FLOW: Amigos de Bolsa Chica Citizen Science Program

Plankton Collection and Identification Report

Date: 05/03/13 Time: 10:30 AM
Collectors: Judy H., Dennis P., Nicole G., Joana T.
Tide: ebb (going out)
Secchi: N/A
Temp.: 21°C
Salinity: 38 ppt
pH: 8-8.2
Nitrates: 0 ppm
Phosphates: 0.25 ppm
Ammonia: 0.25 ppm (close to 0.25 ppm)
Weather/ wind: Sunny/ clear; light onshore breeze (SW)

Summary:

We collected plankton at the Tidal Inlet this morning without any problems. Back at the Visitor Center, we measured nutrients and pH and we observed samples under the microscope: Nicole and Judy were in charge of microscopy; others worked on chemical parameters.

This was a diverse sample that contained very few chains of the potentially harmful genus of diatom *Pseudo-nitzschia* spp., and a variety of both diatoms and dinoflagellates (see complete list at the end of the report). Compared to last week's sample, however, this sample was less diverse, especially in terms of the variety of diatoms present in the water.

Nutrients and pH were within expected ranges (this water was collected when the tide is going out so it makes sense 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).

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.

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).

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 of these *Gymnodinium*-like dinoflagellates in today's sample, but we have seen similar specimens 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.

 *Polykrikos* cf. *schwartzii*	*Polykrikos schwartzii* is a marine athecate dinoflagellate. It is heterotrophic and therefore lacks chloroplasts. *P. schwartzii* occurs in colonies of 2, 4, 8 or 16 individual units called zooids. Each zooid is closely connected to its neighbor, sharing a cell membrane. This species is mainly coastal and estuarine. *P. schwartzii* is common in coastal waters throughout the world except for polar seas. It is mostly confused for *P. kofoidii* hence, exact distribution is not known. It is also often seen in surface sediments from tropical to sub-arctic coastal regions. *P. schwartzii* is mostly seen in summer and autumn. High abundance of *P. schwartzii* cysts is used to indicate high nutrients. The abundance of *Polykrikos* sp. in today's sample was very low.
 *Ceratium divaricatum* var. *balechii*	Distribution of *Ceratium divaricatum* is wider than previously documented (mainly because of previous misidentifications): the North Pacific Ocean, from British Columbia in Canada to temperate or subtropical waters of Mexico, and then is interrupted to reappear again in coasts of Peru and Chile, and also in coasts of the Benguela area, the South-west Atlantic Ocean. In tropical and equatorial areas of the Pacific Ocean, a more delicate form occurs: *Ceratium divaricatum* var. *balechii*. *C. divaricatum* var. *balechii* may be relatively abundant, even producing non-toxic red tides, in various spots along coasts of the Pacific Ocean (Canada to Mexico). I t appears to be a neritic form, with high sensibility to changes in water temperature, and presumably associated to upwelling areas. *Ceratium divaricatum* was reported as "common to abundant between San Mateo and Sonoma counties by the end of the month of September of 2011. The abundance of *C. divaricatum* in today's sample was medium (lower than last week's)

Prorocentrum micans

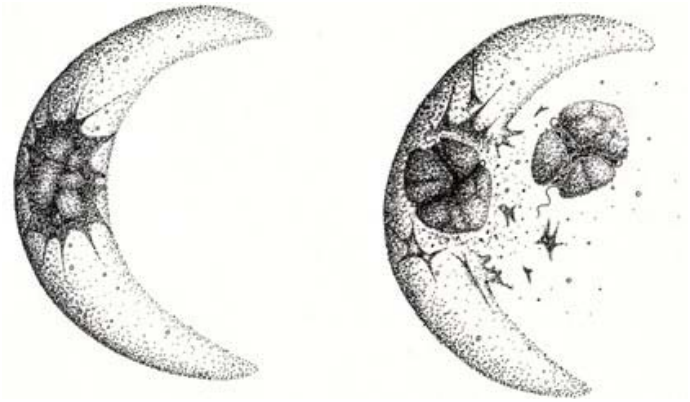
P. micans is a marine bloom-forming dinoflagellate. This is a cosmopolitan species in cold temperate to tropical waters. Although *P. micans* is capable of forming extensive blooms, it is usually considered harmless. It may excrete substances that inhibit diatom growth, but apparently these substances do not enter the food chain or affect organisms at higher trophic levels.

The concentration of *P. micans* observed in today's sample was high (characteristic of a bloom)

Pyrocystis lunula

Pyrocystis lunula is an unarmored (no hard shell), marine dinoflagellate. These are relatively large (100- 140um), crescent moon-shaped cells in which chloroplasts present. May be bioluminescent. Easily confused with *Dissodinium pseudolunula.* Commonly found in oceanic and coastal waters in warm temperate to tropical regions. There no known harmful or toxic effects associated with this species.

See bellow an illustration of *P. lunula* showing a cell reproducing by production of motile planospores. The planospores look very similar to *Alexandrium* (also see possible planospore in our photo on the left)



Plankton ID	
05/03/13	Conc/ Rel. Abundance
Pseudo-nitzschia spp.	Low
Asterionella sp.	Low
Chaetoceros spp.	Medium
Bacteriastrum sp.	Medium-high
Eucampia sp.	Low
Rhizosolenia cf.	Low
Protoperidinium sp.	Low-medium
Ceratium furca	Medium-high
Ceratium divaricatum var. balechii	Medium-high
Prorocentrum micans	Medium- High
Polykrikos cf. schwartzii	Low
Dinophysis acuminata	medium
Pyrocystis lunula	medium

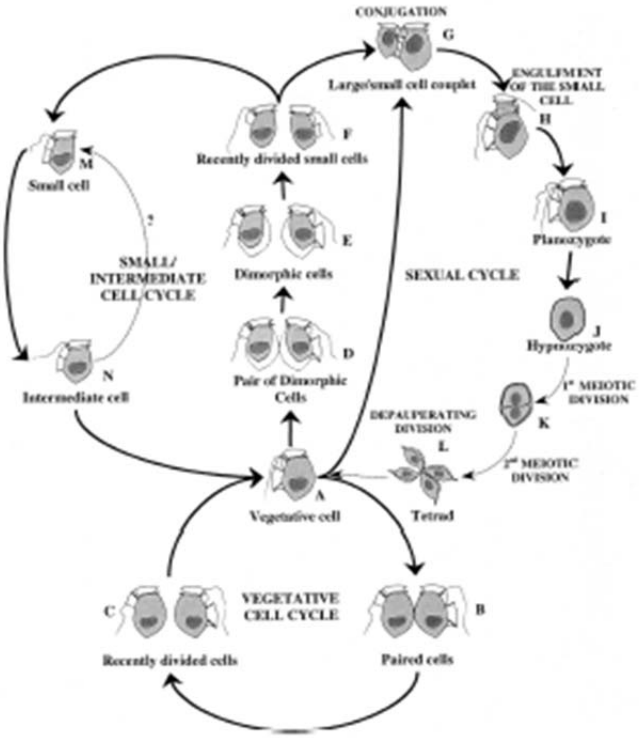


FIG. 10. Schematic diagram of confirmed steps (solid lines) and hypothetical stages (dotted lines) in the life history of *Dinophysis* spp. (A–C) Vegetative cell cycle: (A) Fully developed vegetative cell, (B) paired cells, and (C) recently divided cells showing incomplete development of the left sulcal list. (A–L) Sexual cycle: (D) Pair of dimorphic cells resulting from a depauperating division and (E) recently separated dimorphic cells (dotted lines indicate the contour of the maternal hypothecal plates). (F) Recently divided small cells still with incomplete 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.

Figure 1. Possible size and shape variations for *Dinophysis acuminata* depending on its life cycle stages.

Source: Reguera and Gonzalez-Gil, 2001