Integrating Principles of Biomagnification into The Long Island Sound Curriculum

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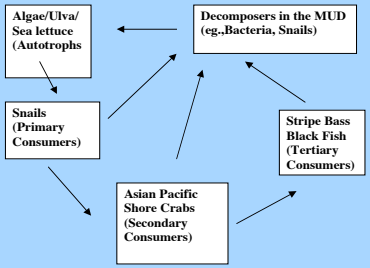
Introduction: The Connecticut Science Standards require grade 6 students to learn that "an ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact" (Standard 6.2). Specifically, they need to know 1.) That populations in ecosystems are affected by biotic factors, such as populations, and abiotic factors, such as soil and water, and 2.) Populations in ecosystems can be categorized as producers, consumers, and decomposers of organic matter. There are three student performances to assess, but only two were covered in this project: 1. Students will explain how populations are affected by predator-prey relationships, and 2.) Describe common food webs in different Connecticut ecosystems.

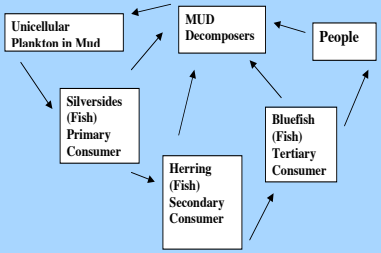
We are interested in studying food-chains, and how some contaminants can accumulate and biomagnify, thus posing a health risk to humans who eat animals at top levels (i.e., bony-fish and shellfish). Thus the hypothesis we are testing is that the concentration of contaminants will increase as we sample up the food chain.

Our study site is Long Warf, New Haven, which is a part of the Long Island Sound. Below are two known food chains that we will we testing for evidence of bioaccumulation/biomagnification.

Hypothesis 1:



Hypothesis 2:



Long Warf, New Haven CT

IN THE CLASSROOM:

My project is on biomagnification of mercury impacting the Long Island Sound's organisms. I began in my classroom by reviewing the water cycle. We explored how we can clean up dirty water by sedimentation. I explained that for smaller organisms that are microscopic, we need to use certain chemicals to get rid of them. We then looked into the aspect that water we use today is the same water that existed from the beginning. We then looked at what we do in our neighborhoods will have an impact on the water that eventually goes into the Sound. We examined water sewage treatment plants and that water, once treated, gets returned to the Sound. We did experiments on what we throw out in the trash in a matter of five days. We made frequency tables (in line with what I was currently teaching in math),We used pieces of fabric, plastic, aluminum foil, paper clip, styrofoam to show which items are biodegradable. We also did an experiment using oil and its impact. We did an experiment on what we do in the urban environment such as cement over soil causes us to have to build sewers. We had an opportunity to examine specimens actually taken from the Sound and question was posed of what consumed what. They had to identify the producers, etc. We discussed food webs of the sound. We researched which rivers feed into the Sound connecting what we do in our day-to-day routine ultimately affects the Sound. We created dioramas showing our research efforts.

Name_____ Date_____

Science Assessment

Match the following organisms to what you believe would be the mercury concentrations

Organisms	Mercury Level (ppm)
Small fish	0.301
Mussels	0.0453
Snail	0.1301
Lady crab	0.2487
Shrimp	0.1073
Sea lettuce	0.1285
Rock crab	0.0883
Sandworm	0.1665
Trout	0.3555

Summary:

My students were very enthusiastic about this project because they were able to view and handle specimens from the Long Island Sound. Just this weekend, students reported going to Lighthouse Park to find the live specimens. I was greeted the day after Memorial Day with excited children that actually saw live organisms, first seen in my class. They even got their parents involved.

For assessment student made dioramas, and some students actually went to the Long Island Wharf to collect representative samples like sand and shells, and took pictures of them, thus displaying the Wharf so eloquently through their dioramas.

Mercury Levels
Long Island Sound samples
WISTR Project

Samples dried April 17, 2007
Measured April 19, 20, 21, 2007

	weight	ppm Hg	average
unknown fish fin	0.0557	0.1620	0.1649
unknown fish fin	0.0986	0.1555	
unknown fish fin	0.0708	0.1772	
unknown fish flesh	0.052	0.6289	0.8747
unknown fish flesh	0.0501	1.1214	
unknown fish flesh	0.0801	0.7737	
unknown fish skin	0.0458	0.2053	0.3309
unknown fish skin	0.0436	0.3830	
unknown fish skin	0.0357	0.3043	
blackfish fin	0.1136	0.0085	0.0736
blackfish fin	0.0556	0.0704	
blackfish fin	0.0471	0.0802	
blackfish flesh	0.1195	0.8001	1.1125
blackfish flesh	0.0786	1.9754	
blackfish flesh	0.0887	0.5620	
blackfish bone	0.0325	0.0871	0.1023
blackfish bone	0.0283	0.1199	
blackfish bone	0.0222	0.0996	
sediment	0.1348	0.0051	0.0051
sediment	0.1728	0.0035	
sediment	0.1787	0.0066	
snail shell	0.0709	0.0198	0.0203
snail shell	0.0306	0.0191	
snail shell	0.0348	0.0218	
Marshasset snail flesh	0.0401	1.7338	
Marshasset snail flesh	0.0128	0.0739	
Marshasset snail flesh	0.0307	0.0175	
Trout fin 1	0.0328	0.0404	0.0316
Trout fin 2	0.0192	0.0294	
Trout fin 3	0.0402	0.0251	
Trout tooth 1	0.0557	0.0027	0.0034
Trout tooth 2	0.0372	0.0038	
Trout tooth 3	0.0624	0.0038	
Trout flesh 1	0.0164	0.1571	0.1458
Trout flesh 2	0.0143	0.1391	
Trout flesh 3	0.0139	0.1413	
Trout tongue 1	0.1658	0.0051	0.0104
Trout tongue 2	0.0423	0.0053	
Trout tongue 3			
small fish tail 1	0.008	0.0074	0.0215
small fish tail 2	0.0075	0.0432	
small fish tail 3	0.0026	0.0139	
mussel flesh1	0.0355	0.1581	0.1556
mussel flesh2	0.0489	0.1506	
mussel flesh3	0.0533	0.1780	
shrimp flesh 1	0.0554	0.0337	0.0308
shrimp flesh 2	0.0404	0.0304	
shrimp flesh 3	0.0332	0.0284	
crab flesh 1	0.0236	0.0908	0.0809
crab flesh 2	0.0255	0.0628	
crab flesh 3	0.0131	0.0891	
Ulva (se lettuce) 1	0.0065	0.0111	0.0069
Ulva 2	0.0071	0.0036	
Ulva 3	0.0101	0.0061	
Red algae 1	0.0839	0.3348	0.4551
Reed algae 2	0.0016	0.5516	
Red algae 3	0.0033	0.4788	
scallop shell 1	0.0843	0.0031	0.0027
scallop shell 2	0.1069	0.0021	
scallop shell 3	0.0674	0.0030	
old whelk shell 1	0.5168	0.0006	0.0008
old whelk shell 2	0.3601	0.0016	
old whelk shell 3	0.0639	0.0002	
pink crab shell 1	0.0964	0.0053	0.0071
pink crab shell 2	0.0542	0.0072	
pink crab shell 3	0.0461	0.0087	
clam shell 1	0.2148	0.0023	0.0026
clam shell 2	0.2079	0.0036	
clam shell 3	0.1563	0.0021	
mussel shell 1	0.0698	0.0039	0.0049
mussel shell 2	0.0655	0.0039	
mussel shell 3	0.0625	0.0041	
horseshoe crab leg 1	0.0248	0.0215	
horseshoe crab leg 2	0.0270	0.0619	
horseshoe crab leg 3	0.0180	1.3958	
stone crab leg 1	0.1636	0.2478	0.2385
stone crab leg 2	0.0680	0.3646	
stone crab leg 3	0.1166	0.1030	

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