**FLOW: Amigos de Bolsa Chica Citizen Science Program**

Plankton Collection and Identification Report

Date: 05/10/13 Time: 2:48 PM
Collectors: Dennis P., Belen C., Carolyn D., Sandy M., Shawleen G., Brian W., Joana T.
Tide: ebb (going out)
Secchi: N/A
Temp.: 21°C/70F
Salinity: 40 ppt
pH: 8.4
Nitrates: 0 ppm
Phosphates: 0.25 ppm
Ammonia: 0.25 ppm
Weather/ wind: Sunny and clear; strong onshore wind (NW)

Summary:

We collected plankton at the Tidal Inlet this afternoon without any problems. Back at the Visitor Center, we measured nutrients and pH and observed samples under the microscope: Belen and Dennis were in charge of microscopy, but everyone participated in identifying the phytoplankton on the TV; others were in charge of measuring the chemical parameters.

The most abundant phytoplankton in today's samples were the diatoms *Bacteriastrum* spp. and the dinoflagellate *Prorocentrum micans.* There were a variety of other dinoflagellates and diatoms (pennate and centric) including a few chains of the potentially harmful genus of diatom *Pseudo-nitzschia* spp. (see complete list at the end of the report).

Nutrients and pH were within expected ranges (this water was collected when the tide is going out so it makes sense that salinity was higher than ocean's average and that ammonia and phosphates are a bit above 0 ppm).

Here are a few species and genera of plankton that we observed, identified and photographed under the microscope today. (See complete list of organisms observed at the end).

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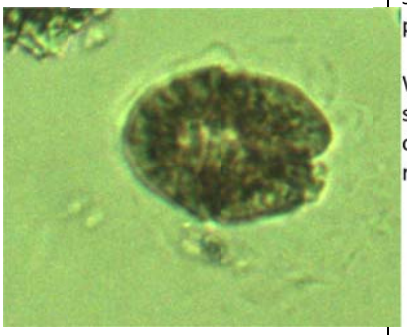
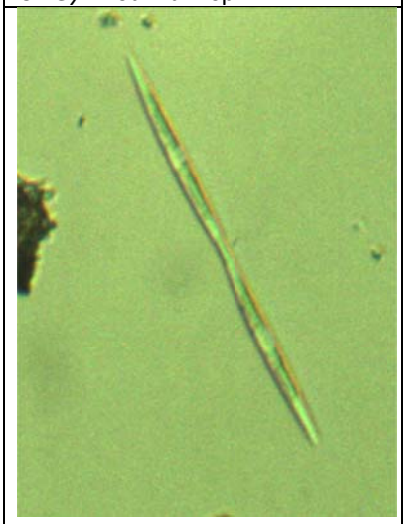
|  <br>  <br>*Dinophysis acuminata* | *Dinophysis acuminata* is marine, planktonic dinoflagellate species. It is a potentially toxic species that may produce ocadaic acid and blooms of this species have been associated with diarrhetic shellfish poisoning (DSP) events. It is commonly found in coastal waters of the northern Atlantic and Pacific Oceans. The most extensive blooms have been reported from the summer and fall months in many parts of the world.<br><br>Similarly to what we recorded last week, the abundance observed in today's sample was medium to high and we observed a great range in sizes and shapes (length ranged between 40 and 70 µm and width ranged between 30-50 µm) which indicates that this population is currently going through the sexual cycle and probably means that this bloom has reached its peak (see diagram at the end of this report; source: Reguera and Gonzales-Gil, 2001).<br><br>The concentration of *Dinophysis* acuminata in today's sample was low to medium (lower than last week's). |
|  <br>*Dinophysis* cf. *fortii* | *Dinophysis fortii* is an armoured, marine, planktonic dinoflagellate species. While similar to *D. acuminata, D. fortii* is best identified by its wide rounded posterior and the presence of reticulations on the sulcal list. This species is a bloom forming toxic species associated with DSP events; noxious blooms have been reported from Australia and Japan. *Dinophysis fortii* was the first species found to be associated with DSP; concentrations as low as 200 cells/L can cause human intoxication. In northern Japan warm currents in spring and early summer carry populations of *D. fortii* landward where cells filter into coastal areas of intensive shellfish aquaculture. Observations of Miyazono and Minoda (1990) suggest that this species prefers high salinity and low temperatures; however, they can tolerate lower salinities. It has world-wide distribution in cold temperate waters, but is also found in subtropical to tropical waters.<br><br>The concentration of *Dinophysis* cf. *fortii* in today's sample was low. |
|  <br>*Prorocentrum micans* | *P. micans* is a marine bloom-forming dinoflagellate. This is a cosmopolitan species in cold temperate to tropical waters. Although *P. micans* is capable of forming extensive blooms, it is usually considered harmless. It may excrete substances that inhibit diatom growth, but apparently these substances do not enter the food chain or affect organisms at higher trophic levels.<br><br>The concentration of *P. micans* observed in today's sample was very high (characteristic of a bloom; similar to last week's abundance) |



Cf. *Gymnodinium* sp.

Gymnodinium is a genus of dinoflagellates. It is one of the few naked dinoflagellates, or species lacking armor (cellulosic plates). Since 2000, the species which had been considered to be part of Gymnodinium have been divided into several genera, based on the nature of the apical groove and partial LSU rDNA sequence data. Members of the genus are bilaterally symmetrical with a delicate pellicle (or envelope) and disk-shaped **chromatophores**, which, when present, contain yellow, brown, green, or blue pigments. Some species are photosynthetic; others require solid food. Some may be bioluminescent or form periodic blooms that may color **water** yellow or red. A few species of this genus produce brevetoxins (neurotoxins). These toxins are responsible for massive fill kills along the west coast of Florida in the Gulf of Mexico. Aerosolization of the toxins (noxious air-borne fragments from sea spray) has been linked to asthma-like symptoms in humans. Brevetoxins produce neurotoxic shellfish poisoning (NSP) when consumed.

We observed only a few of these *Gymnodinium*-like dinoflagellates in today's sample and have seen similar specimens in last week's sample and in a sample collected at the Bolsa Chica Inlet in November of 2012. More observations and measurements will be required for an appropriate taxonomic identification.



*Pseudo-nitzschia spp.*

The genus ***Pseudo-nitzschia*** includes several species of marine diatoms known to produce the neurotoxin called domoic acid; this toxin is responsible for the illness called amnesic shellfish poisoning, which affects higher consumers, such as sea lions, sea birds, humans and mammals in general that have consumed contaminated shellfish.

This genus of phytoplankton is known to form harmful algal blooms in coastal waters of Canada, California, Oregon, Washington state, Europe, Asia, Australia, New Zealand, Central America, and South America. At least nine species within the marine diatom genus *Pseudo-nitzschia* are now known to produce DA. In California, *Pseudo-nitzschia australis* and *Pseudo-nitzschia multiseries* are the main toxin producers. The correct identification of these species is very difficult without the use of electronic microscopy. Blooms of these diatoms in CA often occur during the spring and summer causing the intoxication and death of hundreds of marine mammals and birds.

The abundance of *Pseudo-nitzschia* in the sample analyzed today was low, but a bit higher that last week's concentration. Over the past 6-7 weeks, we observed the development and decline of this genus' bloom at Bolsa Chica. Today's slightly higher abundance may indicate that their populations' abundance is coming back.

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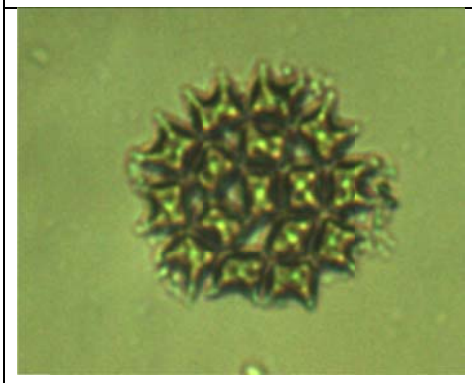
|  <br>*Acanthometron* sp. | ZOOPLANKTON. Acantharia are planktonic, free living, exclusively marine protozoa, ranging in size from 0.05-5 mm in diameter. Like several other marine protists (Radiolaria, Heliozoa), acantharians have axopodia: long, radiating processes used for capturing prey. Acantharia were formerly grouped together with the Polycystina and the Phaeodaria under the common name Radiolaria, but recent molecular evidences suggest that they have not evolved from the same lineage as the Phaeodaria, yet their relationships with the Polycystina are still controversial. Acantharia feed on all kinds of small particulate materials, including bacteria, micro and picoplanktonic algae (diatoms and others), tintinnids and other ciliates and sarcodines, dinoflagellates, copepod nauplii, copepodids and adults, pelagic molluscs, etc.<br>Acantharia are common in surface tropical and subtropical oceanic waters worldwide. In temperate and polar seas, as well as in nearshore areas, they occur in much lower numbers. They are generally restricted to the illuminated upper layer of the ocean. On calm days Acantharia usually aggregate in the upper few meters of the water column; this surface affinity is likely related to the photosynthetic physiology of their symbiotic algae. However, upon wind or rain disturbance, they swiftly descend to lower strata, returning to the surface once adequate conditions there have reestablished. Available information suggests that acantharians are geographically (but not ecologically) cosmopolitan. Almost all species have tropical and/or subtropical distribution.<br><br>The concentration of this group in today's sample was relatively low. |
|  <br>Cf. *Pediastrum* sp. | Pediastrum is a genus of green algae that is commonly found in many freshwater microhabitats because it has a cosmopolitan distribution. Many species of these algae have been described.<br><br>They are typically planktonic organisms, drifting and floating about in ponds, marshes, pools and lakes.<br><br>Green algae are predominantly freshwater; only 10% of them are marine, whereas 90% are freshwater. They and many other algae play an important role for all beings; that is oxygen production by a photosynthetic process.<br><br>The concentration of this group in today's sample was low and it's identity would need to be confirmed by further examination (sp. Considering that these green algae do not often occur in marine waters. |

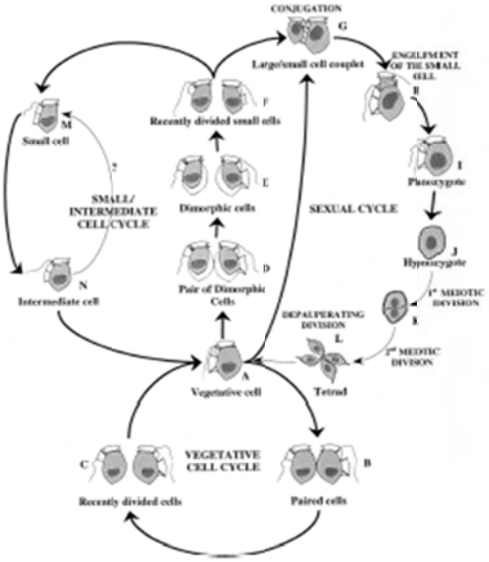



FIG. 10. Schematic diagram of confirmed steps (solid lines) and hypothetical stages (doued lines) in the life history of *Dinophysis* spp. (A–C) Vegetative cell cycle: (A) Fully developed vegetative cell, (B) paired cells, and (C) recently divided cells showing incomplese development of the left sulcal lists. (A–L) Sexual cycle: (D) Pair of dimorphic cells resulting from a depauperating division and (E) recently separated dimorphic cells (doued lines indicate the contour of the maternal hypothecal plaues). (F) Recently divided small cells still with incomplese development of the left sulcal lists. (G) Small cell (acting as a putative (+) anisogamous gamete) and large cell (acting as a putative (−) anisogamous gamete), with nuclei migrated to anterior positions, firmly attached by the ventral margins in apparent conjugation. (H) Engulfment of the small cell by the large cell through the apical end of the sulcus. (I) Planozygote with two trailing flagella. (J) Suspected double-walled hypnozygote. (K) Suspected first meiotic division. (L) Tetrad. (N) Simplified small/intermediate cell cycle.

| Plankton ID | |
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| 05/10/13 | Conc/ Rel. Abundance |
| *Pseudo-nitzschia* spp. | Low-medium |
| *Asterionella sp*. | Low |
| *Chaetoceros* spp. | Low |
| *Bacteriastrum* sp. | High (Bloom) |
| *Eucampia* sp. | Low |
| *Chaetoceros* spp. | Medium |
| *Nitzschia* spp. | Medium |
| *Protoperidinium* sp. | Low |
| *Ceratium furca* | Low |
| *Ceratium divaricatum var. balechii* | Low |
| *Prorocentrum micans* | High (Bloom) |
| *Dinophysis acuminata* | Medium-low |
| *Dinophysis* cf. *fortii* | Low |
| *Pyrocystis lunula* | Low |
| Cf. *Gymnodinium* sp. | Low |
| *Dictyocha* spp. | Low |
| Radiolaria | Low |