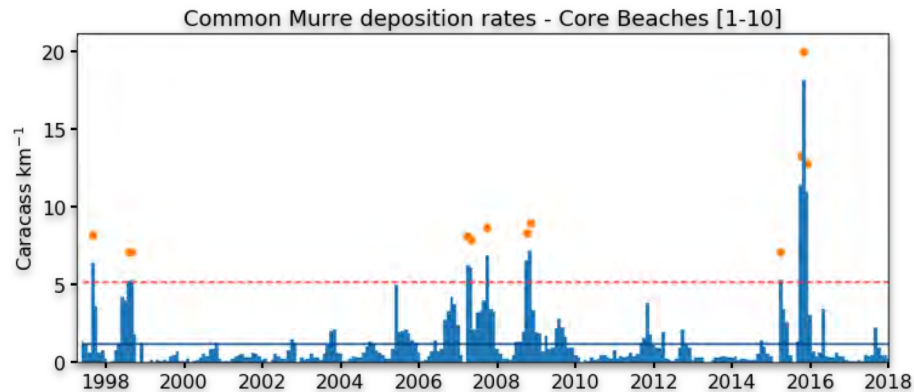


So what now...

All of the data is machine readable.

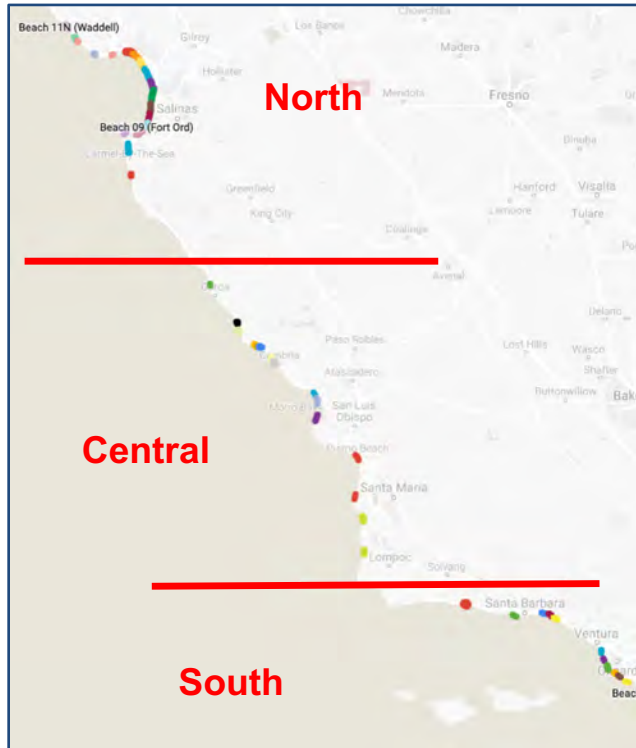
```
[23]: mures = core_birds.query("species_common_name == 'Common Murre'")
# 1. Count the number of surveys per beach per month
unique_surveys = core_birds.groupby([pd.Grouper(freq="M"), core_birds['beach_segment_code']])[['unique_survey_identifier']].unique()
unique_surveys = unique_surveys.apply(lambda x: int(np.shape(x)[0]))
# 2. Count the number of carcasses per month per beach
carcass_count = mures.groupby([pd.Grouper(freq="M"), mures['beach_segment_code']])[['carcass_present']].count()
carcass_count.head()
# 3. Divide by the number of surveys per month (average birds per month)
birds_per_month = carcass_count/unique_surveys
# 4. Divide by the length of the beach (birds/km/month)
beach_length = core_birds.groupby([pd.Grouper(freq="M"), core_birds['beach_segment_code']])[['beach_length']].first()
birds_per_km = birds_per_month/beach_length
birds_per_km.head()
# 5 Calculate the density by beach
beach_ids = ['01', '02', '03', '04', '05', '06', '07', '08', '09', '10']
for i, beach_id in enumerate(beach_ids):
    if i == 0:
        beach_density = pd.DataFrame({'birds_per_km':birds_per_km.xs(beach_id, level='beach_segment_code', drop_level=True)})
        beach_density['date'] = beach_density.index.tz_localize(None).to_pydatetime()
        beach_density.index = beach_density['date']
        beach_density.rename(columns={'birds_per_km':beach_id}, inplace=True)
    else:
        temp_beach = pd.DataFrame({'birds_per_km':birds_per_km.xs(beach_id, level='beach_segment_code', drop_level=True)})
        temp_beach['date'] = temp_beach.index.tz_localize(None).to_pydatetime()
        temp_beach.index = temp_beach['date']
        beach_density[beach_id] = temp_beach['birds_per_km']

mures_filled_zeros = beach_density.replace(to_replace=np.nan,value=0)
murre_deposition = mures_filled_zeros.mean(axis=1)
```



Calculating Unusual Mortality Events of Murres

BeachCOMBERS Overview and Impact

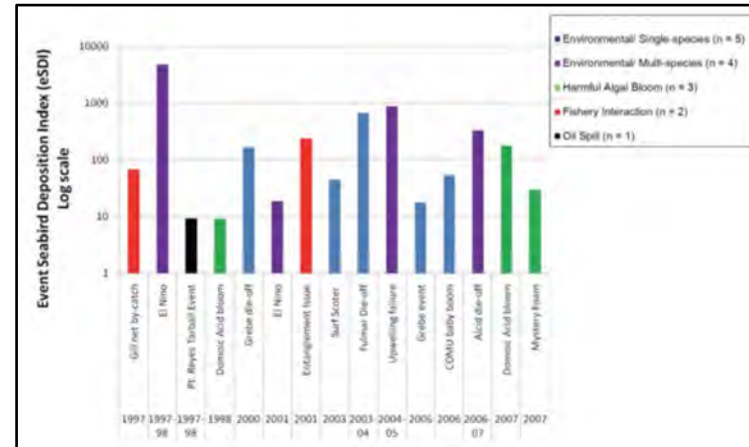


Collaborative citizen science program started in 1997

- Began in Monterey Bay region (North); expanded to central region; southern region added 2013
- As of May 2019: 100+ active volunteers

Goal: Use deposition as index of health of sanctuary

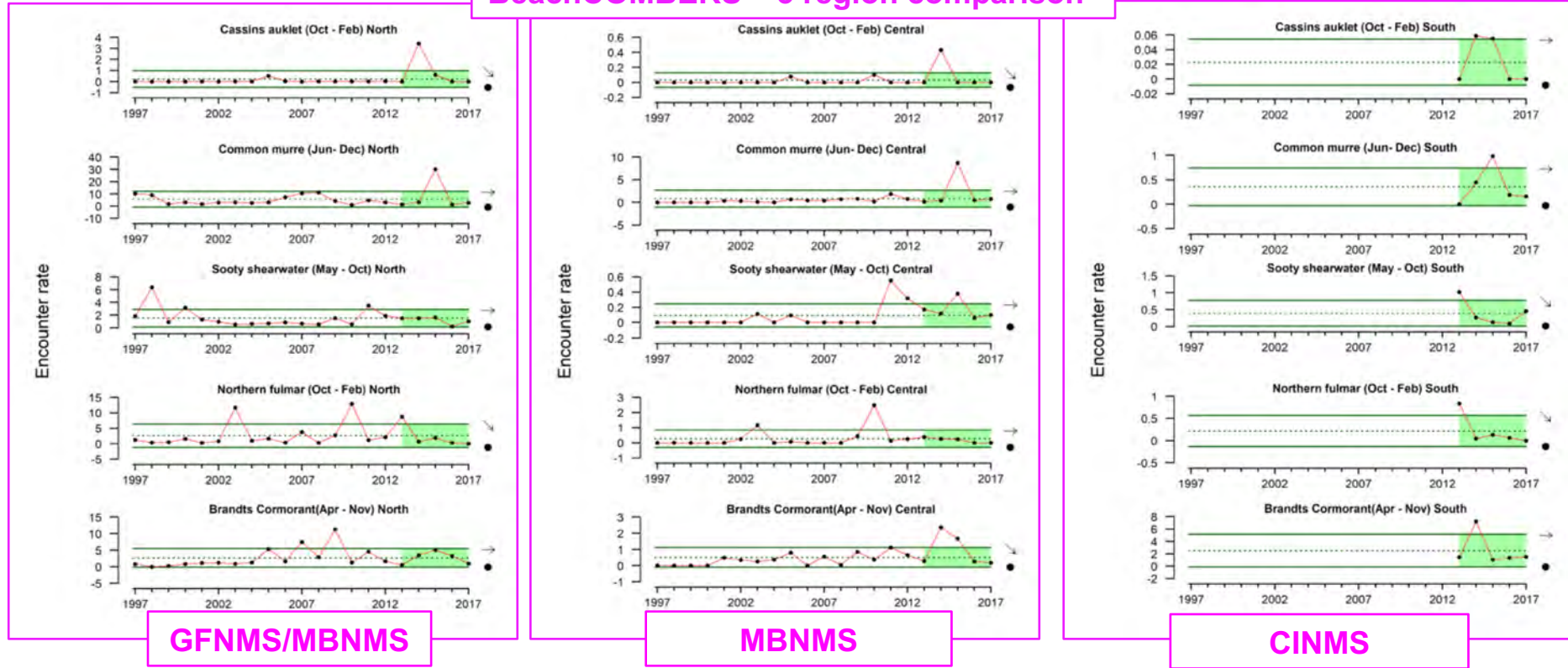
- Detects on 2-3 UMEs each year
- Informs management if UME human-caused
- Informs condition reporting for protected species and human impacts



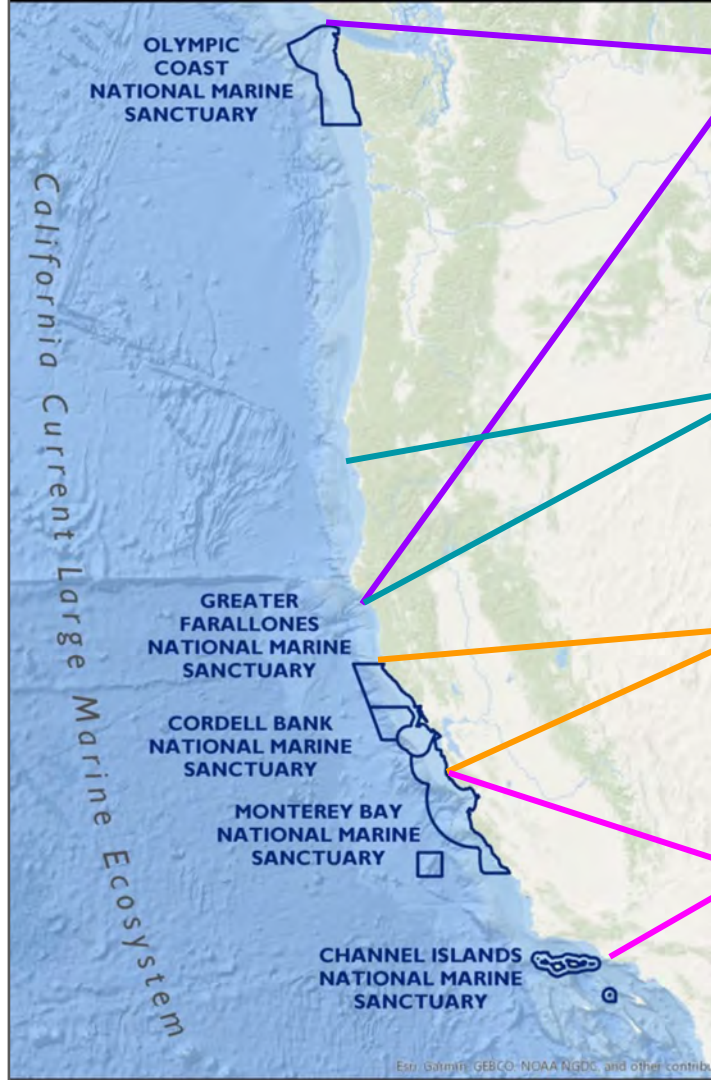
Draft graphs from upcoming CCIEA tech memo

"Ecosystem status report of the California Current for 2019. NOAA Tech Memo NMFS-NWFSC-XXX"

BeachCOMBERS – 3 region comparison



Encounter rate of bird carcasses on a) northern, b) central and c) southern survey beaches in BeachCOMBERS program.



COASST (Coastal Observation and Seabird Survey Team)



Humboldt State Marine Mammal Stranding Program



Beach Watch (GFNMS)



BeachCOMBERS (Coastal Ocean Mammal and Bird Education and Research Surveys)



Esri | Garmin | GEBCO | NOAA | NGDC, and other contributors

BeachCOMBERS Data in Condition Reports

PELAGIC INDICATORS - Monterey Bay



KEY CLIMATE & OCEANOGRAPHIC DRIVERS

- Q2, Q6: Nitrogen: Phosphorus
- Q7: HABs - extent, duration, frequency
- Q8: Basin-scale indicators (MEI, NPGO, CUI)
- Q8: pH
- Q8: Sea surface temperature
- Q8: Dissolved Oxygen



KEY HUMAN ACTIVITIES

- Q2, Q7 Contaminant levels in water, fish
- Q2: Shipping activity levels
- Q2: Marine debris abundance
- Q4: # strandings/entanglements
- Q4: Commercial fishing activity level
- Q4: Recreational fishing activity level



Q12: Phytoplankton/Chl a Biomass

Q15: At-sea seabirds Species richness

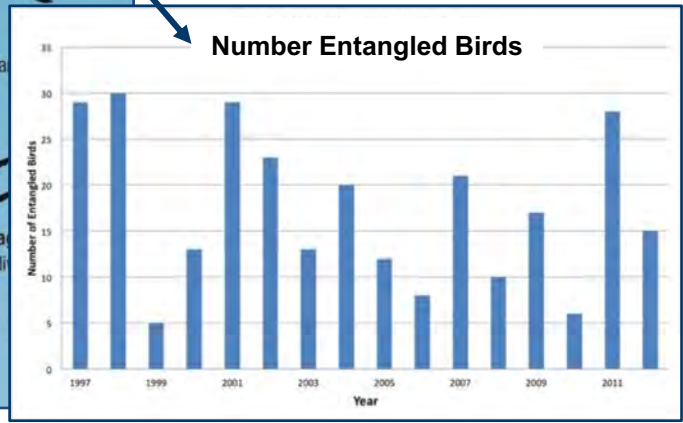
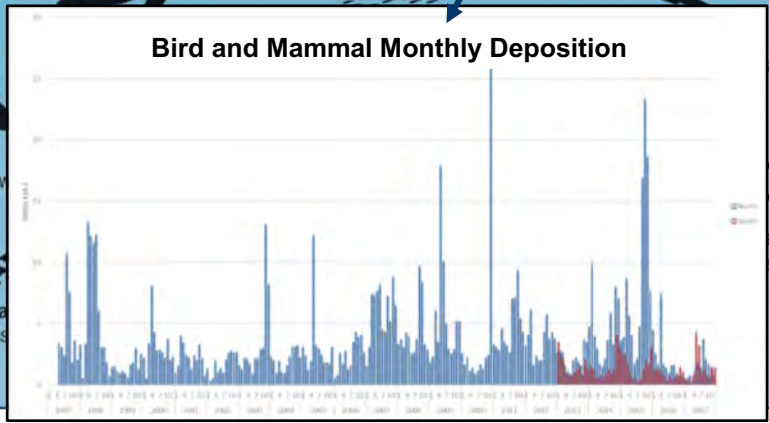
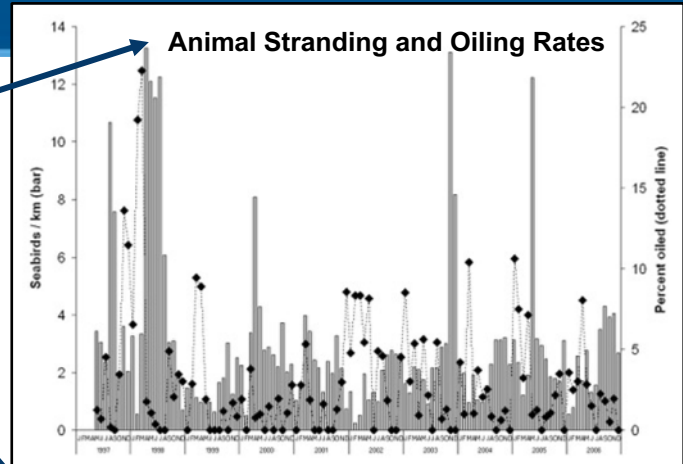
Q13: Local nesting birds Colony size & productivity

Q15: Phytoplankton Taxonomic structure

Q13: Salmon Abundance

Q13: Pinniped Pup production & growth

Q15: Mid-water assemblage Diversity metrics



Data Portal Roll Out

DRAFT

New data portal puts BeachCOMBERS data at your fingertips

Summer 2019

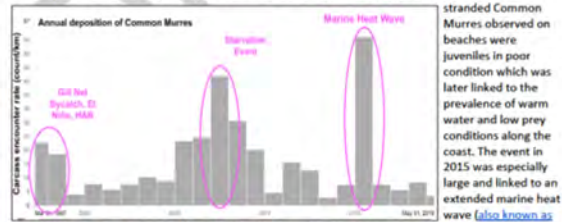
Since 1997, trained volunteers of the Coastal Ocean Mammal and Bird Education and Research Surveys (BeachCOMBERS) program head out each month to beaches in Monterey Bay National Marine Sanctuary on the lookout for the remains of washed up marine birds and mammals. Thanks to these dedicated volunteers, the BeachCOMBERS program now has over 20 years of baseline information on rates of deposition of beachcast birds and mammals on sanctuary beaches, which is used as an index of the health of the sanctuary. When the number of carcasses on beaches is much higher than usual, this is evidence of a mortality event and, on average, the BeachCOMBERS program has detected 2-3 events each year.



A volunteer examining a dead Brown Pelican during a BeachCOMBERS survey. (Credit: Thierry Thy, BeachCOMBERS)

When sanctuary visitors encounter many dead seabirds or marine mammals on the beach, they may assume it is caused by human activities such as fishing, shipping or pollution, but it may also be due to natural events, such as an El Niño. Determining if an event is natural- or human-caused can be challenging, but additional information collected by BeachCOMBERS volunteers, such as noting which carcasses are covered in oil, entangled in fishing gear, or associated with trash, and collecting specimen for analyses, can help wildlife experts and managers determine the cause.

For example, the BeachCOMBERS program detected unusual mortality events of Common Murres, a small black and white seabird, in 1997, 1998, 2007, and 2015 and helped determine that these events could be attributed to different causes. The mortality event in mid-1997 was linked to murrelets entangled in gillnets, while El Niño conditions and a toxic algal bloom within Monterey Bay caused the mortality event the following spring and summer. In both 2007 and 2015, many of the dead and



Annual encounter rate of Common Murres Uria aegle on 11 core BeachCOMBERS beaches in Monterey Bay. Time series graph created using CeNCOOS data portal.



DRAFT

In addition to helping detect and differentiate human and naturally caused events, BeachCOMBERS data have helped the sanctuary answer questions on the status of endangered seabirds and mammals, the impacts of changing ocean conditions (e.g., El Niño, harmful algal blooms), and impacts from human activities (fishing entanglements, marine debris, oiling) in the 1998 and 2015 MBNMS condition reports.

The BeachCOMBERS program recently turned 20 and to mark that important milestone released a 20-year report which is available on the [BeachCOMBERS program website](#). This report is considered a living document that will be added to over the coming months.

Introducing the NEW CeNCOOS data portal

BeachCOMBERS data are available for everyone to explore through an on-line data portal hosted by the Central and Northern California Ocean Observing System. Using this [data portal](#), created through a collaboration between Moss Landing Marine Laboratories, Office of National Marine Sanctuaries, the Marine Biodiversity Observation Network, CeNCOOS, and National Marine Fisheries Services Environmental Research Division, you can:

- View all beach segments being monitored or zoom in to the beaches of interest to you;
- Identify which seabirds and mammals are most commonly found on beaches;
- Explore when [marine mammal](#) and [seabird](#) strandings have peaked;
- Compare BeachCOMBERS marine mammals observations to those collected by two partner programs, Greater Farallones National Marine Sanctuary's Beach Watch and Humboldt State University's Marine Mammal Stranding Program ([example](#)); and
- Compare seabird strandings across Greater Farallones, Monterey Bay, and Channel Islands sanctuaries to explore if an event is local or regional in extent ([example](#)).

A [tutorial](#) is available to guide new users through the portal's many features and show how to create some useful outputs, such as the example data views available through the links above.

What's Next?

Now that seabird and marine mammal stranding data are available through the CeNCOOS portal, it is being used as a key indicator for tracking ecosystem health by NOAA's California Current Integrated Ecosystem Assessment program and incorporated into the upcoming 2019 edition of the [Ecosystem Status Report of the California Current](#). BeachCOMBERS data are being used as a model for developing dynamically updating critical parameters for future sanctuary condition reports. Additionally, the Southern California Coastal Ocean Observing System's monthly [California HAB Bulletin](#) is planning to incorporate BeachCOMBERS seabird stranding data from Santa Cruz to LA County.



Screen shot of the CeNCOOS data portal showing the boundaries of four west coast National Marine Sanctuaries and hexagons showing the geographic scope of the data layer called Effort-based surveys, Northern and Central California Beaches: Seabirds and Marine Mammals.

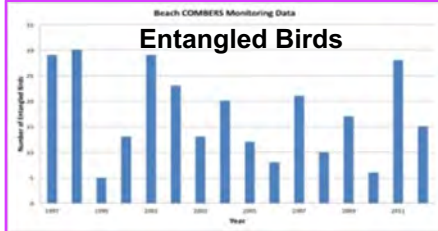
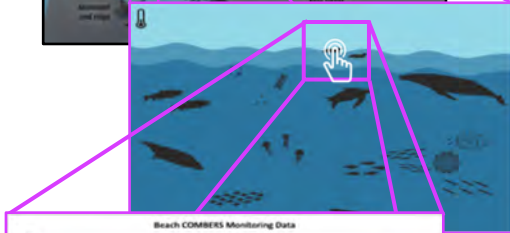


Tiers of Data Products

Infographics

Task: information discovery

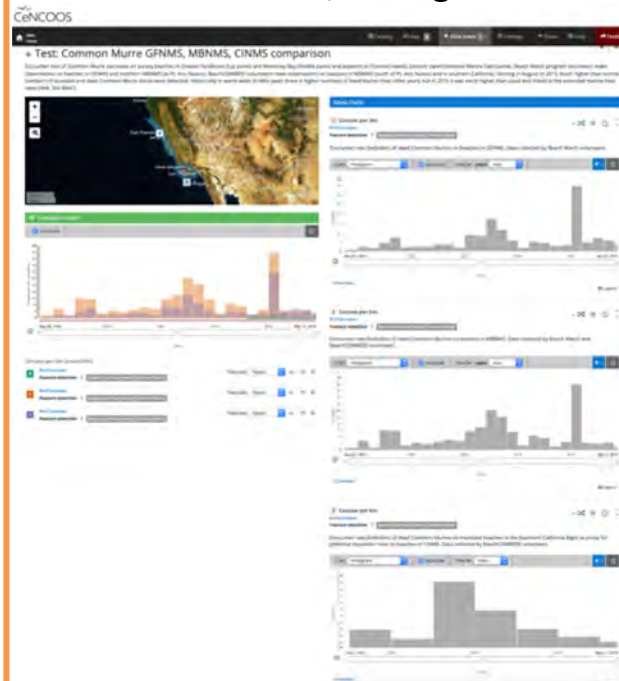
Audience: Public, managers, educators



Curated Data Views

Task: periodic information updates

Audience: Advisory groups,
researchers, managers



Data portals

Task: data exploration

Audience: technical experts



Curated Data Views

- A web page that displays predetermined data, maps, images that are intended for display together
- Allows users limited customization of graph appearance
- More technical than interactive infographics
- Could be focused on specific management theme or topic

Test data view: Long-term monthly beach deposition rates:

<https://data.cencoos.org/?ls=ab310e75-36d5-9f28-32d7-b74a2036e4fc#data/1>

Test data view: The seven commonly encountered seabirds:

<https://data.cencoos.org/?ls=4f0b256c-b807-3aeb-005e-9cfbbe58ffc9#data/default>

Test data view: The five most commonly encountered marine mammals:

<https://data.cencoos.org/?ls=32e4b4c3-44c1-0aeb-8a81-f1daece10c0c#data/2>

Test data view: Common Murre GFNMS, MBNMS, CINMS comparison

<https://data.cencoos.org/?ls=508aa6ce-b7d7-0390-6b3a-71a531b23d4e#data/3>

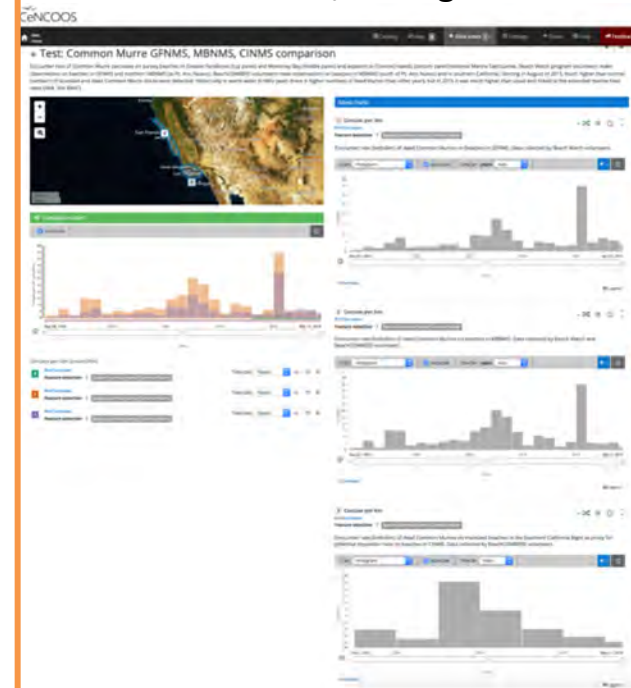
Test data view: California sea lion HSU, BW, BC monitoring program comparison

<https://data.cencoos.org/?ls=6e5dfd27-3b38-9064-85ab-096321b21641#data/4>

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Feedback

- 1) What management question are you most interested in using BeachCOMBERS data to answer?
- 2) What product types would be most helpful to you?
- 3) Don't forget the portal feedback button!





On the SCCOOS project page for the [California HAB Bulletin](#) it says

“Soon we will incorporate marine mammal stranding data for Southern California from the [Pacific Marine Mammal Center](#) and [BeachCOMBERS](#) bird stranding data from Santa Cruz to LA County. “

PELAGIC INDICATORS - Monterey Bay



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KEY HUMAN ACTIVITIES

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 Q2: Shipping activity levels
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 Q4: Commercial fishing activity level
 Q4: Recreational fishing activity level

↑ Chinook returns
 (central valley)



Q12: Phytoplankton/Chl a
 Biomass

Q15: At-sea seabirds
 ↑ Sooty Shearwaters
 (nearshore)

Q13: Local nesting birds
 Colony size & productivity

Q13: Salmon
 Abundance

Q13: Leatherback
 Abundance

Q12: Key forage invertebrates
 Species abundance

Q13: Baleen whales
 Local distribution & abundance

Q13: Pinniped
 Pup production & growth



Q13: Gelatinous zooplanton
 Relative abundance/biomass

Q12: Key forage fishes
 Species abundance

Q15: Forage assemblage
 Species richness & diversity

Q15: Mid-water assemblage
 Diversity metrics

↑ Pyrosomes

Forage Fish & Invertebrates

- ↓ krill
- ↓ YOY rockfish, sanddab
- ↑ anchovy (adults)

Strandings

- ↑ Guadalupe fur seals - emaciated
- ↑ CA sea lion - HABs/domoic acid (central & south CA)
- ↑ Grey whale - emaciated
- ↑ Common Murre (N of Bodega) - emaciated

SE Farallon Island - reproduction

- ↓ Cassin's Auklet, Common Murre, Rhinoceros Auklet, Pelagic Cormorant, Brandt's Cormorant & Pigeon Guillemot

Año Nuevo Island - reproduction

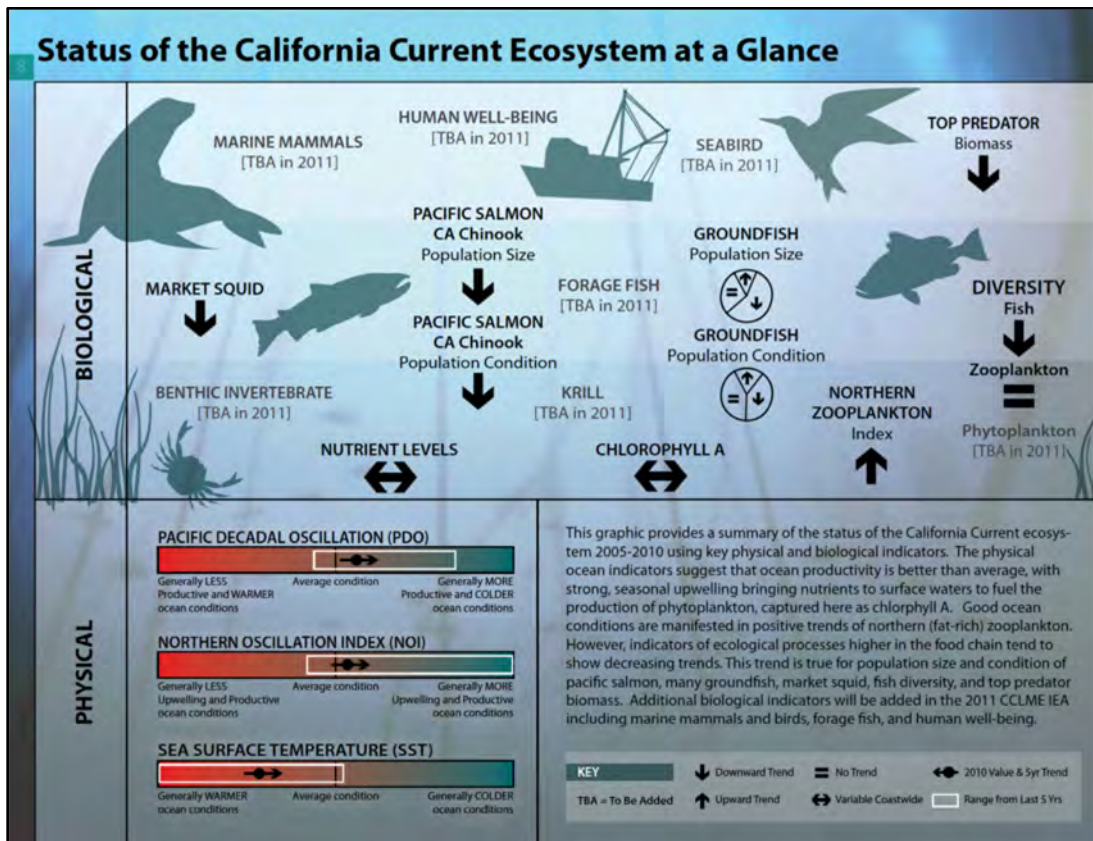
- ↓ Cassin's Auklet (breeding failure)
- ↓ Rhinoceros Auklet, Brandt's Cormorant

↑ Humpback whales (nearshore)

Other observations:

- Largest warm water anomaly, 50 day duration (still offshore for now); see "[BlobTracker](#)"
- Regional (north/south) differences in epipelagic community off CA

Inspiration from early CCIEA Exec Summary 'Visual Condition Report'

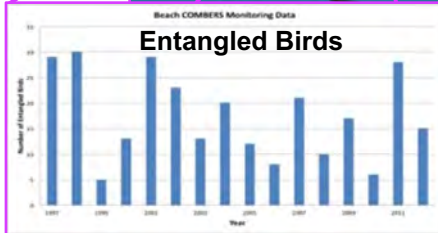
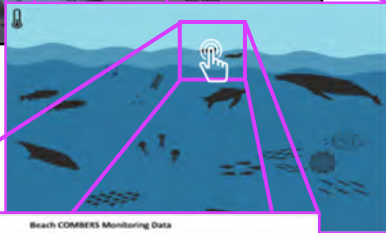


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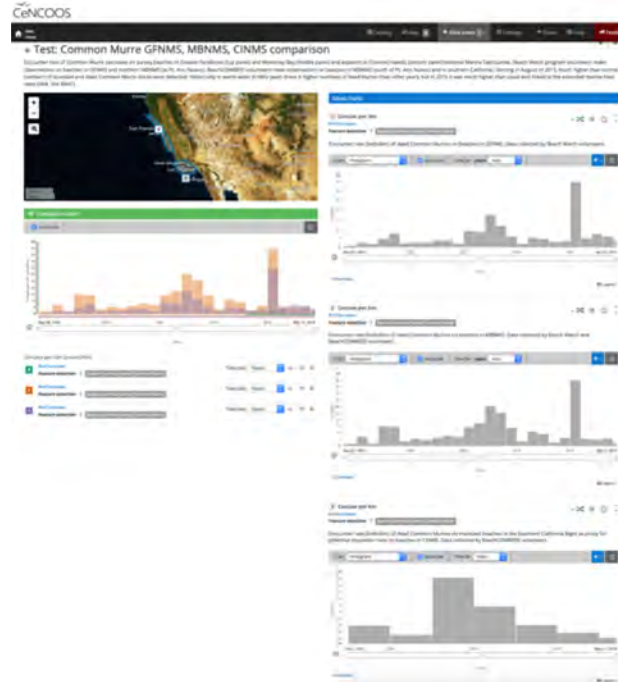
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Curated Data Views

Task: periodic information updates

Audience: Advisory groups, researchers, managers



Data portals

Task: data exploration

Audience: technical experts



Public version of BeachCOMBERS data in ERDDAP

BeachCOMBERS program data is now publically discoverable in ERDDAP (thanks to Lynn deWitt)

[BeachCOMBERS Effort-Based Marine Mammal and Seabird Beach Cast Survey](#)

This includes two fields not available in the CeNCOOS data portal:

Condition code:

- 0: unknown
- 1: live injured, dying, sick or oiled animal
- 2: Fresh dead, a carcass that has just washed in from the sea. May be scavenged, but will have fresh blood and tissue exposed
- 3: Decomposing animal, often has bugs and/or deteriorating tissue
- 4: Animal is no longer decomposing at a fast rate because it has dried out and become mummified

Cause_of_death code:

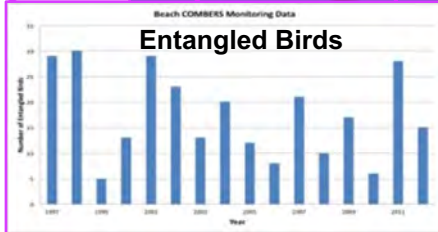
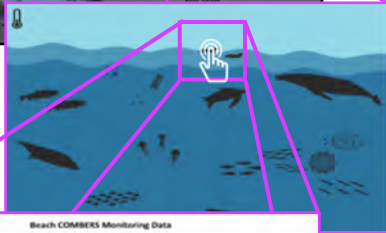
- 0: left blank
- 1: shot
- 2: tangled in fishing net/line
- 3: tangled in plastic
- 4: unknown
- 5: oil
- 6: shark
- 7: other, see notes

Tiers of Data Products

Infographics

Task: information discovery

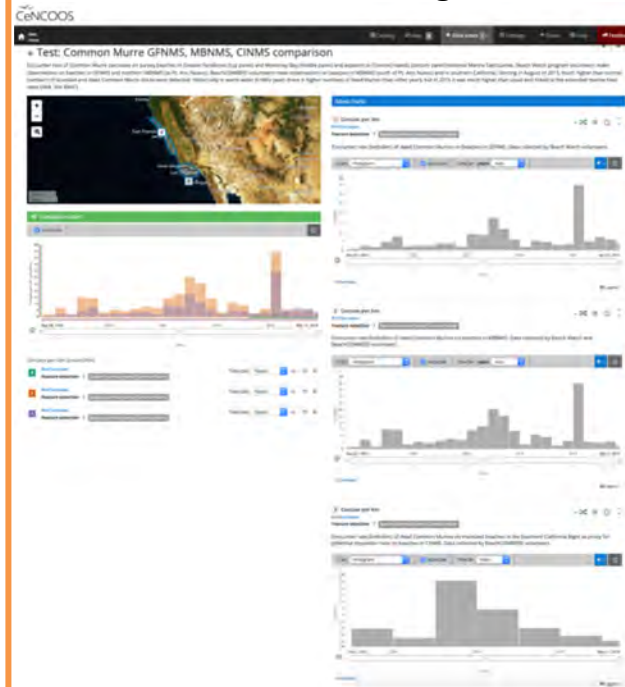
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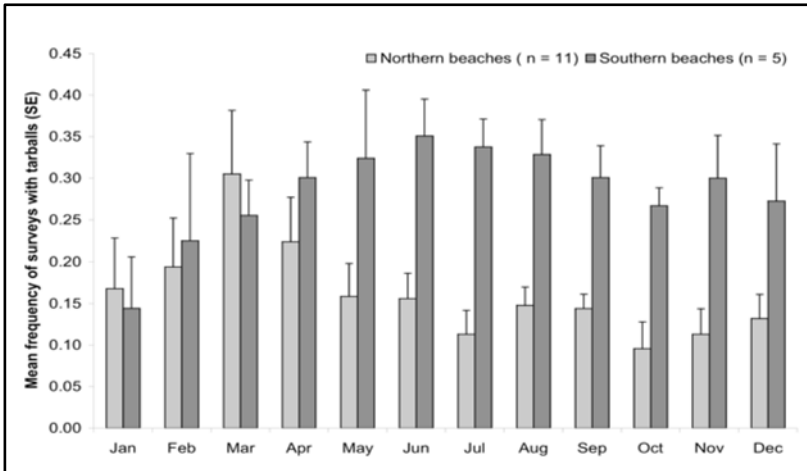
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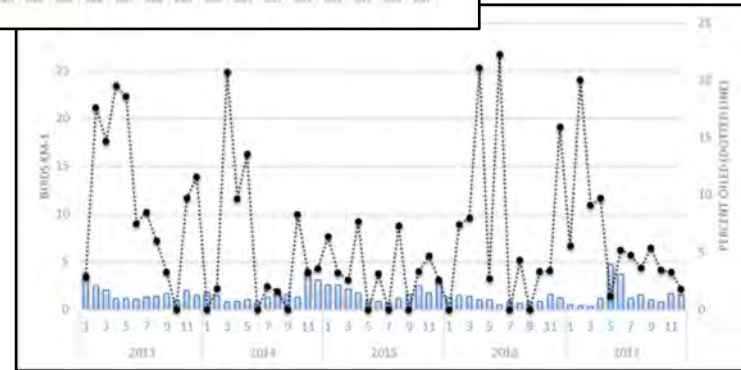
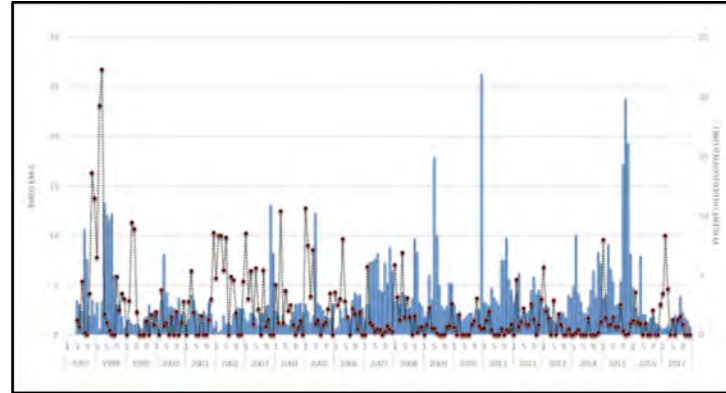


BeachCOMBERS: Tar deposition and oiling rates

Comparing background tar deposition and differences in regional oiling rates could be an interesting component of a CeNCOOS dashboard focused on this topic of management interest/concern



Mean frequency of surveys with tarballs for the northern (beaches #1–11) 1997–2007 and southern (#12–17) survey areas, 2001–2007.



Oiled seabird deposition (seabirds/km) and percent oiled, for Monterey Region core beaches and Southern Chapter beaches. Significant oiling events were identified when the percent oiled birds exceeded 2% in the north and 9% in the south.