



# Marine Biotoxin Monitoring Report

July 2019

Technical Report No. 19-25

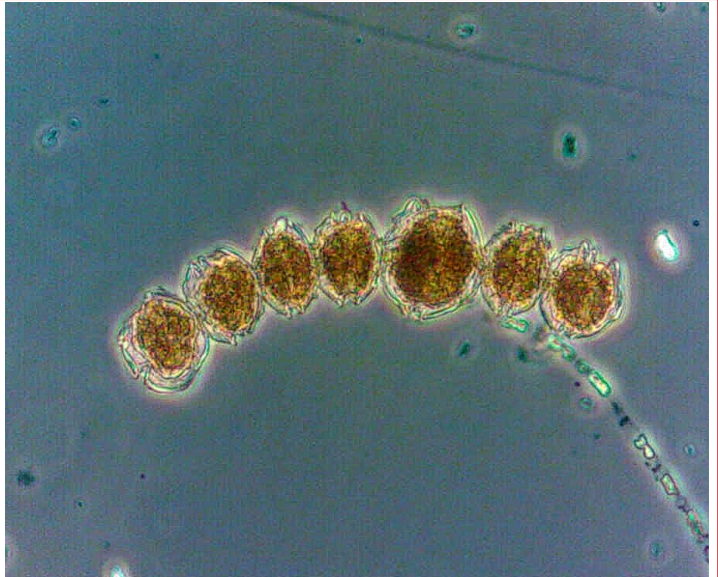
## INTRODUCTION:

This report contains results from the California Department of Public Health (CDPH) monitoring programs for shellfish toxins and associated toxin-producing phytoplankton. Toxin concentration ranges are provided for the paralytic shellfish poisoning (PSP) toxins and for domoic acid (DA); the latter is associated with the syndrome called Amnesic Shellfish Poisoning (ASP). Estimates are also provided for the distribution and relative abundance of *Alexandrium*, the dinoflagellate that produces PSP toxins, and *Pseudo-nitzschia*, the diatom that produces domoic acid. This report also contains summary information for any shellfish quarantine or health advisory in effect during the reporting period. Finally, lists of participating agencies and volunteers for each monitoring effort are provided.

### Northern California Summary:

#### Paralytic Shellfish Poisoning

*Alexandrium* was observed at several locations between Humboldt and Santa Cruz counties in July (Figure 1). Although *Alexandrium* was a minor component of the phytoplankton assemblage at the Trinidad Pier (Humboldt County) on July 12, the cell mass was significant in this sample. The relative



*Alexandrium* was present at several sites in San Luis Obispo County.

abundance of this dinoflagellate declined in Tomales Bay compared to observations in June.

Low levels of the PSP toxins were detected in sentinel mussels from outer Humboldt Bay from July 8 to July 22, declining below the detection limit by July 29 (Figure 2). The elevated concentrations of PSP toxins detected in coastal shellfish samples from the outer coast of Sonoma and Marin counties in June declined below the alert level by July. Washington clams and sentinel mussels in outer Tomales Bay also declined below the alert level, while gaper clams and oysters declined below the detection limit. Simi-

(Continued on page 2)

Please note the following conventions for the phytoplankton and shellfish biotoxin distribution maps: (i) All estimates for phytoplankton relative abundance are qualitative, based on sampling effort and percent composition; (ii) Only known toxin-producing species (*seriata* complex) are represented on the maps; (iii) All toxin data are for mussel samples, unless otherwise noted; (iv) All samples are assayed for PSP toxins; DA analyses are performed as needed (e.g., on the basis of detected blooms of the diatoms that produce DA); (v) Please refer to the appropriate figure key for an explanation of the symbols used on the maps.

(Continued from page 1)

larly, the low toxin levels detected at sites in San Mateo and Santa Cruz counties in June declined below the detection limit by July.

### Domoic Acid

*Pseudo-nitzschia* was observed at the majority of sampling locations between Del Norte and Monterey counties in July (Figure 1). The relative abundance of this diatom increased at sites in Humboldt County, expanding northward along the Del Norte coast in high numbers as well. *Pseudo-nitzschia* relative abundance decreased at sites between Sonoma and Monterey counties compared to observations in June. There was a significant increase in this diatom inside San Francisco Bay at the Richmond Marina Bay Harbor. The highest relative abundances were observed, in decreasing order, in samples from Trinidad Pier, Wilson Creek, Hunter Rock, and Humboldt Bay. A *Pseudo-nitzschia* spe-

cies in the *delicatissima* complex was common at the Santa Cruz Wharf on July 3, declining in relative abundance for the remainder of the month.

Domoic acid was not detected in mussel or oyster samples during July (Figure 2). Razor clams from Humboldt and Del Norte counties, however, continued to contain dangerous concentrations of this toxin. There was an increase in maxi-

(Continued on page 4)

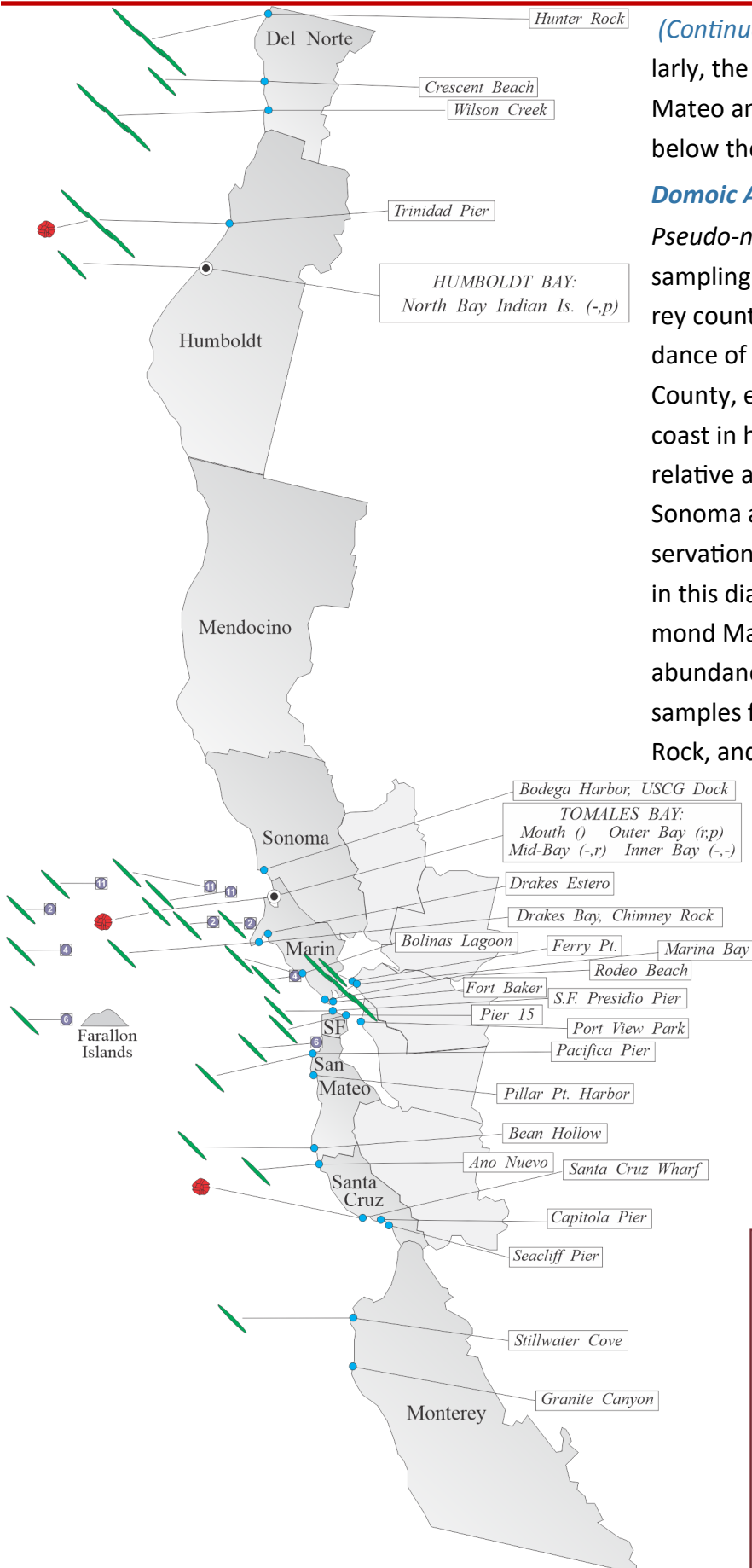
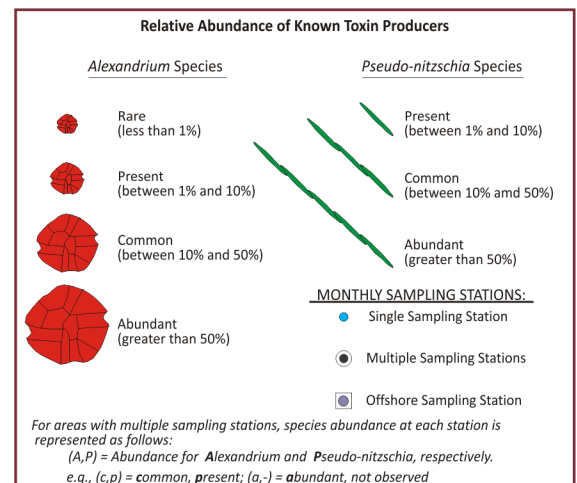


Figure 1. Toxic phytoplankton distribution in northern California.



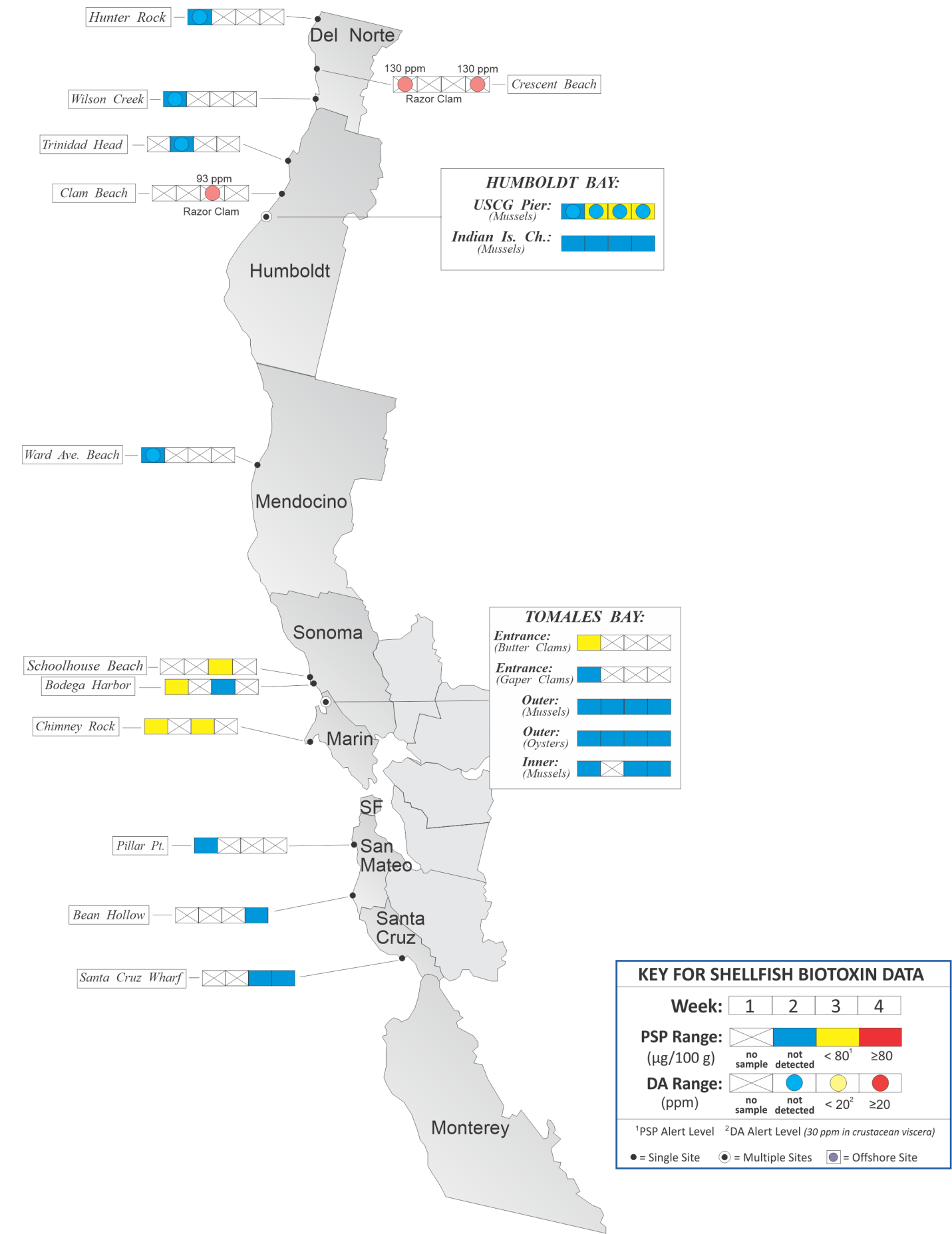


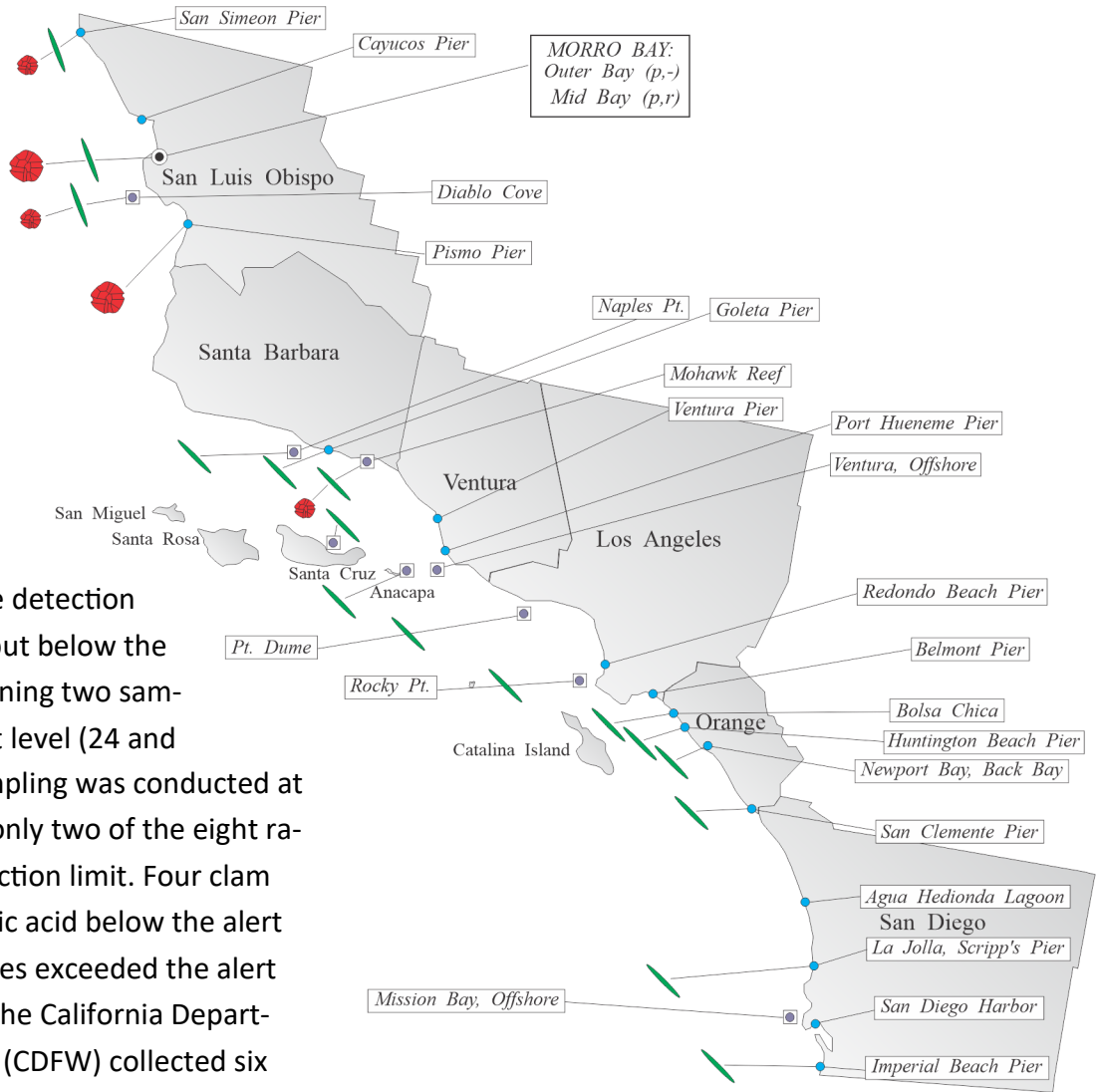
Figure 2. Distribution of shellfish biotoxins in northern California.

(Continued from page 2)

Figure 3. Toxic phytoplankton distribution in southern California.

mum toxin levels in razor clams from Crescent Beach (Del Norte County). This is a reversal of the downward trend detected in June, however fewer samples exceeded the alert level and more samples were below the detection limit. Of the 10 razor clam meat samples collected at this site on

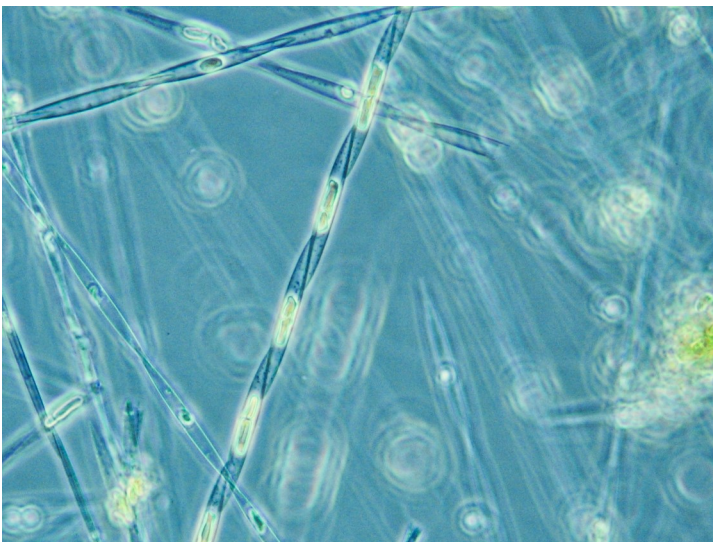
July 2, six were below the detection limit, two were positive but below the alert level, and the remaining two samples were above the alert level (24 and 130 ppm). Additional sampling was conducted at this site on July 30, with only two of the eight razor clams below the detection limit. Four clam samples contained domoic acid below the alert level and two clam samples exceeded the alert level (56 and 130 ppm). The California Department of Fish and Wildlife (CDFW) collected six samples of razor clam meat from Clam Beach (Humboldt County) on July 16. All samples contained domoic acid, with three samples exceeding



the alert level (56, 67, and 93 ppm). This represents a decline in toxicity compared to results for samples collected in June.

### Non-Toxic Species

Diatoms dominated the phytoplankton assemblage along the northern California coast, with *Chaetoceros* common to abundant throughout this range. *Thalassiosira* was abundant offshore of Sonoma and Marin counties in samples collected by the Applied California Current Ecosystem Studies (ACCESS) project. This diatom was also abundant inside Tomales Bay and San Francisco Bay. Although diatoms dominated the northern California coast, some dinoflag-



*Pseudo-nitzschia* was common at several sites between Del Norte and Santa Cruz counties in July.

(Continued on page 5)



(Continued from page 4)

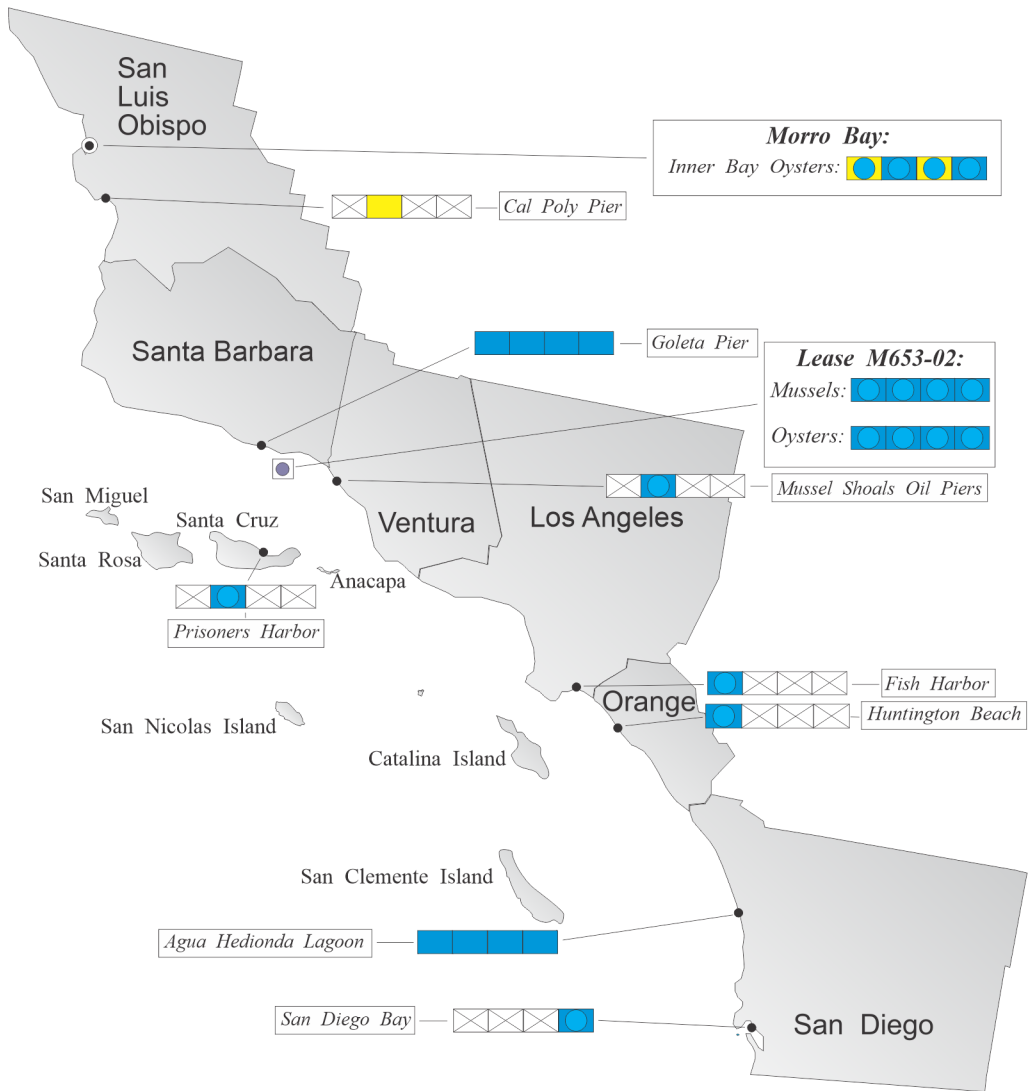
ellates were observed in significant numbers. *Prorocentrum micans* and *Ceratium furca* were common to abundant inside Tomales Bay; the latter was also abundant inside Boli-nas Lagoon. *Akashiwo san-guineum* was common in samples from the Pacifica Pier and Santa Cruz Wharf.

#### Southern California Summary: Paralytic Shellfish Poisoning:

*Alexandrium* was observed at several sites in San Luis Obispo County and one site in Santa Barbara County in July (Figure 3). This represents a decrease in distribution compared to observations in June. *Alexan-drium* remained present in elevated numbers inside Morro Bay and at the Pismo Pier, but declined in number elsewhere.

PSP toxicity well below the alert level continued to be detected in oyster samples from an aquaculture lease in Morro Bay (Figure 4). The high PSP toxin con-

Figure 4. Distribution of shellfish biotoxins in southern California.



centrations detected in mussels from the Cal Poly Pier in June declined below the alert level by July 14.

(Continued on page 6)

The Marine Biotoxin Monitoring and Control Program, managed by the California Department of Public Health, is a state-wide effort involving a consortium of volunteer participants. The shellfish sampling and analysis element of this program is intended to provide an early warning of shellfish toxicity by routinely assessing coastal resources for the presence of paralytic shellfish poisoning (PSP) toxins and domoic acid.

The Phytoplankton Monitoring Program is a state-wide effort designed to detect toxin producing species of phytoplankton in ocean water before they impact the public. The phytoplankton monitoring and observation effort can provide an advanced warning of a potential toxic bloom, allowing us to focus sampling efforts in the affected area before California's valuable shellfish resources or the public's health is threatened.

For Information on Volunteering:

For Recorded Biotoxin Information Call:

Email [redtide@cdph.ca.gov](mailto:redtide@cdph.ca.gov) or call 510-412-4635

(800) 553 - 4133

(Continued from page 5)

**Domoic Acid**

*Pseudo-nitzschia* continued to be observed at the majority of sampling sites along the southern California coast in July (Figure 3). Cell numbers were significantly reduced compared to observations in June. Domoic acid was not detected in any shellfish samples during July (Figure 4).

**Non-Toxic Species**

A mix of diatoms and dinoflagellates were observed along the southern California coast. *Chaetoceros* was common to abundant between San Luis Obispo and Orange counties. *Eucampia* was common at several San Luis Obispo sites and *Skeletonema* was common to abundant inside Agua Hedionda Lagoon. The dinoflagellate *Ceratium divaricatum* was common to abundant at San Luis Obispo sites. *Lingulodinium polyedrum* was common to abundant at numerous sites between Santa Barbara and San Diego counties.

**QUARANTINES:**

The annual mussel quarantine began on May 1 and will continue through at least October 31. This annual quarantine prohibits the sport-harvesting of mussels along the entire California coastline, including all bays and estuaries. On July 23 CDPH lifted the PSP-related health advisory for sport-harvested scallops and all clams in

Table 1. Program participants collecting phytoplankton samples.

| AGENCY   | # | AGENCY  | # |
|--|---|---|---|
| <b>DEL NORTE COUNTY</b>                              |   |   |   |
| Tolowa Dee-ni' Nation                                | 2 | Yurok Tribe Environmental Program                     | 1 |
| <b>HUMBOLDT COUNTY</b>                               |   |   |   |
| Coast Seafood Company                                | 5 | Humboldt State University Marine Lab                  | 3 |
| <b>MENDOCINO COUNTY</b>                              |   | None Submitted  |   |
| <b>SONOMA COUNTY</b>                                 |   |   |   |
| CDPH Marine Biotoxin Program                         | 2 | Gulf of the Farallones National Marine Sanctuary      | 3 |
| <b>MARIN COUNTY</b>                                  |   | CDPH Marine Biotoxin Program                          | 2 |
| CDPH Volunteers ( <i>Brent Anderson, Mike Chin</i> ) |   |   | 4 |
| Golden Gate National Recreational Area               | 1 | Gulf of the Farallones National Marine Sanctuary      | 5 |
| Hog Island Oyster Company                            | 7 | NatureBridge  | 1 |
| <b>CONTRA COSTA COUNTY</b>                           |   |   |   |
| CDPH Volunteer ( <i>Russel Shearer</i> )             | 1 | CDPH Marine Biotoxin Program                          | 5 |
| <b>ALAMEDA COUNTY</b>                                |   | Monterey Bay National Marine Sanctuary                | 1 |
| <b>SAN FRANCISCO COUNTY</b>                          |   | CDPH Volunteer ( <i>Eugenia McNaughton</i> )          | 3 |
| Exploratorium  | 3 | Gulf of the Farallones National Marine Sanctuary      | 2 |
| <b>SAN MATEO COUNTY</b>                              |   | The Marine Mammal Center                              | 5 |
| San Mateo County Environmental Health Dept.          | 4 | U.C. Santa Cruz                                       | 3 |
| <b>SANTA CRUZ COUNTY</b>                             |   | CDPH Volunteer ( <i>Ignacio Martin-Bragado</i> )      | 1 |
| Monterey Bay National Marine Sanctuary               | 2 | U.C. Santa Cruz                                       | 5 |
| <b>MONTEREY COUNTY</b>                               |   |   |   |
| Marine Pollution Studies Laboratory                  | 1 | Pacific Grove Museum of Natural History               | 5 |
| <b>SAN LUIS OBISPO COUNTY</b>                        |   | CDPH Volunteer ( <i>Dan Hoskins, Skip Rotstein</i> )  | 3 |
| Friends of the Sea Otter                             | 3 | Grassy Bar Oyster Company                             | 7 |
| Monterey Bay National Marine Sanctuary               | 3 | Tenera Environmental                                  | 2 |
| <b>SANTA BARBARA COUNTY</b>                          |   | NOAA Channel Islands National Marine Sanctuary        | 1 |
| Santa Barbara Channel Keeper                         | 6 | U.C. Santa Barbara                                    | 5 |
| <b>VENTURA COUNTY</b>                                |   | CDPH Volunteer ( <i>Fred Burgess</i> )                | 4 |
| Channel Islands National Park                        | 2 | Ventura County Environmental Health Dept.             | 1 |
| <b>LOS ANGELES COUNTY</b>                            |   | CDPH Volunteers ( <i>Michelle and Samantha Tran</i> ) | 1 |
| Los Angeles County Sanitation District               | 1 | Los Angeles Water Keeper                              | 5 |
| <b>ORANGE COUNTY</b>                                 |   | Amigos de Bolsa Chica                                 | 4 |
| Back Bay Science Center                              | 5 | CDPH Volunteer ( <i>Truong Nguyen</i> )               | 5 |
| <b>SAN DIEGO COUNTY</b>                              |   | Carlsbad Aquafarms, Inc.                              | 4 |
| Scripps Institute of Oceanography                    | 5 | SEACAMP/HABNet  | 1 |
| Tijuana River National Estuary Research              | 5 | U.S. Navy Marine Mammal Program                       | 3 |

Sonoma, Marin, and Santa Barbara counties.

The CDFW closure of the razor clam fishery remains in effect due to the continued presence of dangerous levels of domoic acid in razor clams from beaches in Humboldt and Del Norte counties.

Consumers of Washington clams, also known as butter clams (*Saxidomus nuttalli*), are cautioned to eat only the white meat. Washington clams can concentrate the PSP toxins in the viscera and in the

(Continued on page 7)

(Continued from page 6)

dark parts of the siphon and can remain toxic for a long period of time. Persons taking scallops or clams, with the exception of razor clams, are advised to remove and discard the dark parts (i.e., the digestive organs or viscera). Razor clams (*Siliqua patula*) are an exception to this general guidance due to their ability to concentrate and retain domoic acid in the edible white meat as well as in the viscera.

PSP toxins can produce a tingling around the mouth and fingertips within a few minutes to a few hours after eating toxic shellfish. These symptoms can be followed by disturbed balance, lack of muscular coordination, slurred speech and difficulty swallowing. In severe poisonings, complete muscular paralysis and death from asphyxiation can occur.

Symptoms of domoic acid poisoning can occur within 30 minutes to 24 hours after eating toxic seafood. In mild cases, symptoms of exposure to this nerve toxin may include vomiting, diarrhea, abdominal cramps, headache and dizziness.

These symptoms disappear completely within several days. In severe cases, the victim may experience excessive bronchial secretions, difficulty breathing, confusion, disorientation, cardiovascular instability, seizures, permanent loss of short-term memory, coma and death. Any person experiencing any of these symptoms should seek immediate medical care. Consumers are also advised that neither cooking or freezing eliminates domoic acid or the PSP toxins from the shellfish tissue. These tox-

Table 2. Program participants collecting shellfish samples.

| COUNTY          | AGENCY  | #  |
|-----------------|---|----|
| Del Norte       | CDPH Volunteer ( <i>Ken Graves</i> )                    | 10 |
|                 | Tolowa Dee-ni' Nation                                   | 9  |
|                 | Yurok Tribe Environmental Program                       | 1  |
| Humboldt        | California Department of Fish and Wildlife              | 6  |
|                 | Coast Seafood Company                                   | 4  |
|                 | Humboldt County Environmental Health Department         | 1  |
| Mendocino       | Mendocino County Environmental Health Department        | 1  |
| Sonoma          | CDPH Marine Biotoxin Program                            | 3  |
| Marin           | CDPH Volunteer ( <i>Carl Vogler</i> )                   | 2  |
|                 | CDPH Marine Biotoxin Program                            | 2  |
|                 | Cove Mussel Company                                     | 3  |
|                 | Hog Island Oyster Company                               | 4  |
|                 | Starbird Mariculture                                    | 1  |
|                 | Tomales Bay Oyster Company                              | 5  |
|                 |   |    |
| San Francisco   | None Submitted  |    |
| San Mateo       | San Mateo County Environmental Health Department        | 2  |
| Santa Cruz      | U.C. Santa Cruz   | 3  |
| Monterey        | None Submitted  |    |
| San Luis Obispo | California Polytechnic State University                 | 2  |
|                 | Grassy Bar Oyster Company                               | 9  |
| Santa Barbara   | CDPH Volunteers ( <i>Larry Harris</i> )                 | 1  |
|                 | Santa Barbara Mariculture Company                       | 11 |
|                 | U.C. Santa Barbara                                      | 5  |
|                 | Vandenberg Air Force Base Environmental Health Services | 1  |
| Ventura         | Ventura County Environmental Health Department          | 1  |
| Los Angeles     | Southern California Marine Institute                    | 1  |
| Orange          | CDPH Volunteer ( <i>Jacob Yohr</i> )                    | 1  |
| San Diego       | Carlsbad Aquafarm, Inc.                                 | 5  |
|                 | U.S. Navy Marine Mammal Program                         | 1  |

ins may also accumulate in seafood species such as crab, lobster, and small finfish like sardines and anchovies.

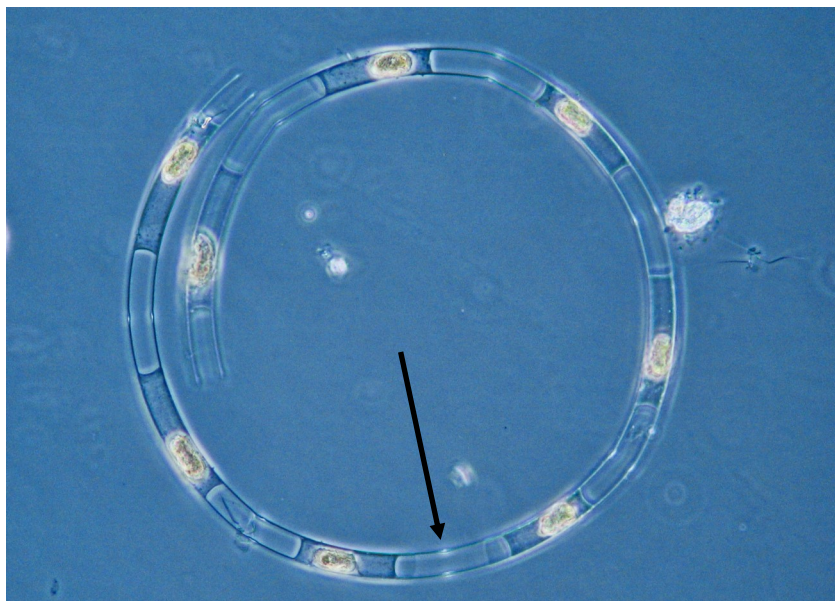
Sport harvesters should only collect shellfish from areas that are not affected by a current health advisory or quarantine. Contact the "Biotoxin Information Line" at 1-800-553-4133 for a current update on marine biotoxin activity prior to gathering and consuming shellfish.



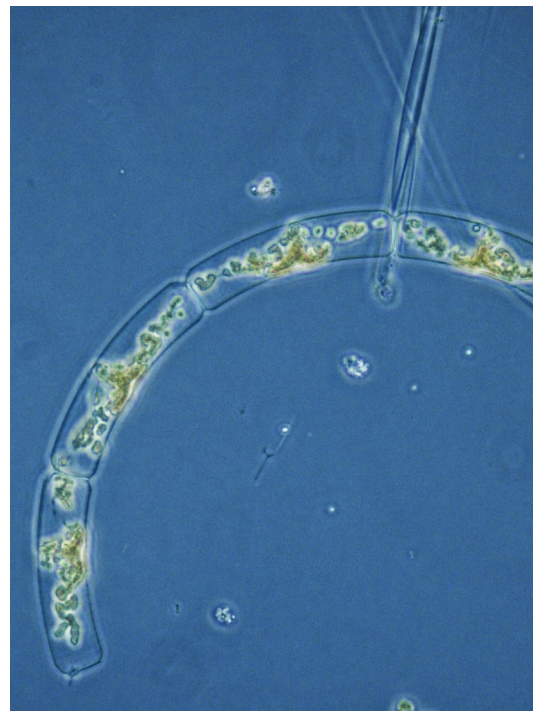
If you are having difficulty accessing this document, please contact CDPH at 1-800-553-4133 to request this information in an alternate format.



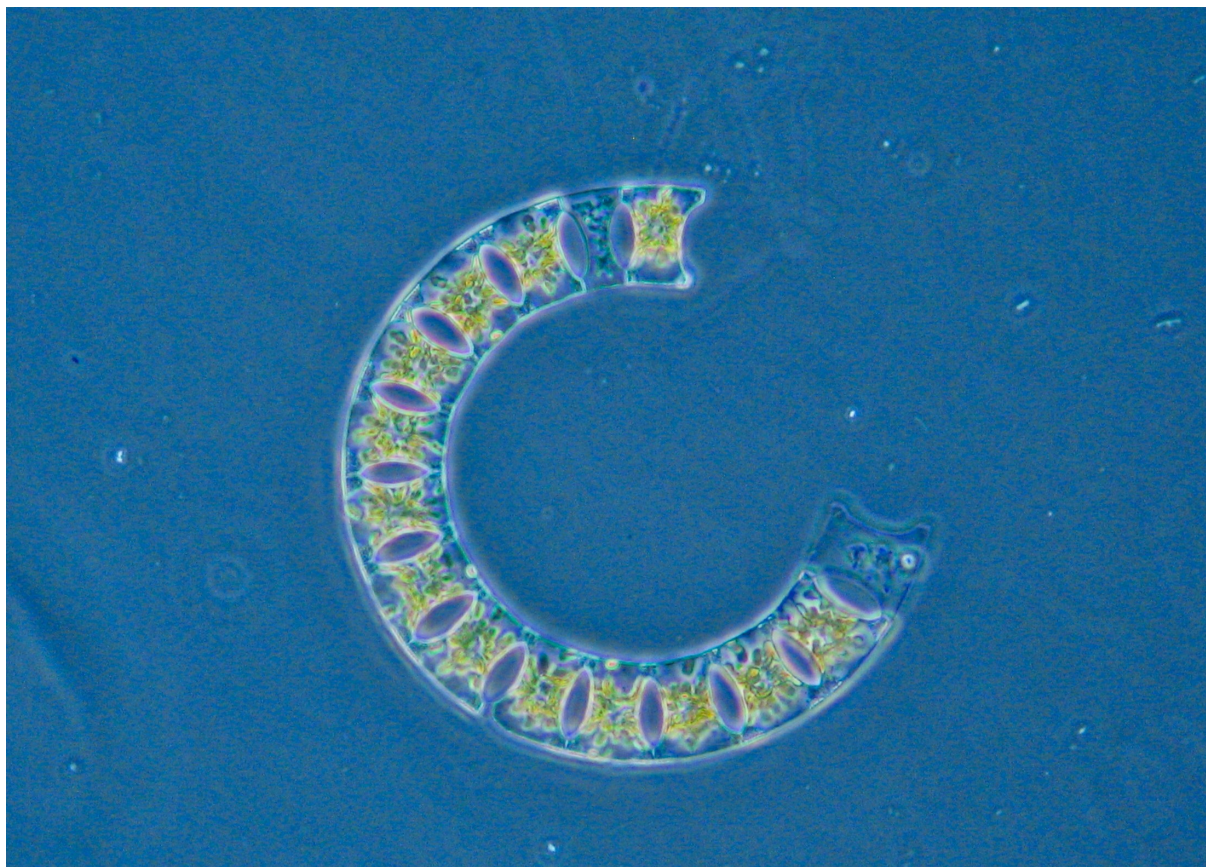
# Phytoplankton Gallery



A chain of the diatom *Hemialus*. The arrow is pointing to the location where the setae of two cells are joined.



The chain-forming diatom *Guinardia*.



*Eucampia*, another chain-forming diatom.