Channel Islands Harbor
Water Quality Event
June & July, 2018

Presented by:

- Dr. David A. Caron
  - Professor of the Department of Biological Sciences, USC (since 1999)
  - Chief Science Officer of Aquatic EcoTechnologies, Inc.
  - Ph.D in Biological Oceanography conferred jointly by the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institution
  - 250 scientific articles and book chapters on the ecology of microbes in marine and freshwater systems

- Mr. Scott C. Johnson
  - Senior Scientist/Laboratory Director, Aquatic Bioassay & Consulting Laboratories, Inc.
  - M.S. in Marine Biology
    California State University Long Beach

Tonight's Presentation

- The Problem?
- The Response
- The Data
- Potential Causes of Water Quality Issue
- What's next?

The Problem

- “Dark murky water” reported in Channel Islands Harbor by the public beginning in early June
- Present throughout back basins, especially at Seabridge and Mandalay
- Strong odor accompanied murky water

The Response

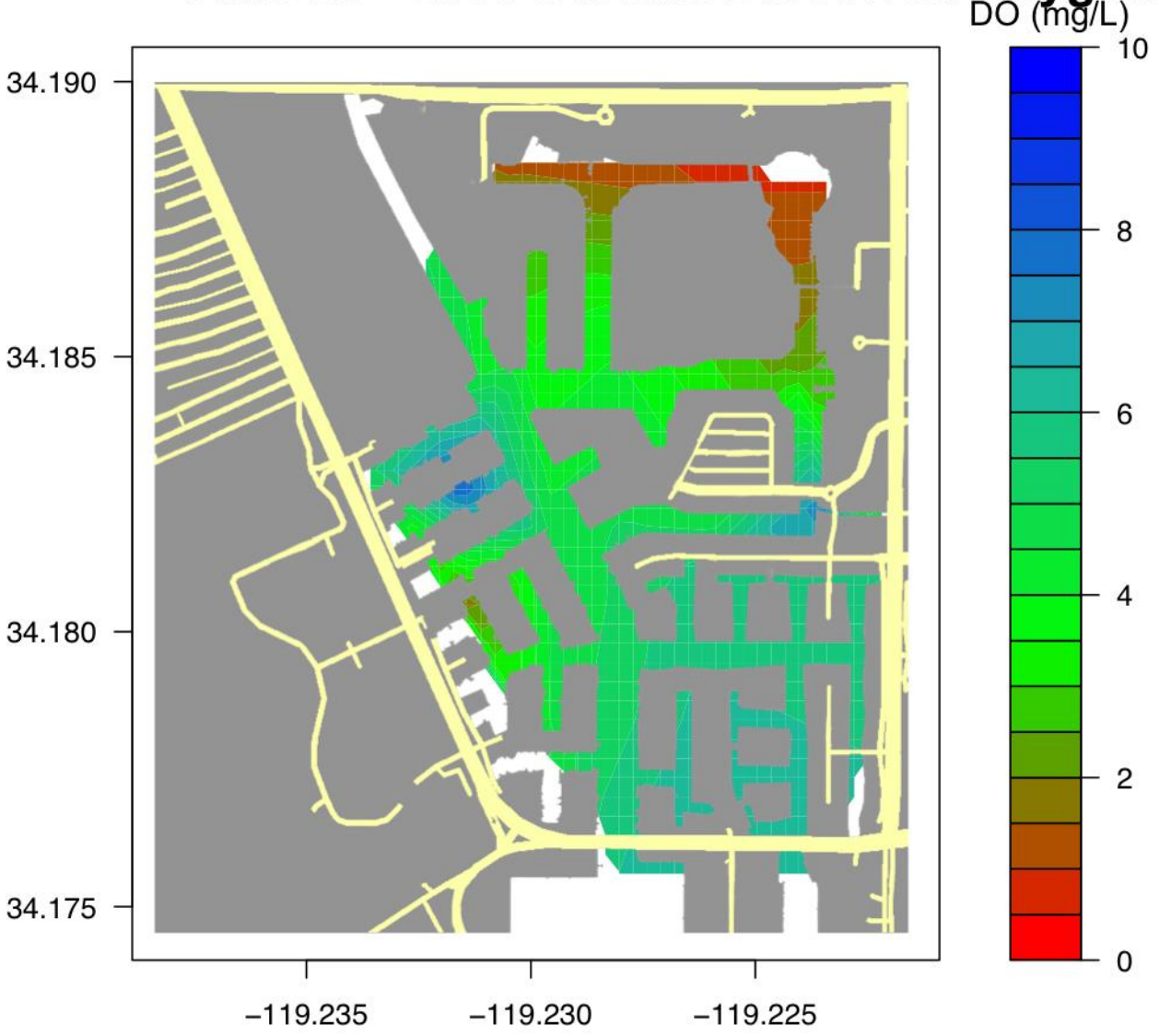
- City collects water quality samples for:
  - Dissolved oxygen; pH; temperature; salinity – beginning mid-June
  - Nutrients
  - Bacteria
  - City hires marine biology team – July 5th

#7
#24
#6
#4
#25
#23
#22
Oxnard Shores
Via Marina
#21
#20
#19
#3
#17
Channel Islands
#11
#10
#9
#8
#16
#15
#18
#14
#12
#13
#2

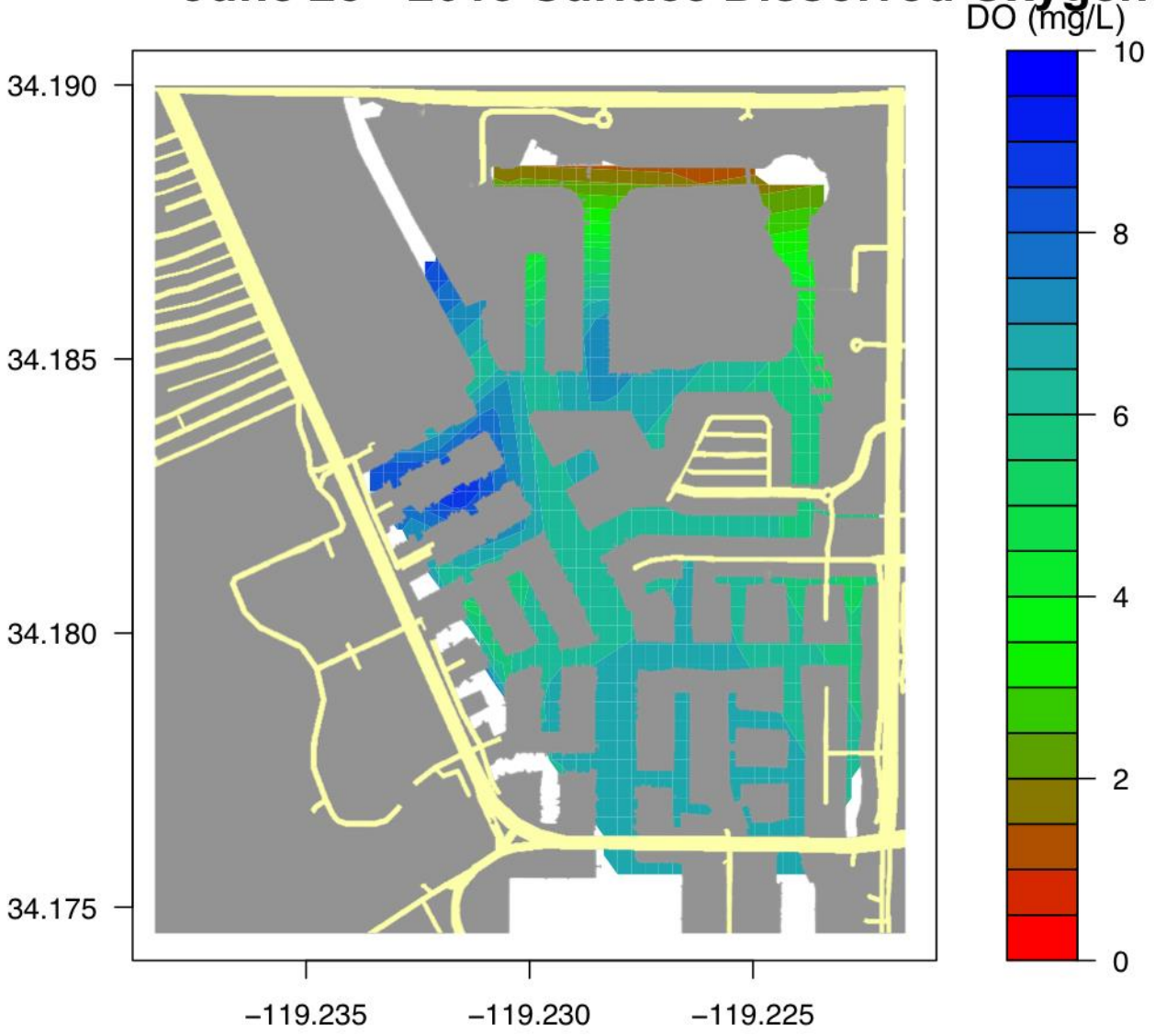
The Response

- Aquatic Bioassay & Aquatic EcoTechnologies collect samples at 11 locations for:
  - Water quality profiles: DO, pH, temp, chl a, salinity, transmissance
  - Phytoplankton & chl a
  - Nutrients: ammonia, nitrate, orthophosphate

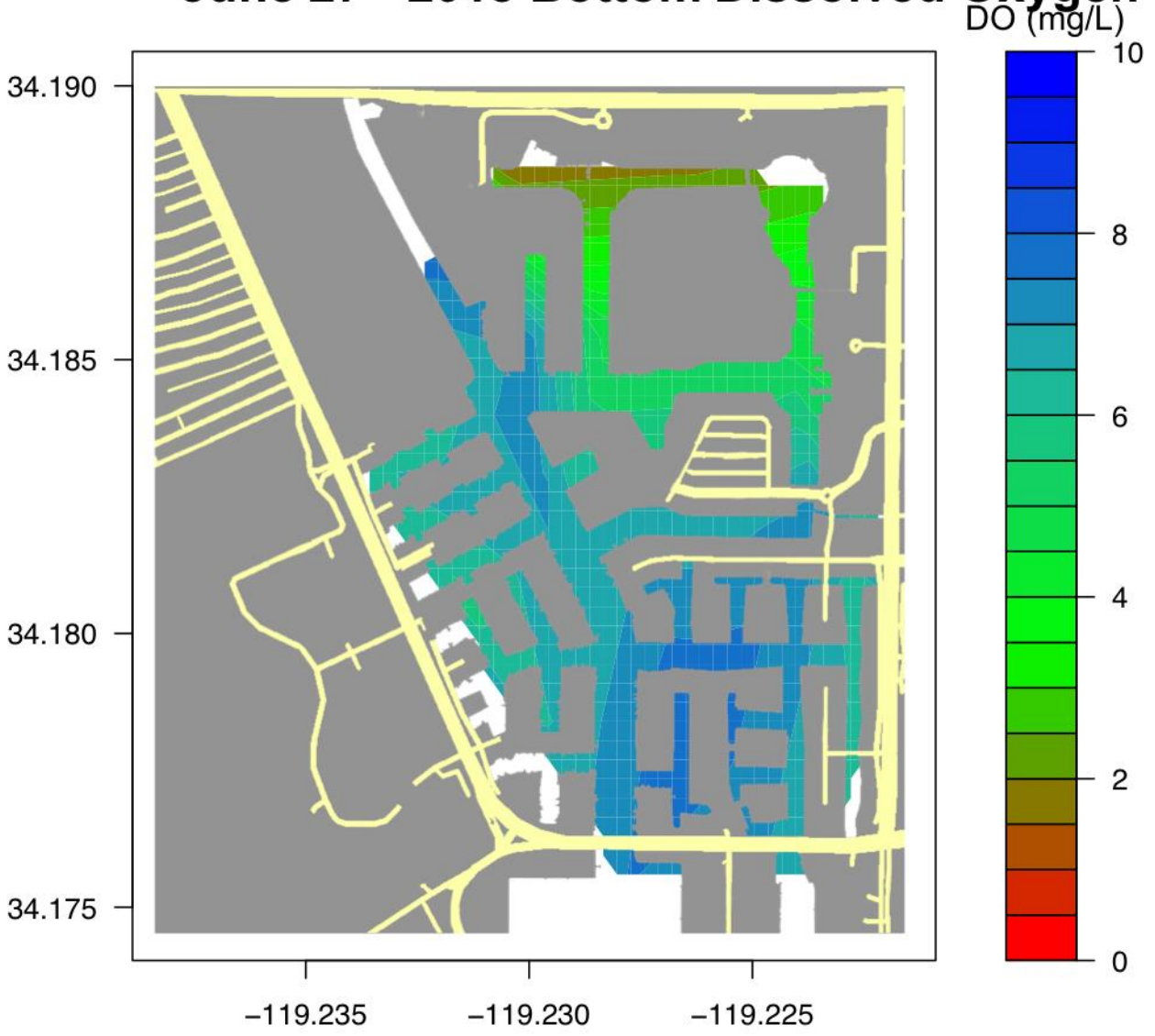
June 23rd 2018 Surface Dissolved Oxygen



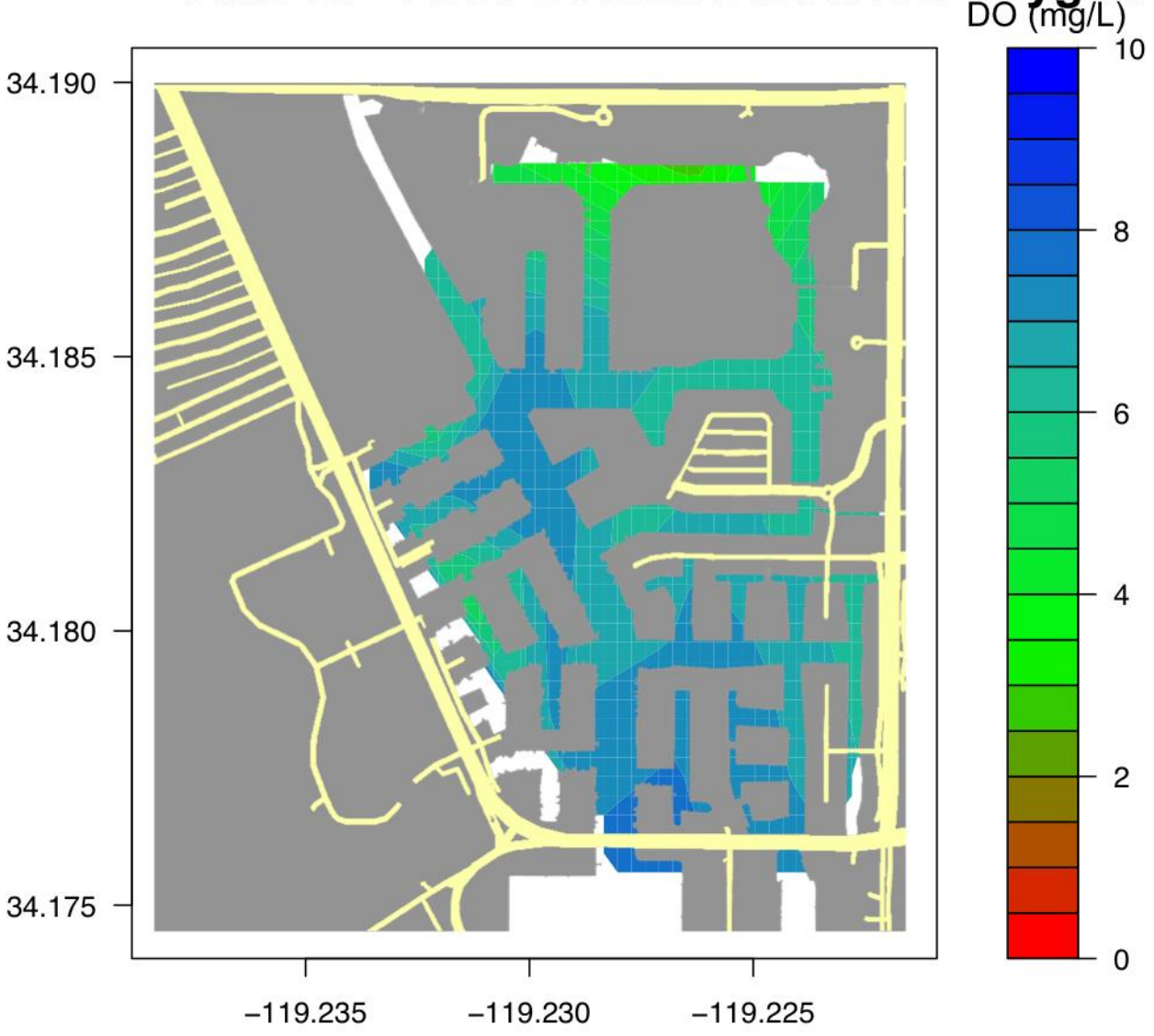
June 25th 2018 Surface Dissolved Oxygen



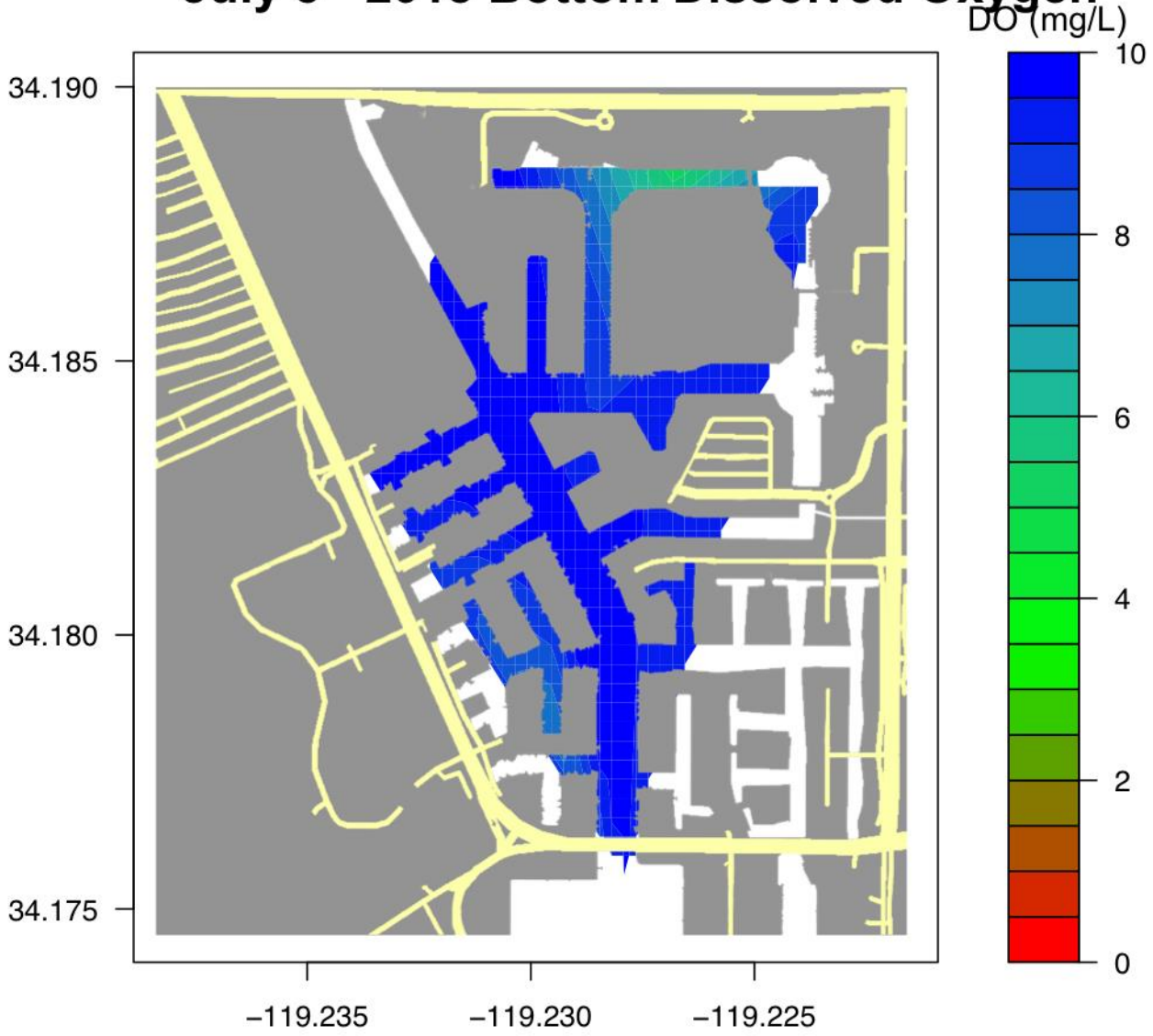
June 27th 2018 Bottom Dissolved Oxygen



June 29th 2018 Bottom Dissolved Oxygen



July 5th 2018 Bottom Dissolved Oxygen

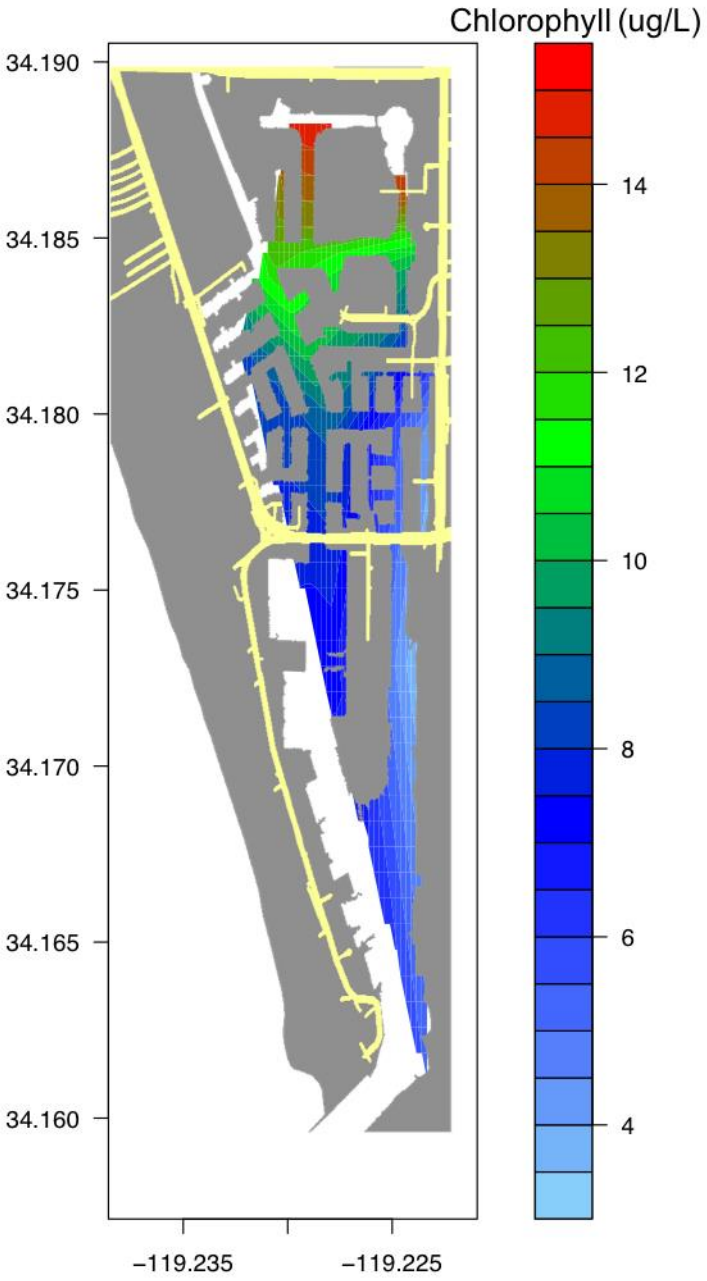


The Data

Bacteria: June 18th, 21st and 28th, 2018			Stations	REC1 Standard
	Method	MDL	Range (n = 16)	
Total Coliform	SM 9223 COLert	10 MPN/100 mL	<100 - 272	10,000
Fecal Coliform	SM 9223 COLert	10 MPN/100 mL	<10 - 63	400
Enterococcus	Enterolert	10 MPN/100 mL	<10 - 10	104

The Data

Nutrients: June 19th, 21st and 22nd 2018			Stations	Range	
	Method	MDL	Range (n = 15)	Background	Of Concern
Nitrate	EPA 300.0	0.02 - 161.29 uM	ND	<1	>5
Nitrite	EPA 300.1	0.58 - 145 uM	ND - 1.7		
Total nitrogen (TKN)	EPA 351.2	3.57 uM	17.14 - 69.29	<10	>10 - 20
Ortho Phosphate	EPA 365.1	0.002 uM	0.16 - 1.05	<0.1	>1


Chlorophyll (ug/L)
34.190
34.185
34.180
34.175
34.170
34.165
34.160
14
12
10
8
6
4
−119.235
−119.225

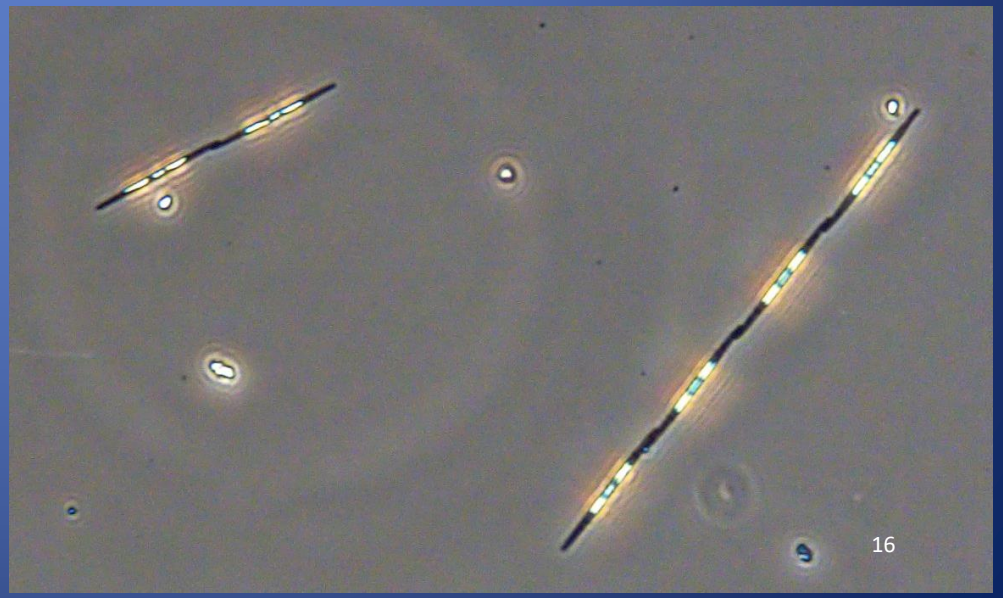
Phytoplankton composition (July 6, 2018)

Diatom genera:

- Pseudo-nitzschia***
- Skeletonema
- Leptocylindrus
- Chaetoceros
- Nitzschia

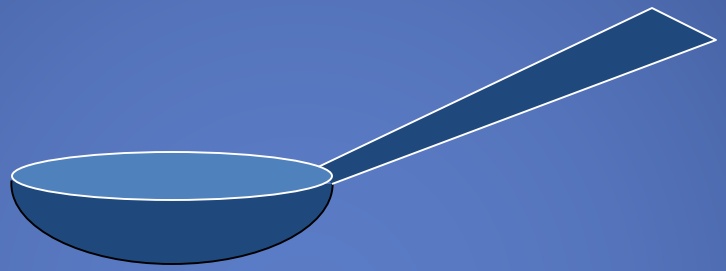
Other taxonomic groups:

- Euglenoids***
- Ciliated protozoa
- Prorocentrum
- Misc. small algae



Potential Causes of Water Quality Issue

What's in a teaspoon of seawater?



1 tsp of seawater ≈ 5 milliliters
≈ 100,000,000 viruses
≈ 10,000,000 bacteria
≈ 5,000 microalgae
≈ 3,000 protozoa

most are harmless, even beneficial…
…a few are not.

SoCal 'Local' Harmful Algal Blooms

(from bad-to-worst)

Fairly innocuous 'red tides'

Mostly color, but lots of biomass

Noxious 'foams' and 'scums'

Food web disruption

Toxic truly species

Paralytic, amnesic, diarrhetic shellfish poisoning

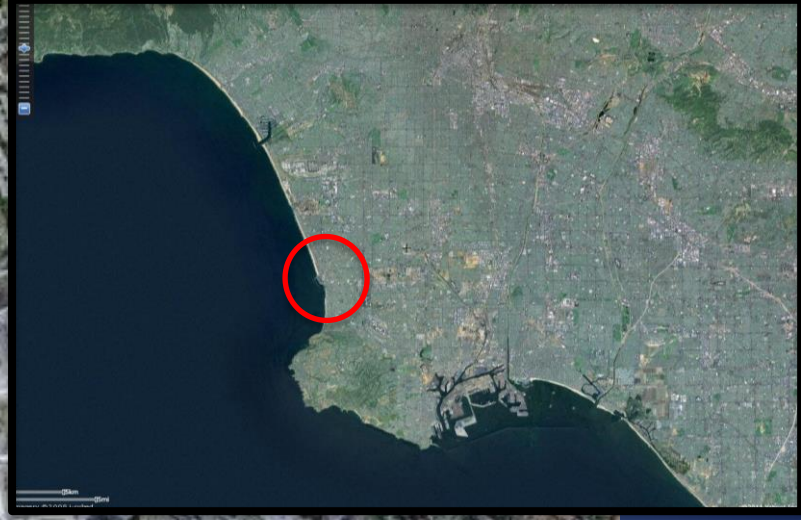
Newly introduced or newly recognized species:

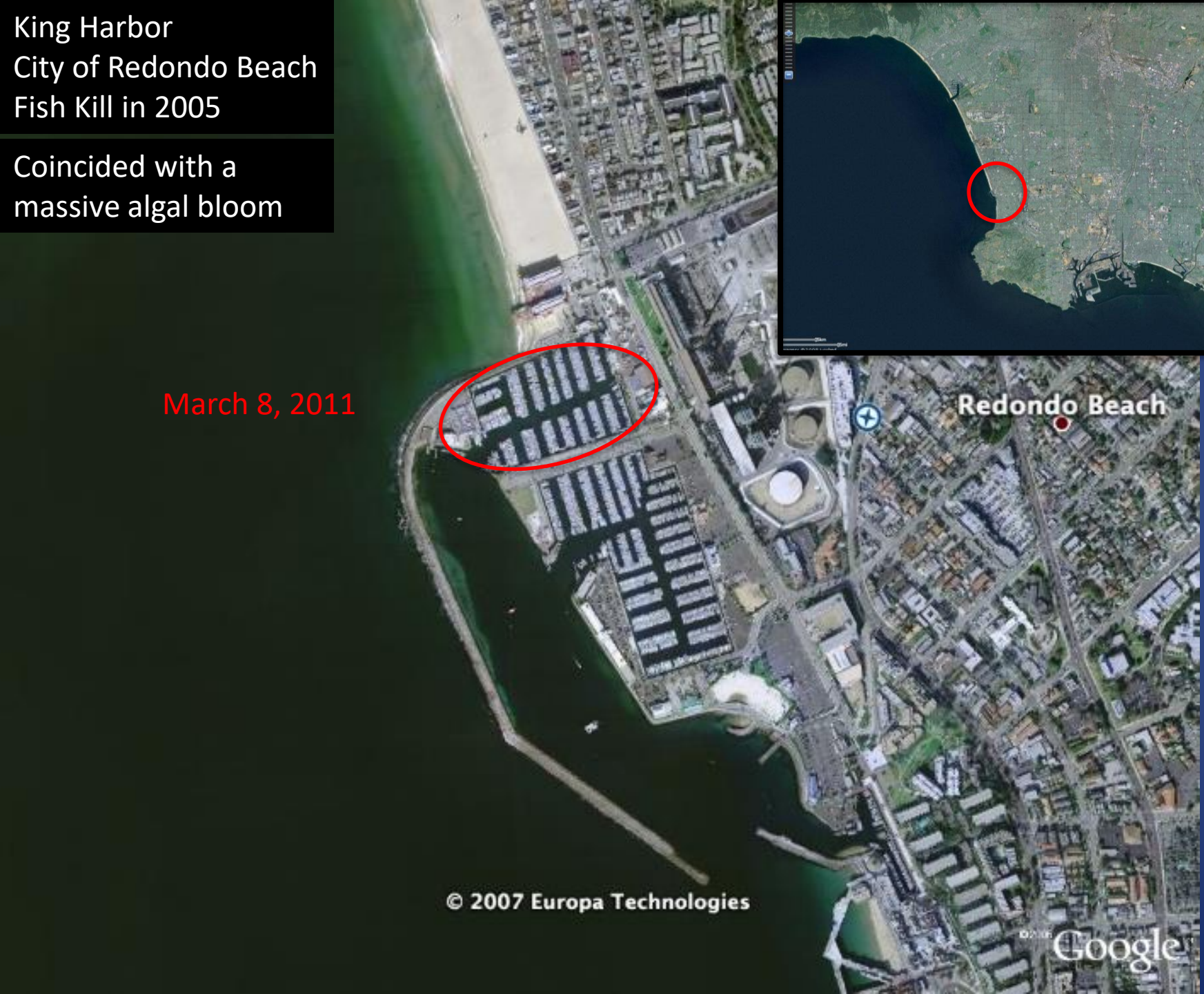
Fish-killing taxa

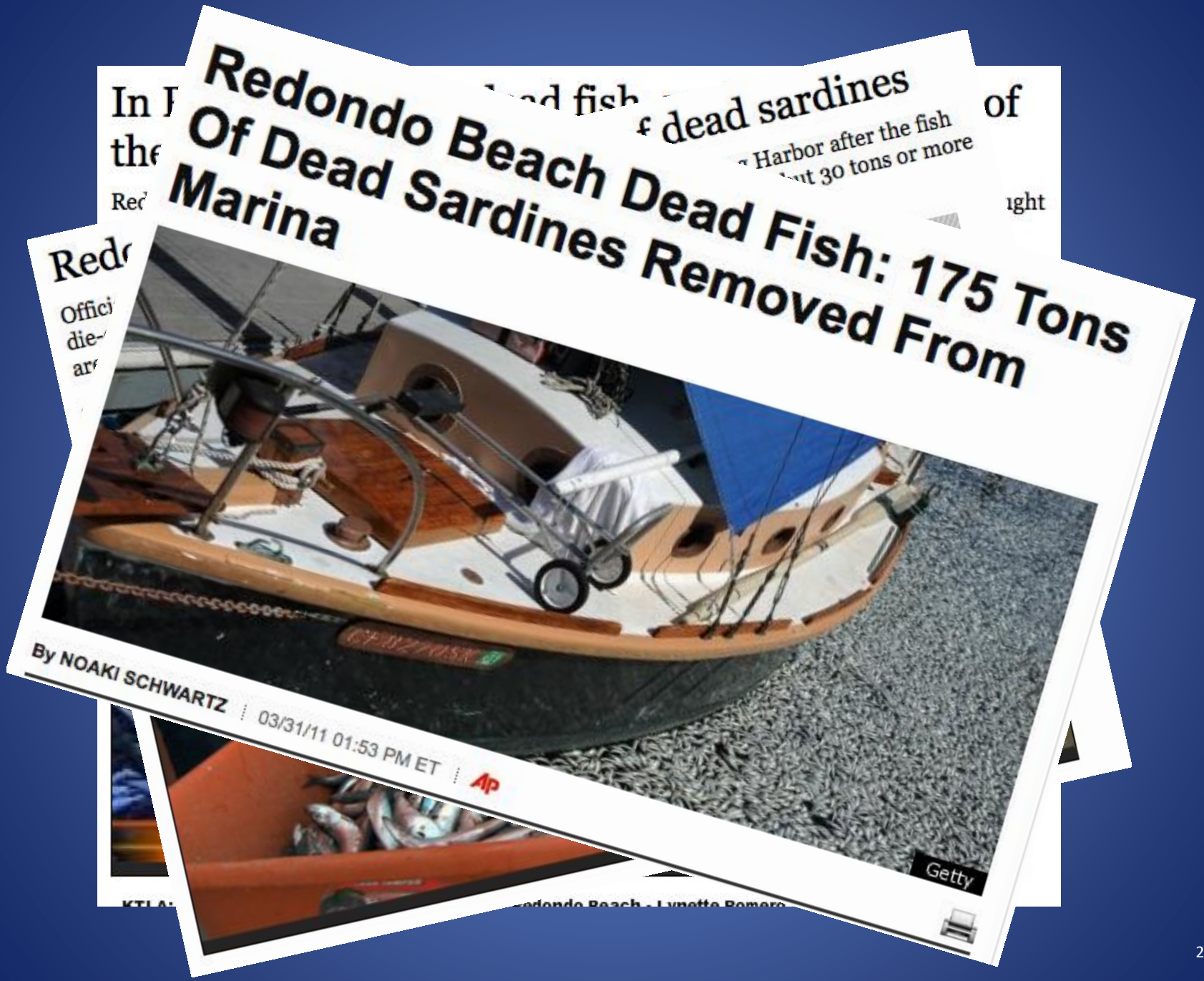
King Harbor
City of Redondo Beach
Fish Kill in 2005

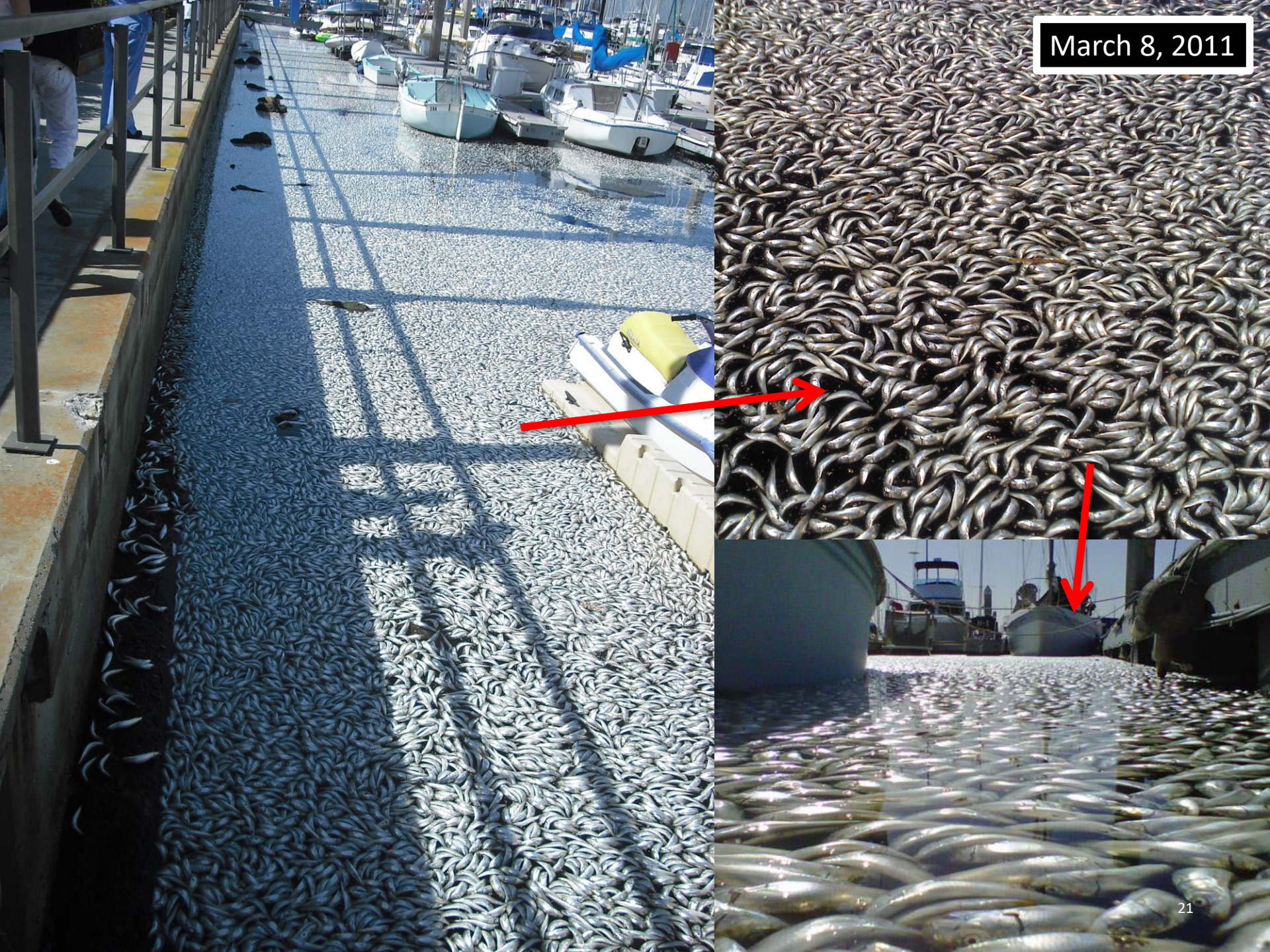
Coincided with a massive algal bloom

March 8, 2011

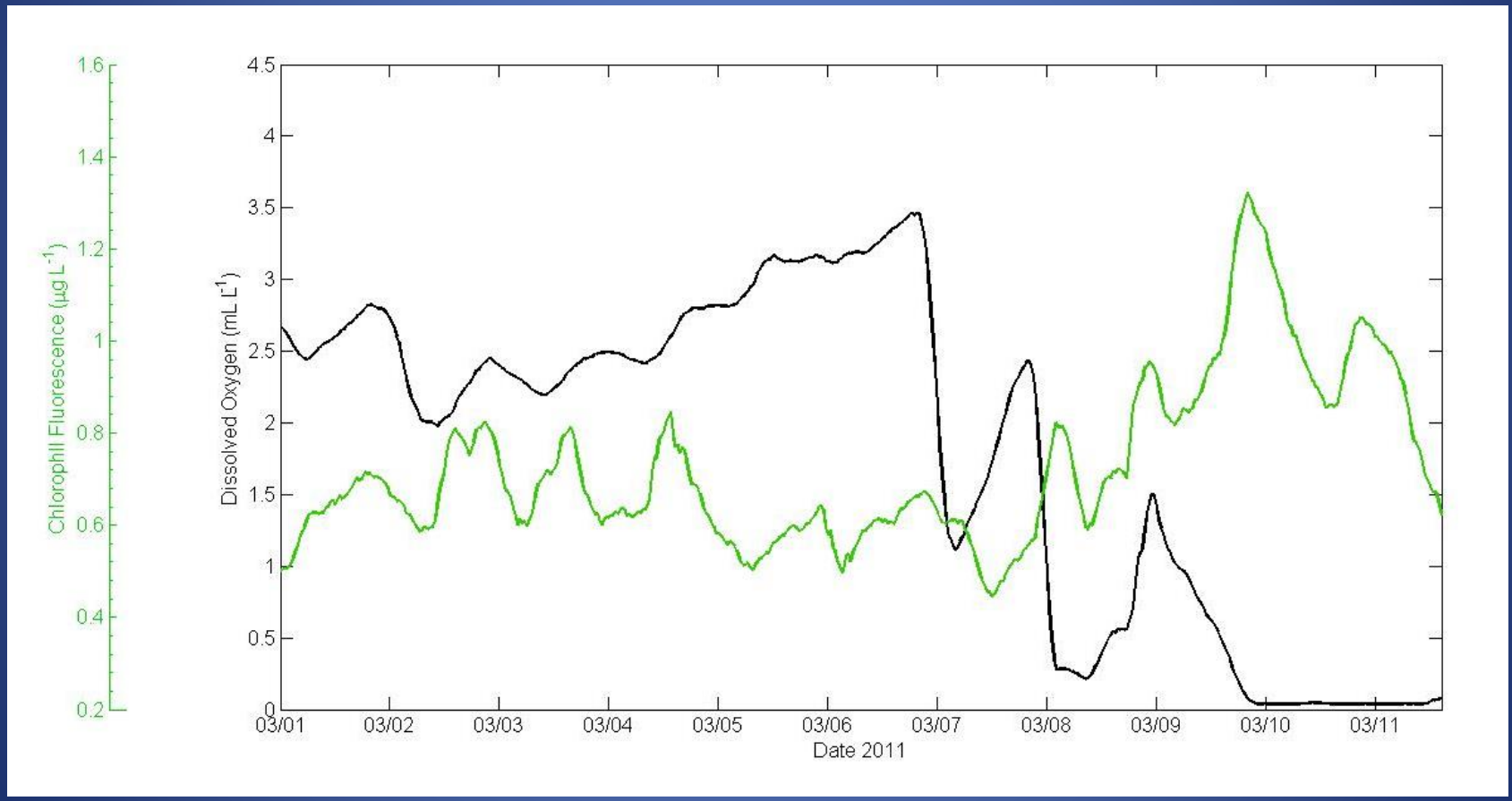





Redondo Beach Dead Fish: 175 Tons Of Dead Sardines Removed From Marina
By NOAKI SCHWARTZ
03/31/11 01:53 PM ET
AP
Getty


March 8, 2011

Temporal changes in Chlorophyll fluorescence (algal biomass) and dissolved oxygen



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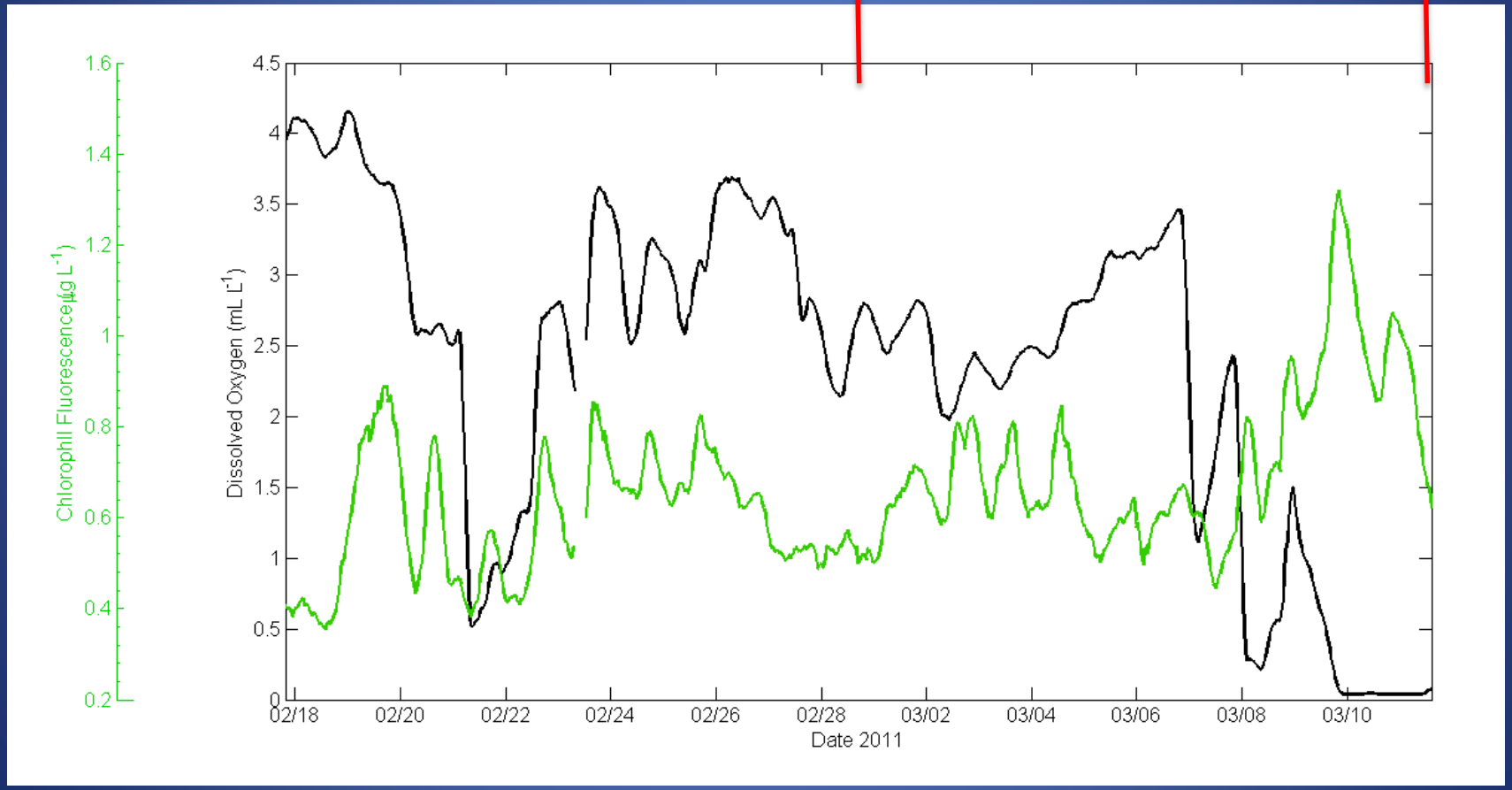
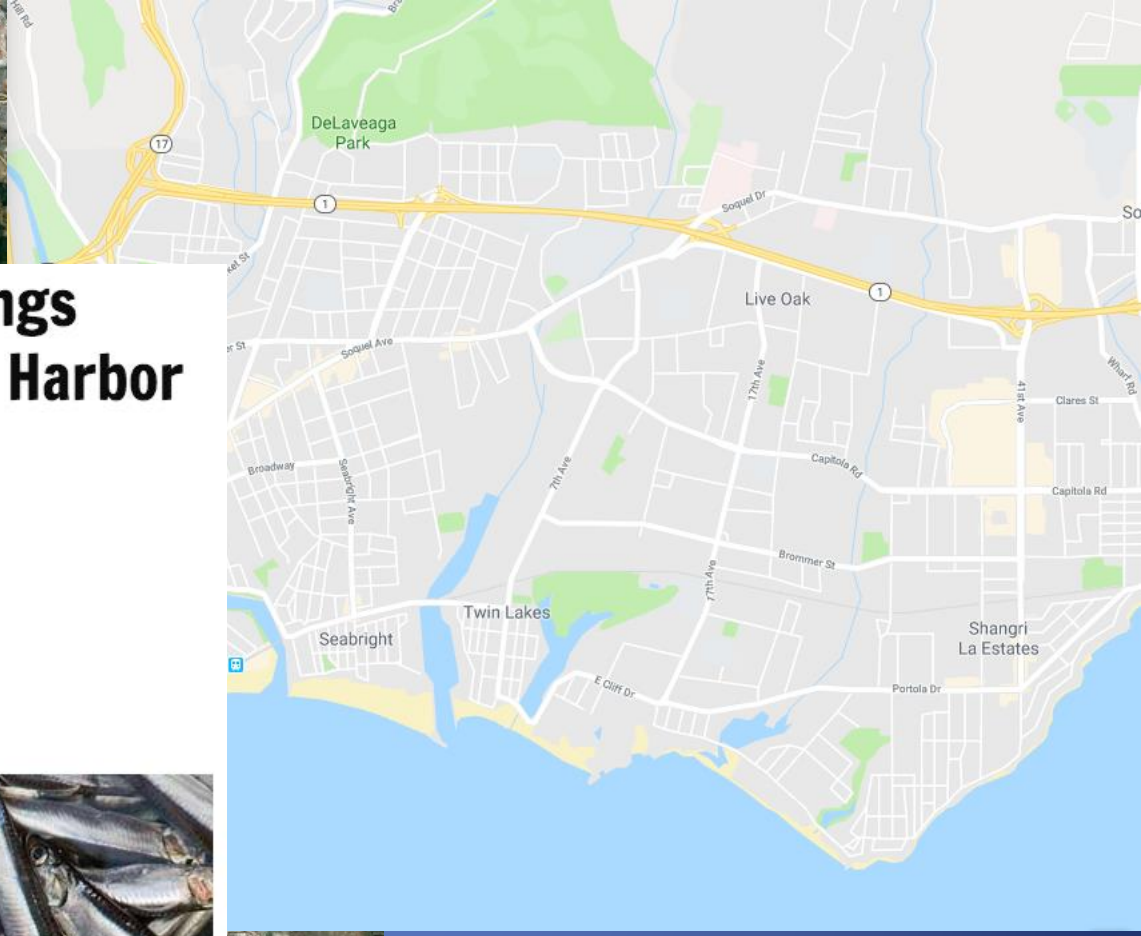


Prorocentrum micans
King Harbor,
Redondo Beach
(May 2006)

(unknown if a toxin was produced during this bloom)



Huge Die-off of Anchovy Brings Unique Aroma to Santa Cruz Harbor

CALIFORNIA DIVER – AUGUST 1, 2014

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News

Fish meet grisly end at Santa Cruz harbor

By **MERCURY NEWS** | themerc@bayareanewsgroup.com |
August 1, 2014 at 2:09 am

Next Steps

- Finalize analysis of data collected on July 6th
- Reduce frequency of City WQ sampling to 2x's per week
- Two sampling events remaining on contract:
  - Await potential next event to sample at peak of bloom
- Install aerators in back basins
- Establish a Monitoring & Action Plan
  - Install remote sensor(s) to continuously monitor dissolved oxygen, pH and chlorophyll
  - Prepare action plan to mitigate water quality problems