



UNH Great Bay Coast Watch Volunteer Phytoplankton Monitoring and Outreach Project



A Final Report to the New Hampshire Coastal Program

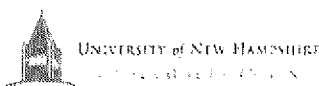
Submitted by
Bonnie S. Meeker and Ann S. Reid
Sea Grant Extension,
University of New Hampshire, Durham NH 03824

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Cover Photo: GBCW volunteers Barbara Baird, Andrew Steward, Jack Balaguer, and Wally Fries at the Darling Marine Center with Tracey Riggins of Bigelow Laboratory for Ocean Sciences.

Great Bay Coast Watch – Volunteer Phytoplankton Monitoring and Outreach Projects

Introduction

The Great Bay Coast Watch (GBCW) was founded in 1990 as part of the University of New Hampshire Cooperative Extension/New Hampshire Sea Grant outreach. The GBCW mission is to protect the long-term health of New Hampshire's coastal environment through volunteer monitoring and education programs. This year the New Hampshire Coastal Program (NHCP) provided the Watch with operational support to continue phytoplankton monitoring and education efforts in coastal New Hampshire.

In 1999, GBCW volunteers completed training and started the first New Hampshire harmful algae bloom (HAB) monitoring effort. HAB events continue to increase in U.S. coastal waters. Most species of algae or phytoplankton are not harmful and serve as an important energy source at the base of the food chain. However, a small number of species can produce toxins that when present in large quantities may concentrate in shellfish. Harvested and consumed by humans, these now toxic shellfish can cause sickness and death. Many coastal states now rely on volunteers to collect water quality data and assist scientists and shellfish managers in monitoring for blooms of potentially toxic phytoplankton species. Currently, GBCW volunteers are trained to identify four target species that are toxic or capable of becoming toxic. They include *Alexandrium* spp., *Dinospheysis* spp., *Prorocentrum lima* and *Pseudonitzschia* spp.

Goals and Objectives

The main Objectives of this project were:

1. Recruit new volunteers and provide training for both new and existing volunteers for phytoplankton monitoring.
2. Continue quality sampling and data collection.
3. Continue education and outreach efforts through monthly meetings, volunteer workshops and volunteer demonstrations aboard ferry services.
4. Develop a digital photo library of local phytoplankton species.

Results and Discussion

Volunteers sampled over 80 times while monitoring for toxic phytoplankton blooms at five coastal locations (see Appendix A).

Phytoplankton volunteers engaged the public in phytoplankton demonstrations onboard ferry service to the Isle of Shoals. Activities included sampling techniques, phytoplankton identification with microscopes and distribution of informational brochure.

GBCW phytoplankton coordinator and volunteers attended a two-day workshop co-hosted by the Maine and New Hampshire phytoplankton volunteer programs. Presentation topics included:

- Phytoplankton identification
- Phytoplankton and shellfish relationships in the Gulf of Maine
- GOMOOS, Access to weather and oceanographic conditions
- *Alexandrium* bloom dynamics in the Gulf of Maine

GBCW organized monthly educational meeting and training sessions for volunteers. Topics included the following:

- Great Bay Coast Watch website design
- Results of the Annual NH Coastal Clean-up
- Overview of the Gulf of Maine Council on the Marine Environment
- Results of volunteer rainfall shoreline surveys
- Fish and marsh ecology
- Microbial tracking on pollution sources
- Restoration of South Mill Pond

From the beginning of the grant period in June 2002, phytoplankton volunteers monitored preexisting sites located at the Seabrook Fisherman's Cooperative, Hampton State pier, Parsons Creek in Rye, the Coastal Marine dock in New Castle and Hilton Park in Dover. Per an ongoing agreement with the Isles of Shoals Steamship Line, Star Island Corporation and the NH Department of Environmental Services Shellfish Program a sampling site was also maintained at Star Island. Throughout the summer and fall of 2002, recorded samples were unremarkable in their composition and in fact produced far lower numbers than in previous years.

Phytoplankton monitoring for the 2003 season began in the middle of April at most sites. The first Paralytic Shellfish Poisoning (PSP) causative *Alexandrium* cells were found in samples collected from the Seabrook site on May 28, 2003. Subsequently, cells were reported present in samples taken at the Rye, Coastal Lab and Hilton Park monitoring sites. As reported by DES, shellfish samples collected from Star Island on

June 3, 2003 tested positive for PSP at 114 micrograms and dropped to 48.8 on June 12, only to increase again to 81.5 on June 19, then drop to 47.4 by June 23. Similar variations in toxin levels were observed throughout the month of June at most sampling sites.

Volunteer collected phytoplankton data recorded during that period have been compared with toxicity data collected by NHDES. This has led to discussions with both U.S. Food and Drug Administration (USFDA) and Maine Division of Marine Resources representatives over the possibility it could have been a combination of *Alexandrium* and/or *Dinophysis acuminata* responsible for the fluctuating levels. The presence of *Dinophysis* is not remarkable at this time of year. However, since our program started in June 1999 *Dinophysis norvegica* has been by far the more common species recorded. The presence of a large number of *Dinophysis acuminata* during this sampling season was an observable change over previous years. Although there is no documented history of Diuretic Shellfish Poisoning (DSP) incidents related to this cell in the U.S., it has been implicated in DSP events in Europe. In response to this observed change, GBCW data recording sheets will be modified to allow monitors to differentiate between the numbers of the two species observed. Toxin test results are pending on *Dinophysis* samples sent to the USFDA Laboratory in Washington. This event points out the value of volunteer collected data. Without the observations of volunteers the possibility of a new and different causative cell would not have been raised.

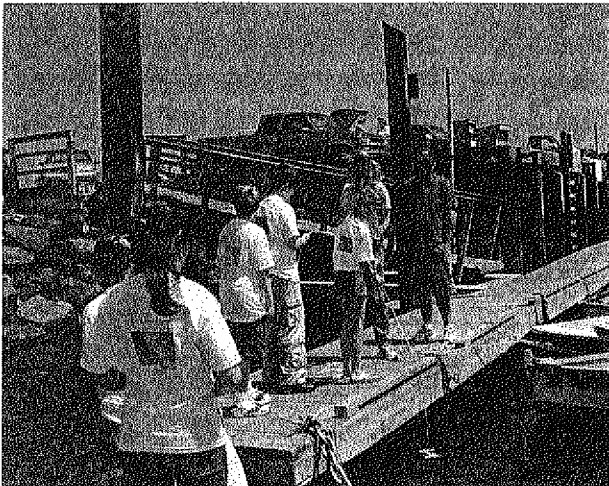
In addition to monitoring, on April 1, 15, May 20 and June 10, GBCW volunteers and staff presented introductory phytoplankton programs to the 6th grade students at Portsmouth Middle School as part of their study of the history and restoration efforts of the South Mill Pond. Additionally, a Friday afternoon "Phytoplankton Club" was started as an enrichment activity at the Lincoln Akerman School (LAS) in Hampton Falls. Students at both schools had the opportunity to examine samples of phytoplankton using the field microscopes. LAS students monitored the Hampton site through the months of May and June and were featured in an article run in the Seacoast newspapers (Appendix B). A public demonstration of GBCW phytoplankton monitoring methods was presented at the Seacoast Science Center (SSC) on May 17. This was intended to introduce the public as well as SSC staff to our Phytoplankton Monitoring Program.

Work has continued on the digital photographic database of phytoplankton species observed in collected samples. Representative photos are included in this report (Appendix D).

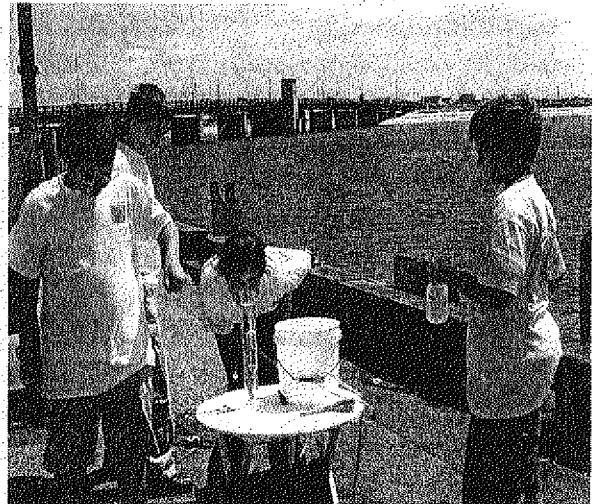
GBCW volunteer phytoplankton monitoring continues to be closely aligned with the Maine volunteer monitoring network. A joint spring training session was held March 14-15 at the University of Maine Darling Marine Center (DMC), Walpole, Maine. Sponsored by GBCW, guest speaker Dr. Bruce Keefer spoke about *Alexandrium* dynamics in the Gulf of Maine. Volunteers also worked with DMC staff to improve their identification

skills. At this time, GBCW volunteer collected phytoplankton data is being shared with the NH Department of Environmental Services/Shellfish Program, Maine Department of Marine Resources and the U.S. Food and Drug Administration Office of Seafood Safety.

During the grant period an additional sum of \$5,000.00 was received. This additional money was used to purchase sampling supplies and replacement equipment.



Collecting a sample



LAS Phytoplanktoneers Photos by Wally Fries.

Recommendations

GBCW volunteer phytoplankton monitors have been successful in observing, identifying and reporting the presence of toxic cells well before the presence of toxins have been identified in tested mussel meats during both 2000 and the 2003 seasons. Continued support of the monitoring program will ensure that it remains a valuable adjunct to Department of Environmental Services / Shellfish Program testing.

CML

Date	Time	Current Speed	Wind Speed	Wind Direction	Air Temp. (C)	Transparency	Water Depth (cm)	Water Temp (C)	Water Temp. in Cylinder (C)	Water Density	Salinity (ppt)	Tow Depth (cm)	Duration (min)	Disolved Oxygen (ppm)	Tube 1	Tube 2	Pr. spp.	A.t.	Ps. spp.	D. spp.	Dominant Species	Number of Cells	Comments	Sampler	Vol. Min.	Vol. Mi.
07/06/02	8:45	L	4	NW	22	440	580	16.5	18	1.0225	29.9	400	3	8	8	8	0	0	0	1		16		C Hoffman, E Hill	180	56
07/11/02	12:43	0	10	W	28.5	310	635	16.5	18	1.0225	29.9	400	3	8.3	23	7	0	0	0	2		30		E Hutchins, C Hill	120	32
07/19/02	7:45	0	3	NE	17	480	615	15	16	1.0245	31.9	400	3	8	0	5	0	0	0	1		5		L Chernyshov, C Hill	120	36
07/26/02	13:50	H	4	E	23	400	630	18	19	1.025	33.4												net was lost.	E Hutchins, C Hill	120	40
08/08/02	11:13	L	12	NE	25	460	510	19	20	1.023	31.2	300	4	7.4	5	3	0	0	0	0		8		E Hutchins, C Hill	180	45
08/22/02	12:30	0	8	S	30	280	480	17	nt	nt	nt	400	3	8	3	2	0	0	0	0		5	little fish!	C Hoffman, E Hill	180	38
08/28/02	15:45	0	6	E	20	360	490	18	18	1.025	33.2	400	3	8.2	2	2	0	0	0	0		4		C Hoffman, E Hill	120	16
04/16/03	11:15	0	5	S-SE	nt	270	555	9	10	1.0195	24.1	5	3	10.5	11	100+	0	0	0	0	Phaeocystis	100+		Ken Costello, Staff	150	10
04/21/03	15:40	0	5-10	N	10	230	480	8.5	9.5	1.022	27.35			11.3	100+	100+	0	0	0	0	same	100+		Peter, Ginny Rat	510	82
05/01/03	12:30	0	5-10	SE	8.8	290	505	7	8	1.021	25.9	4	3	10.4	6	100+	0	0	0	0	Phaeocystis	100+		E Hutchins, C Hill	120	26
05/16/03	12:05	L	10	N	10.5	345	525	11	11	1.0215	27.05	4	3	9.5	6	3	0	0	0	0		9		E Hutchins, C Hill	180	72
05/23/03	6:20	0	5	NE	11.1	355	495	11	14	1.022	28.2	4	4	9.6	9	9	0	0	0	1	diatoms	18		staff	0	0
05/29/03	11:30	L	5	NW	24.4	305	510	13	30	1.0175	27.4	4	3	8.4	8	4	0	0	0	0		12		Cliff Horrigan	90	6
06/13/03	10:50	L	3	N	19.4	295	510	13.5	13	1.021	26.8	4	4	nt	24	25	0	3	0	6	CH	49	5 DN, 1 DA	staff	0	0
06/27/03	10:35	0	0-5	SE	30	355	490	18	18	1.022	29.2	400	4	8.5	9	16	0	0	0	10	DN	25		E Hutchins, Lisa	150	50

Hilton Park

Date	Time	Current Speed	Wind Speed	Wind Direction	Air Temp. (C)	Transparency	Water Depth (cm)	Water Temp (C)	Water Temp. in Cylinder (C)	Water Density	Salinity (ppt)	Tow Depth (cm)	Tow Duration (min)	Disolved Oxygen (ppm)	Tube 1	Tube 2	Pr. spp.	A.t.	Ps. spp.	D. spp.	Dominant Species	Number of Cells	Comments	Sampler	Vol. Min.	Vol. Mi.
07/07/02	11:12	L	1	NW	24	332.5	400	18	19	1.0225	30.15	300	3	8.1	8	4	0	0	0	0	CS	12		D Chamberland,	240	52
07/14/02	16:20	H	5	S	26	305	370	18	20	1.023	31.2	300	3	8	7	11	0	0	0	5		18		Don Chamberland	240	38
07/23/02	12:35	L	3-5	SW	35	297.5	400	19	21	1.0225	30.8	390	3	7.9	2	3	0	0	0	0	diatoms	5			50	20
08/04/02	9:30	L	3	NW	28	385	400	21	22	1.0225	31.1		3	7.7	6	12	0	0	0	0		18	guinardia 80%	B Baird, D Charr	180	20
08/11/02	15:20	0	10-15	SW	33	353	420	19	21	1.0235	32.1		3	7.8	5	3	0	0	0	1		8		B Baird, D Charr	150	20
09/03/02	9:55	M		NE	19	265	380	19	18.5	1.0235	31.45	300	3	7.5	8	8	0	0	0	0	PT	16		B Baird, M, S, S Wensman	270	52
09/03/02	16:25	L	4	S	25	300	400	18	19	1.0235	31.5	300	3	8.1	3	7	0	0	0	0	GY	10		B Baird, D Charr	180	20
09/16/02	8:20	L	10	S	22	360	390	17	17.5	1.0255	33.95	300	3	7.4	26	28	0	0	0	0	LP	54		M, S, S Wensman	180	14
09/24/02	14:55	O	5	SSW	22	425	427	17	18	1.024	31.9		3	8	10	6	0	0	0	0	GY	16	approx 12 GY	B Baird, D Charr	180	20
10/07/02	13:35	M	3	S	20	289.5	410	14	15	1.026	33.7	300	3	7.4	24	16	0	0	0	0	GY	40		M, S, S Wensman	180	42
10/15/02	9:10	NW	5	NW	6	410	410	12.5	10	1.0255	31.7	400	3	8.1	9	15	0	0	0	0	GY	24		M, S, S Wensman	240	52
10/22/02	14:30	NW	10-13	NW	8	435	435	11	12	1.0255	32.35	400	3	8.4	8	4	0	0	0	0		12		M, S, S Wensman	180	42
05/07/03	16:14	L	0	0	16.5	255	430	12	13	1.0175	22.25	300	3	8.7	8	8	0	0	0	5	DN	16		B Baird, M Wensman	150	24
06/13/03	12:16	L	0	0	21	210	420	14	14.5	1.0215	27.7	300	3	8.8	10	9	0	0	0	4	DA	19		M Wensman, Staff	270	14
06/21/03	7:49	H	4	S	18	340	430	15.5	15.5	1.019	24.7	300	3	8	30	24	0	0	0	21	CN	54	9 DA, 13 DN	M & S Wensman	270	48
06/29/03	13:30	0	10	SW	30	320	320	17	18.5	1.0205	27.45	300	3	9.6	13	28	0	0	0	9	SK	41		B Baird, S Harber	220	35

Students get down to detail at the ocean

Lincoln Akerman School helps Coast Watch science project

BY STEVE JUSSEAUME
sjusseume@seacoastonline.com

HAMPTON — A dozen “planktoneers” from Lincoln Akerman School in Hampton Falls are keeping an eye on Hampton/Seabrook Harbor, monitoring the harbor water for clarity, salinity and checking dissolved oxygen. The study is part of a science project being undertaken in conjunction with Great Bay Coast Watch.

A dozen students from fifth- to seventh-grade have been combining class exercises and field trips to the harbor for six weeks, recording the subtle changes that take place with the incoming and outgoing tides.

“We’ve been involving area residents in our monitoring program for years, and this year we initiated a project with the schools that gets kids out. They learn about phytoplanktons, do some sampling; it’s multidisciplinary,” said Candice Dolan, project coordinator with Great Bay Coast Watch. Last Friday at the harbor, she took a break while her LAS students pulled samples from the harbor and set up a portable sampling station next to Hampton Harbor Bait & Tackle.

Students work on site with computers, with aerial mapping of potential algae blooms, and with microscopes to identify what they find in the harbor water.

Great Bay Coast Watch, affiliated with the University of New Hampshire Cooperative Extension and Sea Grant New Hampshire, uses volunteers to regularly

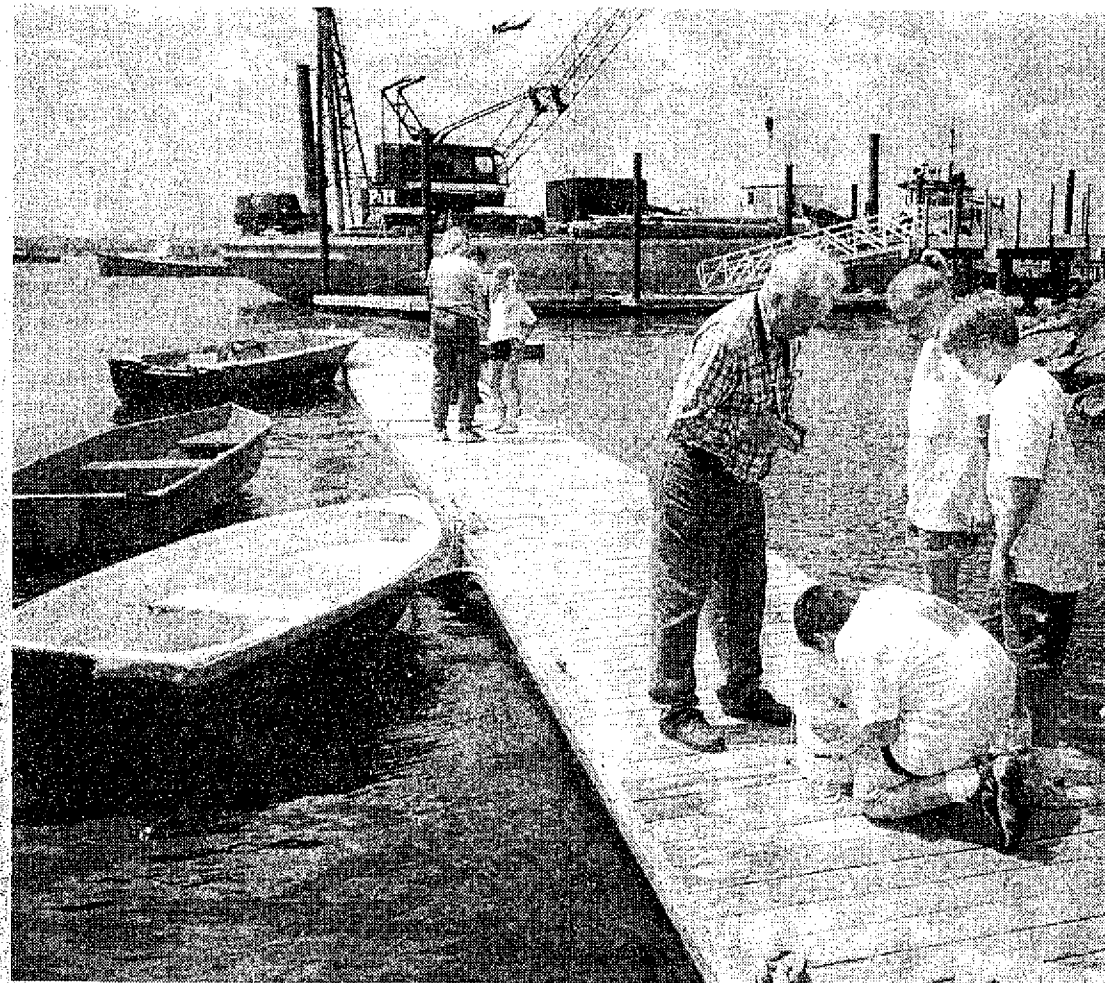
monitor water quality, take shoreline surveys, provide community outreach and education, and check for harmful algae blooms, not only in Hampton Harbor but all along the New Hampshire coastline and up the Piscataqua River to Great Bay.

Since 1990, more than 100 volunteers have monitored 30-plus sites along the state’s 18-mile coastline and its two estuaries.

Friday’s field trip included Linda Coe, a Great Bay Coast Watch volunteer, who guided the students through the collection and data-recording aspects of the project. At one end of the dock, seventh-grader Kaleigh Grade hauled a net in while fifth-grader Allison Pike kept notes. At the other end of the dock Dolan worked with David Holt, Kyle Ham and Charles Puschel, all sixth-graders, collecting water samples. The students used a Secchi disk to measure water clarity, while up above in the parking lot seventh-grader Shauna Walor set up a table with chemistry equipment that would be used to measure salinity, temperature and oxygen content.

“You should estimate the wind direction and speed. The wind speed will measure how much mixing is going on in the harbor,” Coe told Pike, sticking her finger in the wind and glancing down at the water below, noting a lack of white caps on the water surface.

With the microscopes, the students counted how many one-celled animals they found in a drop of water, identify-



Students collect data for their project with Great Bay Coast Watch members at a dock on Hampton/Seabrook Harbor recently.

Steve Jusseume photo

ing thalasionema nitzschiioides, chaetoceros debilis and tamarensis by the dozen.

“The girls are seriously into the chemistry part of this project. They see colors change, things in the water. It’s like a magic show,” Dolan commented.

She noted that some of the students will eventually take part in the floating lab program that goes out into the estu-

ary. “We just try to introduce this kind of science to the students now. It introduces kids to something they can’t see and didn’t know existed,” she said. She recalled a similar field trip last year when two guys on Harley-Davidsons drove by.

“I was out here taking samples and identifying some of the cells. Often we’ll get tourists looking over our shoulders,

asking what we’re doing,” Dolan said with a smile.

“One morning these two big guys came by on Harleys. One looked over, they let then came back, and this big guy walked over and asked what I was doing. He was amazed. Well, I never expected to see anything like this when I got out of bed this morning,” the guy said, then the just rode off.”

**NHCP Grant - GBCW Phytoplankton Monitoring and Outreach Project
Quarter 1**

Date	Sampler	Vol. Min.	Vol. Mi.
Rye Harbor			
07/14/02	A Stewart, L Beattie, J Chambers	180	14
Coastal Lab			
07/06/02	C Hoffman, E Hutchins, L Cheryshov	180	56
07/11/02	E Hutchins, C Hoffman	120	32
07/19/02	L Chernyshov, C Hoffman	120	36
07/26/02	E Hutchins, C Hoffman	120	40
08/08/02	E Hutchins, C Horrigan, C Hoffman	180	45
08/22/02	C Hoffman, E Hutchins, C Horrigan	180	38
08/28/02	C Horrigan, C Hoffman	120	16
Hilton Park			
07/07/02	D Chamberland, M S,S Wensman	240	52
07/14/02	Don Chamberland,M,S,S Wensman	240	38
07/23/02		50	20
08/04/02	B Baird , D Chamberland	180	20
08/11/02	B Baird, D Chamberland	150	20
09/03/02	B Baird, M,S,S Wensman	270	52
09/03/02	B Baird, D Chamberland	180	20
09/15/02	M, S, S Wensman	180	14
09/24/02	B Baird, D Chamberland	180	20
Seabrook			
07/01/02	Roy & Marie	270	14
07/08/02	Roy & Marie	270	14
07/15/02	Roy & Marie	270	14
07/22/02	Roy & Marie	270	14
07/29/02	Roy & Marie	270	14
08/05/02	Roy & Marie	270	14
08/12/02	Roy & Marie	270	14
08/18/02	Roy & Marie	270	14
08/25/02	Roy & Marie	210	14
09/10/02	Linda Coe	90	20
09/18/02	Linda Coe	90	20
Coast Guard Pier			
07/13/02	E Hutchins, C Hoffman	180	32
08/01/02	staff	0	0
Parson's Creek			
07/01/02	A Stewart, J Chambers, L Beattie	120	10
07/08/02	A Stewart, J Chambers, L Beattie	180	11
07/22/02	A Stewart, J Chambers, L Beattie	120	11
07/29/02	A Stewart, J Chambers, L Beattie	120	10
08/03/02	A Stewart, J Chambers, L Beattie	120	10

**NHCP Grant - GBCW Phytoplankton Monitoring and Outreach Project
Phytoplankton Sampling and Activities - Quarter 2**

Date	Comments	Sampler	Vol. Min.	Vol. Mi.
Hilton Park				
10/07/02		M, S, S Wensman	180	42
10/15/02		M, S, S Wensman, B Baird	240	52
10/22/02		M,S,S Wensman, B Baird	180	42
Rye Harbor				
10/13/02		A Stewart, L Beattie, J Chambers	135	17
Seabrook				
10/04/02		Linda Coe	90	20
10/07/02		L Coe	90	20
10/10/02		C Dolan	0	0
10/15/02		Linda Coe	40	20
10/21/02		Linda Coe	90	20
Hampton				
10/07/02		B&J Balaguer	180	20
10/16/02		B&J Balaguer	240	20
10/20/02		J Balaguer	<u>120</u>	<u>10</u>

Totals **1585** **283**

(26 hours)

Match \$\$ **\$351.00** **\$103.30**

Monthly Meetings and Training

	Volunteer Hours	Miles
July*	250	1107
August*	96	739
September*	71	437
October	38	320
November	133	442
December	kit clean-up	<u>14</u> <u>124</u>
	Totals	602 3169
	Match \$\$	\$8,127.00 \$1,156.69

*not reported last quarter

Match Summary

	hours	miles	
Q1			\$2,025.00 \$384.00
Q2	phyto sampling		\$351.00 \$103.00
	monthly mtgs.		\$8,127.00 \$1,156.00
Totals			\$10,503.00 \$1,643.00 \$12,146.00

**NHCP Grant - GBCW Volunteer Phytoplankton Monitoring and Outreach Project
 Quarter 4- Volunteer activities and hours, and match summary**

Monthly Meetings and Training

	Volunteer	Hours	Miles
04/18/03 Training		23	208
04/02/03 Monthly meeting		31.5	343
05/07/03 Monthly meeting		34	
06/04/03 Monthly meeting		30	
Totals		118.5	551
Match \$	\$2,015.86		\$201.12

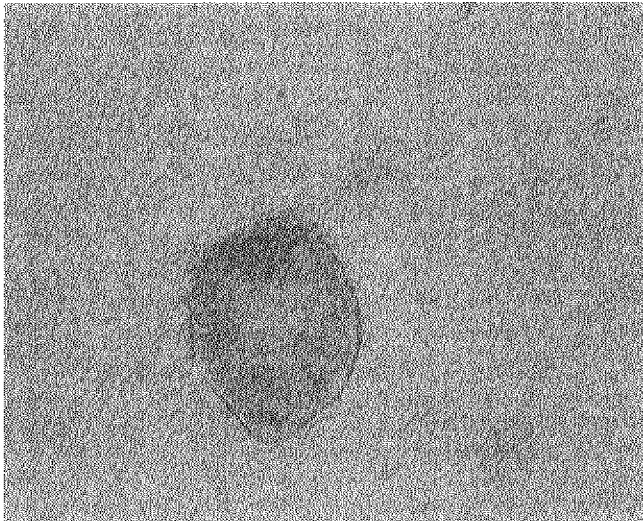
*note- phytoplankton sampling not included in match calculations - see project database for account of activities.

Match Summary

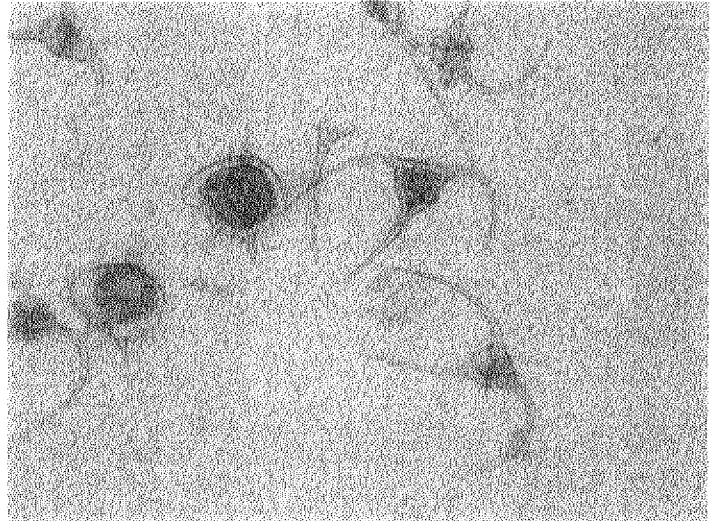
Quarter

1	\$2,409.00		
2	\$9,737.00		
3	\$3,870.00		
4	<u>\$2,216.00</u>		
Total match	\$18,232.00	Required match	\$13,150.00

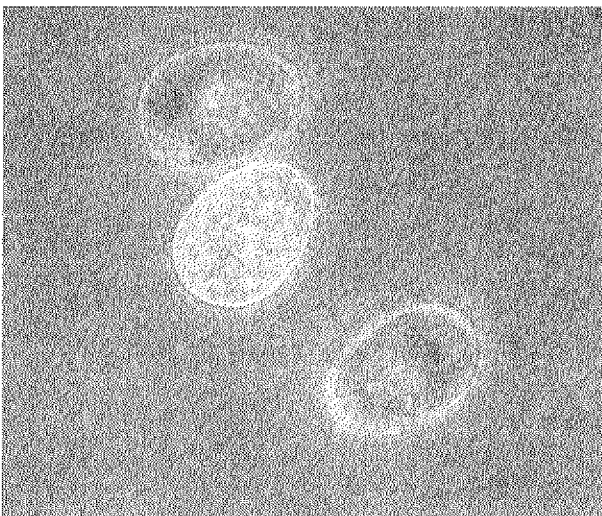
Appendix D: Representative Photos from Database



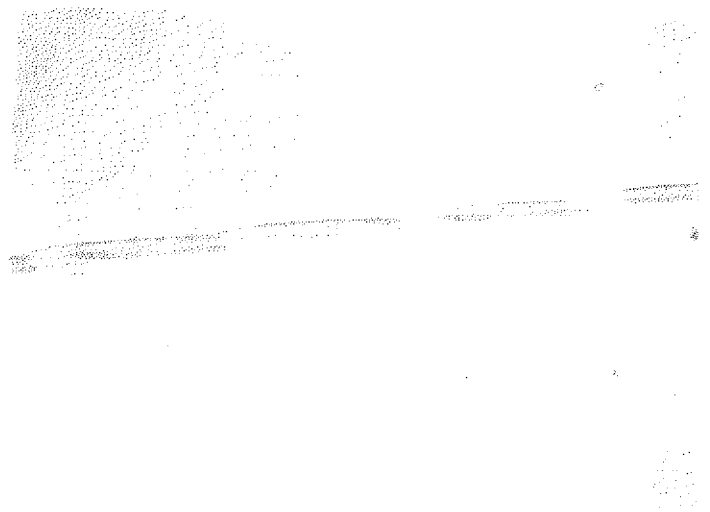
Dynophysis norvigica



Ceratium longipes and *Protoperidinium* spp.



Procentrum lima



Pseudo-nitzschia fraudulenta

