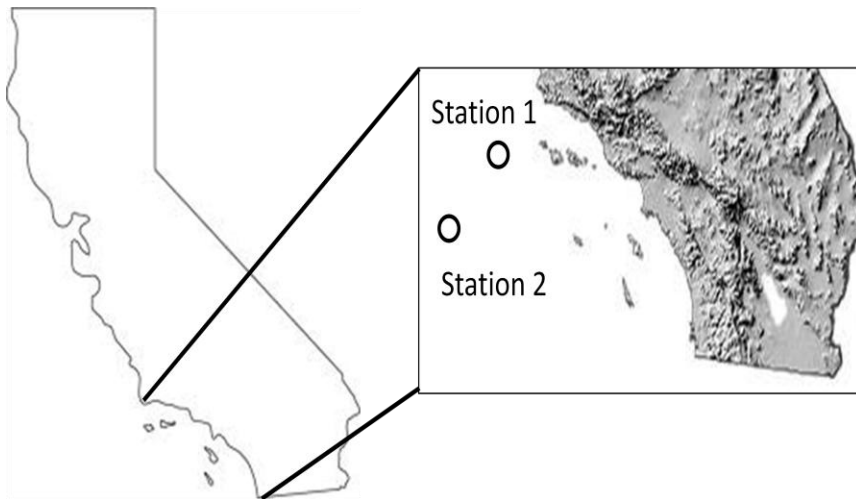


Phytoplankton Growth and Oxygen Production in the California Current

Background:

Dr. Mike is an oceanographer studying phytoplankton in the California Current ecosystem. He wants to know where in the region the phytoplankton are growing the best and why. This is important to him because phytoplankton produce oxygen during *photosynthesis*, and the oxygen concentrations in the ocean are important to keep the ocean healthy. Dr. Mike has chosen two stations to take the ship and collect water sample to study the phytoplankton. The two stations are station 1 which is close to shore (inshore station), and station 2 which is further offshore (offshore station).



At each station, Dr. Mike and his graduate students lowered the rosette (the sampling instrument) to collect water from different depths. They measured the phytoplankton concentration by measuring the concentration of chlorophyll *a* (Chl*a*), and they also measured the concentration of the important nutrient, nitrate, and the concentrations of oxygen at each depth. The

values they measured are shown in the two tables below for each station. Use the table to make a graph of each variable with depth (Chl*a*, Nitrate and Oxygen). Fill in the graphs provided on the separate sheet by plotting each variable on a different x-axis but the same y-axis (depth). Use a different color for each variable and make sure to label each variable with the corresponding color in a legend. An example graph is shown below. Then answer the following questions using **your graphs**.

Inshore Station 1

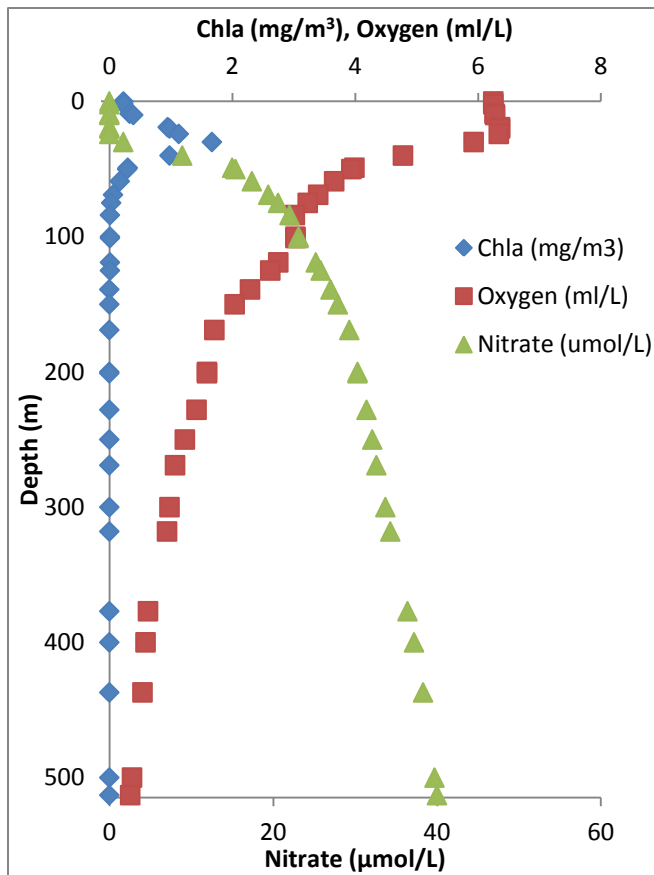
Depth (m)	Oxygen (ml/L)	Nitrate (μmol/L)	Chl a (mg/m ³)
0	5.83	0.00	0.27
3	5.83	0.00	0.27
10	5.92	0.00	0.36
20	6.03	0.20	0.89
30	5.55	3.00	1.68
50	4.75	11.70	0.46
75	3.62	19.30	0.07
100	3.07	22.90	0.02
125	2.37	25.40	0.02
150	1.74	27.00	0.01
200	1.25	28.40	0.01

Offshore Station 2

Depth (m)	Oxygen (ml/L)	Nitrate (μmol/L)	Chl a (mg/m ³)
0	5.82	0.00	0.13
3	5.82	0.00	0.13
10	5.82	0.00	0.13
16	5.82	0.00	0.13
20	5.82	0.00	0.13
30	5.81	0.00	0.13
45	5.8	0.00	0.14
50	5.88	0.00	0.22
75	5.39	3.80	0.66
100	4.82	11.20	0.17
125	4.03	17.30	0.08

250	1.22	30.30	0.00	150	3.28	21.90	0.00
300	1.18	32.50	0.00	200	2.58	26.50	0.00
400	0.64	36.80	0.00	250	2.22	29.30	0.00
500	0.36	39.10	0.00	300	1.56	31.60	0.00
515	0.32	39.40	0.00	400	0.98	37.40	0.00
				500	0.49	40.20	0.00
				515	0.41	40.60	0.00

Example Graph



What does your oceanography data mean?

1. Before you look at the tables or the data, what do you think might be different between these two areas of the ocean (the “inshore” station versus the “offshore” station), based on how close to shore they are? For example, do you think there are more fish at one station than another? More nutrients? (Hint: Think about where most of the nutrients come from) Explain your answer.

2. Make two graphs, one for the inshore station and one for the offshore station. Look at the graphs you have made and circle the depths at each station where there is the highest chlorophyll.

3. Use your graphs to answer the following question. What depth at each station does the nitrate start to increase? (Hint: Choose the depth where the nitrate begins to be higher in concentration than the preceding

depths.

- Use your graphs and tables to answer the following question. At what depth (s) for each station are there the highest oxygen concentrations?
- What do you notice about the depth where there is a maximum in chlorophyll and where the nitrate starts to increase? Why do you think there is a maximum in chlorophyll at this depth and not right at the surface closest to the sun?
- What have you learned about where phytoplankton like to live? Which station do you think supports a healthier food web? Explain your answer.