

Report 17641

Final Report

Plankton Indicators of Ecological Change in Southern Biscayne Bay

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Introduction

Compared to northern Biscayne Bay, southern Biscayne Bay is relatively unaltered and pristine. This has been attributed largely to the relatively low ratio of land runoff to bay volume in the south (Brand et al., 1991). Nevertheless, the influence of land runoff can be observed in the south. The communities along the western shoreline, particularly near canal mouths, are most influenced by sudden changes in salinity, high nutrient concentrations, and other pollutants. Algal blooms occur around the mouths of the canals entering southern Biscayne Bay during the rainy season (Brand et al., 1991). The densest seagrass meadows with thick epiphyte growth are observed along the shoreline. These spatial patterns have been interpreted to indicate that nutrients from land runoff in the canals is a major source of nutrients to south Biscayne Bay (Brand et al., 1991; Brand, 2002).

The Comprehensive Everglades Restoration Plan (CERP) is expected to alter land runoff into southern Biscayne Bay, altering its salinity and nutrient regimes and other aspects of the ecosystem. Because this is such a large, unprecedented project that will alter the entire South Florida hydroscape, it is recognized that all of the ecological consequences cannot be predicted ahead of time. As a result, the strategy of adaptive management will be used to observe changes in various ecosystems so that midcourse corrections can be made. Therefore, baseline studies need to be conducted before hydrographic alterations begin. Also, specific indicators of environmental stress are needed for long term monitoring.

Phytoplankton are among the most sensitive indicators of water quality and ecosystem health. Because of pelagic-benthic coupling in shallow ecosystems like Biscayne Bay, changes in phytoplankton would reflect not only changes in land runoff directly, but also changes in the sediments and shallow benthic community as a result of changes in land runoff.

Because of the expense of long term monitoring, only techniques that are relatively simple, quick, and inexpensive are very useful. Several specific indicator ratios of environmental stress in the phytoplankton community were examined for their use in monitoring ecosystem health.

As a broad generalization, phycocyanin-rich cyanobacteria and chlorophyte phytoplankton (e.g. green algae, euglenids) tend to become dominant in stressed marine ecosystems, and chromophyte phytoplankton (e.g. diatoms, dinoflagellates) dominate in stable marine ecosystems. It was hypothesized that, as a result, the ratios of phycocyanin:chlorophyll a and chlorophyll b:chlorophyll a could be used as indicators of stress on the phytoplankton community.

Methods

Using a Biscayne National Park boat, 27 stations in south Biscayne Bay (Figure 1), located by GPS, were sampled. At each station, temperature, conductivity, salinity, and oxygen were measured 0.5 meters below the surface and 0.5 meters above the bottom with a portable YSI 85 Oxygen-Conductivity-Salinity-Temperature Meter. In water less than a meter deep, measurements were made halfway between the surface and the bottom.

Water samples were collected 0.5 meters below the surface in clean high density polyethylene bottles. The water samples were transported back to the laboratory in cooled ice chests the same day. On the same day as water collection, turbidity was measured in the lab with a LaMotte 2008 Turbidimeter calibrated with EPA-approved polymeric standards.

For chlorophyll a, b, and c analysis, three replicate water samples (with approximately 1 mg of $MgCO_3$ added) were filtered through GF/F filters, and the filters were frozen at $-20^{\circ}C$. The filters were extracted with 10 ml of dimethylsulfoxide for 30 minutes, and then with an additional 15 ml of 90% acetone overnight at $5^{\circ}C$. Spectral fluorescence was measured before and after acidification in a SPEX Fluorolog-3 spectrofluorometer at different excitation wavelengths to take advantage of the different excitation and emission spectra of chlorophylls a, b, and c (chl. a: ex.-435 nm, em.-668 nm; chl. b: ex.-470 nm, em.-652 nm; chl. c: ex.-450 nm, em.-634 nm).

Phycocyanin and phycoerythrin were analyzed by filtering three replicate water samples through GF/F filters and freezing them. The filters were extracted overnight with a phosphate buffer (pH 6.5, with 0.01% mercaptoethanol added) at $5^{\circ}C$ and their spectral fluorescence measured with a SPEX Fluorolog-3 spectrofluorometer at different excitation wavelengths

(phycocyanin: ex.-580 nm, em.-640; phycoerythrin: ex.-520 nm, em.-580 nm). The SPEX Fluorolog-3 spectrofluorometer was calibrated with purified pigments.

Nutrient bioassays were conducted by adding either no nutrients (as a control); 250 μM NO_3 ; 25 μM PO_4 ; or 250 μM NO_3 and 25 μM PO_4 (as a control) to 30 ml water samples and monitoring algal biomass daily fluorometrically for 1 to 2 months. The highest in vivo chlorophyll fluorescence measurements achieved in each enrichment were compared to determine if the initial water samples were originally N or P limited. An index of nutrient limitation was calculated using the equation:

$$\frac{\text{FLN} - \text{FLP}}{\text{FLN} + \text{FLP}}$$

where FLN is the highest chlorophyll fluorescence observed in the incubation with 250 μM NO_3 added and FLP is the highest chlorophyll fluorescence observed in the incubation with 25 μM PO_4 added. A positive index indicates nitrogen limitation and a negative index indicates phosphorus limitation.

Results

The raw data are given in Table 1. Figure 2 shows the rainfall during the period of sampling at S123, located along the western shore of south Biscayne Bay near the mouth of Cutler Canal. It shows a fairly typical South Florida seasonal cycle, with low rainfall November to April and high rainfall June to September, with May and October being transitional months between the dry season and rainy season. Flow through canals draining Miami-Dade County into south Biscayne Bay shows roughly the same seasonal pattern (data shown in subsequent figures). The impact of this land runoff is seen in Figure 3, which shows that average salinity over the year is considerably lower along the coastline than further offshore.

Abundance of phytoplankton in the water, measured as chlorophyll a, also reflects the land runoff along the western side of the bay (Figure 4). This indicates that the freshwater runoff is the major source of nutrients for the algae. As a result, one observes higher chlorophyll concentrations at lower salinities (Figure 5). This can also be observed in time courses from dry season to rainy season in canal flow, salinity near the canal mouths, and chlorophyll concentrations near the canal mouths. Figures 6 through 13 show the data for the Aerojet Canal (C111), Mowry Canal (C103), Military Canal, Princeton Canal (C102), Black Creek Canal (C1), Cutler Canal (C100), Snapper Creek Canal (C2), and Coral Gables Canal (C3), respectively. These data are in agreement with an earlier study that showed

that freshwater runoff from land was the major source of nutrients to Biscayne bay (Brand et al., 1991).

Chlorophyll c is a major accessory pigment of many typical marine phytoplankton such as diatoms and dinoflagellates. Figure 14 shows a chlorophyll c concentration pattern similar to that of total phytoplankton biomass measured as chlorophyll a: higher inshore than offshore. As a result, there is a strong correlation between chlorophyll c and chlorophyll a (Figure 15). The chlorophyll c/chlorophyll a ratio as an indicator of the chromatophyte component of the phytoplankton community is fairly constant throughout Biscayne Bay, not changing substantially from oligotrophic to eutrophic communities (Figure 16) or low to high salinity habitats (Figure 17).

An examination of the time course of the chlorophyll c/chlorophyll a ratio from the dry season to wet season also shows that there is no major change over time (Figures 18-25), with some exceptions. Manatee Bay, which receives water from the Aerojet Canal, does show a drop in the chlorophyll c/chlorophyll a ratio in the rainy season (Figure 18). Water near the mouths of the northernmost canals (Cutler, Snapper Creek, Coral Gables) also show a two-fold drop in the chlorophyll c/chlorophyll a ratio during the rainy season (Figure 22). All the canal mouths also have a low chlorophyll c/chlorophyll a ratio in the first month of sampling (Figures 18, 21, 22) for reasons that are not understood, but probably a result of conditions that existed before sampling began. Overall, however, Barnes Sound, Card Sound, waters near the Mowry, Military, Princeton, and Black Creek canals, central Biscayne Bay, and offshore waters all show no substantial change in the chlorophyll c/ chlorophyll a ratio from the dry season to the rainy season (Figures 19, 20, 21, 23, 24, 25).

Chlorophyte algae, containing chlorophyll b, tend to predominate in more perturbed, eutrophic water. Higher chlorophyll b/ chlorophyll a ratios along the shoreline than further offshore (Figure 26) is an indication of this. The higher chlorophyll b/ chlorophyll a ratio in water with the highest total chlorophyll a (Figure 27) also indicates that chlorophyte algae are a greater portion of the phytoplankton community in more eutrophic waters. The data also indicate a somewhat higher chlorophyll b/ chlorophyll a ratio in lower salinity water (Figure 28). This is seen more dramatically in the time courses from dry season to rainy season. It is quite striking that the chlorophyll b/ chlorophyll a ratio increases throughout Biscayne Bay as the rainy season develops (Figures 29-36). It is significant that the chlorophyll b/ chlorophyll a ratio increases even offshore (Figure 36) where runoff is greatly diluted. The fact that the chlorophyll b/chlorophyll a ratio

during the rainy season is considerably smaller offshore than inshore indicates that this is the result of runoff dilution and not a general seasonal factor. The chlorophyll b/ chlorophyll a ratio is small and total pigment concentrations are lower than closer to shore, but the elevated ratio can still be detected, indicating that it could be used as a sensitive indicator of runoff.

Cyanobacteria that have phycocyanin also tend to proliferate in more perturbed, eutrophic waters. This is reflected in the fact that the phycocyanin/ chlorophyll a ratio is higher along the coastline near the canal mouths and lowest in the middle of the bay and offshore (Figure 37). This is also seen in the higher phycocyanin/ chlorophyll a ratios in waters that have higher total chlorophyll a (Figure 38).

The role of runoff can be seen in the correlation between high phycocyanin/ chlorophyll a ratios and low salinity (Figure 39). This can also be seen in the time course of phycocyanin/ chlorophyll a ratios throughout the bay (Figures 40-47). The phycocyanin/ chlorophyll a ratio increases dramatically as the rainy season starts and land runoff enters the bay. This is even seen offshore (Figure 47) where runoff is diluted and total phytoplankton biomass is lower. The fact that the phycocyanin/chlorophyll a ratio during the rainy season is considerably smaller offshore than inshore indicates that this is the result of runoff dilution and not a general seasonal factor. The phycocyanin/ chlorophyll a ratio is lower than inshore, but the increase can still be easily detected, indicating its usefulness as a sensitive indicator of runoff.

Cyanobacteria that contain phycoerythrin predominate in oligotrophic offshore waters. As a result, the highest phycoerythrin/ chlorophyll a ratios are found offshore and the lowest are found along the coastline (Figure 48). A curious exception to this is high phycoerythrin/ chlorophyll a ratios in the north near Snapper Creek Canal, Coral Gables Canal and Key Biscayne. Higher phycoerythrin/ chlorophyll a ratios tend to be associated with lower chlorophyll a (Figure 49), indicating that phycoerythrin-containing cyanobacteria are a larger portion of more oligotrophic phytoplankton communities. Phycoerythrin/ chlorophyll a ratios also tend to be higher at higher salinities and lower at lower salinities (Figure 50). An examination of the course of phycoerythrin/ chlorophyll a ratios from dry season to rainy season (Figures 51-58) indicates no major changes.

Figure 59 shows that south Biscayne Bay is primarily phosphorus limited, which is in agreement with earlier studies that found Biscayne Bay to be phosphorus limited (Brand et al., 1991). This is largely the result of eastern South Florida being dominated by limestone, which chemically scavenges phosphorus

from the water, shifting the ecosystem to a phosphorus limited one (Brand 2002).

Conclusions

As had been found in an earlier study (Brand, et al., 1991), phytoplankton abundance was higher along the coastline than offshore. Phosphorus is the primary limiting nutrient in south Biscayne Bay. Algal blooms increased substantially after the rainy season began and land runoff flowed down the canals into the western side of south Biscayne Bay. Chlorophyll b/ chlorophyll a and phycocyanin/ chlorophyll a ratios, as indicators of the proportion of chlorophytes and cyanobacteria in the phytoplankton community, respectively, also increased dramatically with increased runoff down the canals. These data indicate that chlorophyll b/ chlorophyll a and phycocyanin/ chlorophyll a ratios can be used as sensitive indicators of perturbations in the phytoplankton community caused by runoff.

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Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb	Temp	Salinity (PSU)	chl A	chl B	chl C	Phycocyanin	Phaeocyanin	(FLN-FLP)(FLN-FLP)
								NTU	°C	ppt	µg/L	µg/L	µg/L	µg/L	µg/L	
1	10/22/2001	2001	October	2001.10	25.46306667	-80.31883333		1.10	25.8	13	0.445235	0	0.011693	0.002735	0.184608	
2	10/22/2001	2001	October	2001.10	25.45283333	-80.30605		0.35	26	18	0.236591	0	0.00872	0.003768	0.016197	
3	10/22/2001	2001	October	2001.10	25.43106667	-80.27965		1.30	26	24	0.235137	0	0.01076	0.005502	0.009867	
4	10/22/2001	2001	October	2001.10	25.40703333	-80.24476667	9:47	0.45	26.1	30	0.141297	0	0.006039	0.002834	0	
5	10/22/2001	2001	October	2001.10	25.38376667	-80.20758333	10:00	4.90	25.9	32	0.155735	0	0.00597	0.006074	0	
6	10/22/2001	2001	October	2001.10	25.38065	-80.17905	10:26	7.10	26.6	36	0.289141	0	0.01966	0.047878	0	
8	10/22/2001	2001	October	2001.10	25.33403333	-80.24013333	10:43	6.20	26	28	0.1401	0	0.005858	0.00335	0	
9	10/22/2001	2001	October	2001.10	25.34983333	-80.27738333	10:54	0.25	26.5	28	0.26833	0	0.022422	0.006629	0	
10	10/22/2001	2001	October	2001.10	25.35063333	-80.29868333	11:03	0.40	26.5	27	0.341639	0	0.031297	0.002844	0.000764	
11	10/22/2001	2001	October	2001.10	25.31513333	-80.344		0.60	26.5	23	0.224234	0	0.014343	0.003495	0.001109	
12	10/22/2001	2001	October	2001.10	25.29771667	-80.35985	11:27	1.30	26.6	26	0.378552	0	0.029634	0.007114	0.004214	
13	10/22/2001	2001	October	2001.10	25.266	-80.37731667	11:38	1.40	26.5	26	0.402	0	0.042568	0.006336	0.001106	
14	10/22/2001	2001	October	2001.10	25.23016667	-80.38921667	11:49	0.75	26.4	24	0.199206	0	0.013414	0.003677	0	
15	10/22/2001	2001	October	2001.10	25.24463333	-80.41473333	11:58	3.20	26.4	10	0.235873	0	0.007494	0.002482	0.078644	
16	10/22/2001	2001	October	2001.10	25.41666667	-80.31091667	12:40	0.85	26.5	19	0.238111	0	0.012878	0.003577	0.007074	
17	10/22/2001	2001	October	2001.10	25.47046667	-80.32668333		60.00	26.5	0	0.565187	0	0.003485	0.001999	0.03522	
18	10/22/2001	2001	October	2001.10	25.48985	-80.33038333		10.00	26.8	3	0.587024	0	0.013534	0.016292	0.112986	
19	10/22/2001	2001	October	2001.10	25.51888333	-80.32013333	13:15	3.90	26.5	2	0.261195	0	0.003216	0.002617	0.027123	
20	10/22/2001	2001	October	2001.10	25.52716667	-80.30385	13:23	0.60	26.9	9	0.210306	0	0.005131	0.003312	0.050665	
21	10/22/2001	2001	October	2001.10	25.61071667	-80.30215	13:39	0.55	27.1	1	1.288853	0	0.00361	0.011626	1.14658	
22	10/22/2001	2001	October	2001.10	25.65486667	-80.26503333	13:54	1.90	26.7	15	0.366071	0	0.003613	0.009058	0.537934	
23	10/22/2001	2001	October	2001.10	25.70031667	-80.2425	14:08	0.25	27	20	0.399954	0	0.011744	0.021661	0.104224	
24	10/22/2001	2001	October	2001.10	25.70735	-80.20155	14:19	0.60	26.9	28	0.536743	0	0.033307	0.019021	0.002414	
25	10/22/2001	2001	October	2001.10	25.60616667	-80.2318	15:12	0.20	26.9	33	0.223448	0	0.011804	0.005485	0	
26	10/22/2001	2001	October	2001.10	25.55148333	-80.23988333	12:26	0.10	26.7	33	0.167217	0	0.012115	0.004384	0	
27	10/22/2001	2001	October	2001.10	25.49478333	-80.27848333	15:45	0.35	27.3	20	0.29188	0	0.01937	0.002818	0.0082	
1	11/19/2001	2001	November	2001.11	25.46306667	-80.31883333		0.30	23.1	22	0.308659	0	0.021734	0.000707	0	
2	11/19/2001	2001	November	2001.11	25.45283333	-80.30605		0.65	23.2	24	0.351978	0	0.041326	0.001125	0.000754	
3	11/19/2001	2001	November	2001.11	25.43106667	-80.27965		0.35	23.1	26	0.26195	0	0.028547	0.004833	0.000469	
4	11/19/2001	2001	November	2001.11	25.40703333	-80.24476667		0.75	23	28	0.193864	0	0.015316	0.006952	0	
5	11/19/2001	2001	November	2001.11	25.38376667	-80.20758333		1.40	22.8	29	0.149712	0	0.010163	0.002942	0.000774	
6	11/19/2001	2001	November	2001.11	25.38065	-80.17905		0.00	25.3	31	0.373657	0	0.042881	0.015909	0	
8	11/19/2001	2001	November	2001.11	25.33403333	-80.24013333		1.90	24.1	33	0.314764	0	0.040177	0.010025	0.000267	
9	11/19/2001	2001	November	2001.11	25.34983333	-80.27738333	9:53	2.10	23.1	29	0.144916	0	0.010275	0.005207	0	
10	11/19/2001	2001	November	2001.11	25.35063333	-80.29868333	10:10	1.40	23.3	29	0.251761	0	0.023349	0.00939	0.002605	
11	11/19/2001	2001	November	2001.11	25.31513333	-80.344	10:20	0.45	23.2	27	0.255384	0	0.020081	0.013709	0.00159	
12	11/19/2001	2001	November	2001.11	25.29771667	-80.35985	10:31	0.05	23.4	26	0.172408	0	0.01782	0.012912	0.00771	
13	11/19/2001	2001	November	2001.11	25.266	-80.37731667	10:42	1.20	23.6	24	0.254165	0	0.014103	0.007511	0.002777	
14	11/19/2001	2001	November	2001.11	25.23016667	-80.38921667	11:00	0.30	23.7	24	0.289521	0	0.025473	0.007279	0.000316	
15	11/19/2001	2001	November	2001.11	25.24463333	-80.41473333	11:10	0.00	23.6	24	0.127894	0	0.007005	0.001942	0	
16	11/19/2001	2001	November	2001.11	25.41666667	-80.31091667	11:24	0.00	24.1	20	0.136808	0	0.015375	0.001843	0.000676	
17	11/19/2001	2001	November	2001.11	25.47046667	-80.32668333	12:12	0.05	23.6	22	0.206199	0	0.017679	0.001146	0	
18	11/19/2001	2001	November	2001.11	25.48985	-80.33038333	12:30	0.20	23.7	19	0.181579	0	0.016491	0.001605	0	
19	11/19/2001	2001	November	2001.11	25.51888333	-80.32013333		0.00	23.7	23	0.162374	0	0.017288	0.00046	0	
20	11/19/2001	2001	November	2001.11	25.52716667	-80.30385	12:50	0.00	23.6	26	0.079806	0	0.007315	0.001416	0.000214	
21	11/19/2001	2001	November	2001.11	25.61071667	-80.30215	13:10	0.00	23.5	25	0.162711	0	0.015719	0.001589	0.000239	
22	11/19/2001	2001	November	2001.11	25.65486667	-80.26503333	13:23	0.60	23.6	29	0.408475	0.039856	0.026713	0.00626	0	
23	11/19/2001	2001	November	2001.11	25.70031667	-80.2425	13:34	0.25	23.6	31	0.458382	0.058323	0.020577	0.003428	0.000321	
24	11/19/2001	2001	November	2001.11	25.70735	-80.20155	13:47	1.60	24.1	34	0.631911	0	0.072243	0.030528	0.002058	
25	11/19/2001	2001	November	2001.11	25.60616667	-80.2318	14:33	0.80	23.4	32	0.238272	0	0.018179	0.003261	0	
26	11/19/2001	2001	November	2001.11	25.55148333	-80.23988333	14:46	0.55	23.5	33	0.159091	0	0.010526	0.002898	0	
27	11/19/2001	2001	November	2001.11	25.49478333	-80.27848333	15:01	0.35	23.8	24	0.173966	0	0.011149	0.003567	0	

Table 1

Station	Date	Year	Month	Year Month	Latitude	Longitude	Time	Turb NTU	Temp °C	Salinity (ppt)	Chl A µg/L	Chl B µg/L	Chl C µg/L	Phycocyanin µg/L	Phycocyanin µg/L	(FLN-FLP)/(FLN+FLP)
1	12/18/2001	2001	December	2001.12	25.46306667	-80.31873333	8:35		24.1	23	0.219144	0	0.013259	0.000892	0	0.079136691
2	12/18/2001	2001	December	2001.12	25.45283333	-80.30605	8:40		23.3	24	0.170072	0	0.010623	0.000436	0	0.073359073
3	12/18/2001	2001	December	2001.12	25.4308	-80.27963333	8:50		23.5	29	0.166408	0	0.007282	0.004286	0	-0.300492611
4	12/18/2001	2001	December	2001.12	25.40705	-80.24475	9:00		24.3	30	0.154122	0	0.009957	0.00169	0	0.006535948
5	12/18/2001	2001	December	2001.12	25.38375	-80.20746667	9:15		24.4	30	0.103664	0.000045	0.005502	0.000761	0	-0.073170732
6	12/18/2001	2001	December	2001.12	25.38106667	-80.17883333	9:25		24.6	31	0.190156	0	0.010915	0.011489	0	-0.317647059
7	12/18/2001	2001	December	2001.12	25.37455	-80.1574	9:35		24.9	31	0.175049	0	0.011062	0.010027	0	0.022727273
8	12/18/2001	2001	December	2001.12	25.33403333	-80.24023333	9:50		24.1	33	0.120389	0	0.007345	0.001663	0	0.142857143
9	12/18/2001	2001	December	2001.12	25.34975	-80.27775	10:05		23.9	30	0.196159	0	0.012887	0.000936	0	-0.598885794
10	12/18/2001	2001	December	2001.12	25.35061667	-80.29906667	10:10		24.1	29	0.173965	0	0.015108	0.003013	0	-0.134020619
11	12/18/2001	2001	December	2001.12	25.32523333	-80.33068333	10:25		24.3	28	0.202778	0.000034	0.017758	0.002011	0	0.369230769
12	12/18/2001	2001	December	2001.12	25.29765	-80.35991667	10:35		24.3	24	0.202653	0	0.013934	0.004201	0	0.158974359
13	12/18/2001	2001	December	2001.12	25.26596667	-80.37728333	10:45		24.3	23	0.159992	0	0.010417	0.004473	0	-0.055555556
14	12/18/2001	2001	December	2001.12	25.23015	-80.3891	10:55		24.4	22	0.138079	0	0.009964	0.004672	0	-0.355371901
15	12/18/2001	2001	December	2001.12	25.24463333	-80.41473333	11:05		24.6	19	0.113448	0	0.008907	0.000222	0	-0.460526316
16	12/18/2001	2001	December	2001.12	25.41663333	-80.31093333	11:45		24.5	30	0.120581	0	0.009366	0.00067	0	-0.082872928
17	12/18/2001	2001	December	2001.12	25.47041667	-80.3267	12:00		24.8	21	0.142139	0	0.011228	0.000275	0	-0.595744681
18	12/18/2001	2001	December	2001.12	25.48986667	-80.33041667	12:10		25.3	15	0.200272	0	0.016184	0	0	-0.601092896
19	12/18/2001	2001	December	2001.12	25.51886667	-80.32005	12:20		25.2	17	0.257558	0	0.021456	0.000022	0	-0.304511278
20	12/18/2001	2001	December	2001.12	25.52716667	-80.30385	12:30		24.9	24	0.164287	0	0.011238	0.000408	0	-0.624413146
21	12/18/2001	2001	December	2001.12	25.61063333	-80.30213333	12:50		25.5	26	0.134586	0	0.011212	0.000418	0	-0.51
22	12/18/2001	2001	December	2001.12	25.65481667	-80.26503333	13:05		25.8	26	0.298083	0	0.026389	0.0026	0	0.139344262
23	12/18/2001	2001	December	2001.12	25.70045	-80.24263333	13:25		25.2	28	0.358493	0	0.031119	0.004274	0	0.031055901
24	12/18/2001	2001	December	2001.12	25.70716667	-80.20133333	13:35		24.8	30	0.326328	0	0.027004	0.010716	0	-0.049180328
25	12/18/2001	2001	December	2001.12	25.60628333	-80.23175	14:50		25.4	31	0.136072	0	0.008851	0.003375	0	-0.213675214
26	12/18/2001	2001	December	2001.12	25.55168333	-80.23961667	15:00		25.2	30	0.119919	0	0.009449	0.001738	0	-0.076923077
27	12/18/2001	2001	December	2001.12	25.49478333	-80.27845	15:15		25.1	27	0.134632	0	0.009809	0.00155	0	-0.400966184
1	1/11/2002	2002	January	2002.01	25.4631	-80.3188	8:20	0.60	15.3	24	0.090747	0	0.006276	0	0	-0.734567901
2	1/11/2002	2002	January	2002.01	25.4527	-80.30581667	8:30	1.20	15.5	27	0.109331	0	0.008985	0.00001	0	-0.829787234
3	1/11/2002	2002	January	2002.01	25.43111667	-80.27948333	8:40	1.40	15.7	29	0.11256	0	0.008005	0	0	-0.454545455
4	1/11/2002	2002	January	2002.01	25.40893333	-80.24466667	8:50	2.40	15.8	33	0.113681	0	0.007126	0.000244	0	0.182389937
5	1/11/2002	2002	January	2002.01	25.38383333	-80.20766667	9:00	3.90	15.7	34	0.08058	0	0.004732	0.00019	0	-0.50867052
6	1/11/2002	2002	January	2002.01	25.38078333	-80.17876667	9:15	1.10	20.2	36	0.21775	0	0.013753	0.008785	0	-0.15625
8	1/11/2002	2002	January	2002.01	25.33428333	-80.23976667	9:30	6.40	17.7	35	0.176486	0	0.011871	0.002256	0	-0.098901099
9	1/11/2002	2002	January	2002.01	25.35	-80.27703333	9:45	0.50	16.4	33	0.124156	0	0.007455	0.000706	0	0.180952381
10	1/11/2002	2002	January	2002.01	25.35061667	-80.2987	9:55	2.50	16.1	32	0.161342	0	0.013722	0.00062	0	-0.935662784
11	1/11/2002	2002	January	2002.01	25.32535	-80.33055	10:05	1.90	16.4	28	0.193983	0	0.014135	0.000502	0.000503	-0.218543046
12	1/11/2002	2002	January	2002.01	25.2977	-80.35983333	10:15	1.50	16.1	27	0.141415	0	0.011785	0.000012	0	0.437125749
13	1/11/2002	2002	January	2002.01	25.26591667	-80.37721667	10:25	1.00	16.2	26	0.108465	0	0.010325	0.000057	0	-0.296875
14	1/11/2002	2002	January	2002.01	25.23013333	-80.38936667	10:30	1.40	16.1	25	0.092992	0	0.007696	0.000043	0	-0.028571429
15	1/11/2002	2002	January	2002.01	25.24453333	-80.41471667	10:50	1.40	16.8	21	0.109247	0	0.009012	0	0	-0.1875
16	1/11/2002	2002	January	2002.01	25.41666667	-80.31101667	11:30	2.20	16.1	25	0.114299	0	0.009178	0	0	-0.647416413
17	1/11/2002	2002	January	2002.01	25.47045	-80.32663333	11:45	0.80	16.4	21	0.103861	0	0.006427	0	0	-0.739130435
18	1/11/2002	2002	January	2002.01	25.4896	-80.33038333	11:55	0.50	17.2	20	0.20096	0	0.016533	0	0	-0.543209877
19	1/11/2002	2002	January	2002.01	25.51901667	-80.3201	12:10	0.00	18.8	17	0.211444	0	0.013371	0	0	-0.475083056
20	1/11/2002	2002	January	2002.01	25.52718333	-80.30385	0.00	17.2	24	0.103812	0	0.00727	0	0	-0.246753247	
21	1/11/2002	2002	January	2002.01	25.60606667	-80.30241667	12:55	0.40	19	28	0.269031	0	0.0237	0.000085	0	-0.44
22	1/11/2002	2002	January	2002.01	25.65486667	-80.2649	13:15	0.85	18.6	29	0.406757	0	0.033942	0.002562	0	0.05
23	1/11/2002	2002	January	2002.01	25.70023333	-80.24258333	13:30	1.40	18	28	0.1018302	0	0.093323	0.007145	0.006839	-0.036789298
24	1/11/2002	2002	January	2002.01	25.70733333	-80.20146667	13:45	0.30	17.6	32	0.236333	0	0.020003	0.008129	0	-0.133333333
25	1/11/2002	2002	January	2002.01	25.60633333	-80.23175	15:00	0.35	17	32	0.125931	0	0.012046	0	0	0.183673469
26	1/11/2002	2002	January	2002.01	25.55156667	-80.23996667	15:15	1.10	17.3	33	0.097936	0	0.007963	0.000027	0	0.012658228
27	1/11/2002	2002	January	2002.01	25.49498333	-80.27841667	15:30	0.80	17	32	0.117525	0	0.009197	0	0	0.180327869

Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb NTU	Temp °C	Salinity (‰)	chl A µg/L	chl B µg/L	chl C µg/L	Phycocyanin µg/L	Phycocyanin µg/L	(FLN+FLP)/(FLN+FLP)
1	2/5/2002	2002	February	2002.02	25.4631	-80.31888333	8:15	2.40	21.3	30	0.316353	0	0.014806	0.0004	0	
2	2/5/2002	2002	February	2002.02	25.45308333	-80.30608333	8:25	8.80	21.5	32	0.25569	0	0.013316	0.001328	0	
3	2/5/2002	2002	February	2002.02	25.43108333	-80.27953333	8:35	6.70	21.9	34	0.255581	0	0.013139	0.005263	0	
4	2/5/2002	2002	February	2002.02	25.40725	-80.24478333	8:50	9.20	22.5	35	0.327012	0	0.012642	0.011559	0.003395	
5	2/5/2002	2002	February	2002.02	25.38391667	-80.20763333	9:10	16.00	21.7	35	0.250521	0	0.012539	0.001989	0	
6	2/5/2002	2002	February	2002.02	25.38078333	-80.17865	9:20	4.80	23.5	36	0.217355	0	0.007118	0.017827	0	
8	2/5/2002	2002	February	2002.02	25.33416667	-80.24016667	9:40	2.80	21.2	35	0.160238	0	0.008948	0.001291	0	
9	2/5/2002	2002	February	2002.02	25.34986667	-80.2774	9:55	2.50	21.6	34	0.193922	0	0.009078	0.002118	0	
10	2/5/2002	2002	February	2002.02	25.35063333	-80.29876667	10:05	0.65	22.8	33	0.207874	0	0.010714	0.001547	0	
11	2/5/2002	2002	February	2002.02	25.32528333	-80.33061667	10:15	0.55	23.1	32	0.176864	0	0.011872	0.001796	0	
12	2/5/2002	2002	February	2002.02	25.29765	-80.35976667	10:30	1.90	22.7	31	0.170757	0	0.01271	0.001499	0	
13	2/5/2002	2002	February	2002.02	25.26603333	-80.37718333	10:40	1.50	22.5	27	0.194741	0	0.012164	0.004302	0	
14	2/5/2002	2002	February	2002.02	25.23041667	-80.3891	10:50	1.10	23.1	25	0.200358	0	0.015664	0.001656	0	
15	2/5/2002	2002	February	2002.02	25.2447	-80.41486667	11:00	0.75	22.1	24	0.191173	0	0.013932	0.001378	0	
16	2/5/2002	2002	February	2002.02	25.41693333	-80.31123333	11:45	2.70	21.7	33	0.216247	0	0.015986	0.002498	0.001104	
17	2/5/2002	2002	February	2002.02	25.4704	-80.32661667	12:00	0.20	21.6	28	0.161262	0	0.013289	0.000234	0	
18	2/5/2002	2002	February	2002.02	25.49033333	-80.33023333	12:15	0.40	22.2	24	0.31025	0	0.028809	0.000147	0	
19	2/5/2002	2002	February	2002.02	25.5188	-80.3201	12:35	0.20	22	22	0.259918	0	0.02449	0.00054	0.002618	
20	2/5/2002	2002	February	2002.02	25.52711667	-80.30388333	12:45	0.60	22.2	23	0.241255	0	0.019407	0.000689	0.002012	
21	2/5/2002	2002	February	2002.02	25.61016667	-80.30155	13:05	0.30	22.9	29	0.189175	0	0.015698	0.000462	0	
22	2/5/2002	2002	February	2002.02	25.65481667	-80.26485	13:25	2.70	23.4	31	0.464275	0	0.045111	0.007505	0.002215	
23	2/5/2002	2002	February	2002.02	25.69978333	-80.24201667	13:40	0.80	23.1	30	0.446132	0	0.031344	0.01044	0	
24	2/5/2002	2002	February	2002.02	25.70751667	-80.20113333	13:50	12.00	23.2	34	0.562836	0	0.036871	0.064168	0	
25	2/5/2002	2002	February	2002.02	25.60803333	-80.23188333	15:00	4.20	23.3	36	0.145866	0	0.011297	0.001801	0.000765	
26	2/5/2002	2002	February	2002.02	25.55165	-80.23983333	15:15	4.80	23.2	36	0.138633	0	0.012465	0.001039	0	
27	2/5/2002	2002	February	2002.02	25.49506667	-80.2783	15:30	1.40	22.9	34	0.166192	0	0.009904	0.001607	0	
1	3/14/2002	2002	March	2002.03	25.46286667	-80.319		0.55	24.4	29	0.177608	0.000084	0.01063	0.000274	0	
2	3/14/2002	2002	March	2002.03	25.45303333	-80.30613333	8:50	1.40	24.2	30	0.148662	0.005636	0.009903	0.000433	0	
3	3/14/2002	2002	March	2002.03	25.43066667	-80.2791	9:00	1.60	24.4	34	0.215708	0.000104	0.011983	0.002939	0	
4	3/14/2002	2002	March	2002.03	25.40705	-80.24468333	9:15	2.70	24.9	36	0.10548	0	0.007166	0.000683	0	
5	3/14/2002	2002	March	2002.03	25.38381667	-80.20751667	9:30	3.60	25.2	36	0.140449	0	0.008633	0.000604	0	
6	3/14/2002	2002	March	2002.03	25.3809	-80.17875	9:40	2.80	24.7	36	0.162916	0	0.008367	0.00159	0	
8	3/14/2002	2002	March	2002.03	25.33433333	-80.23991667	10:00	0.90	24.6	36	0.169867	0	0.00897	0.001305	0	
9	3/14/2002	2002	March	2002.03	25.34978333	-80.27768333	10:10	7.50	25.2	36	0.132304	0	0.008799	0.004428	0	
10	3/14/2002	2002	March	2002.03	25.35058333	-80.29895	10:15	1.90	24.8	35	0.199341	0	0.012723	0.004154	0	
11	3/14/2002	2002	March	2002.03	25.32503333	-80.33065	10:30	1.20	24.5	34	0.159785	0	0.009377	0.004321	0	
12	3/14/2002	2002	March	2002.03	25.2975	-80.36006667	10:40	1.30	25.3	31	0.164892	0	0.012433	0.00086	0	
13	3/14/2002	2002	March	2002.03	25.26625	-80.36736667	11:00	2.20	25.3	29	0.195409	0.000104	0.015485	0.003072	0	
14	3/14/2002	2002	March	2002.03	25.23006667	-80.38903333	11:15	1.10	25.2	28	0.166299	0	0.011272	0.002707	0	
15	3/14/2002	2002	March	2002.03	25.2446	-80.41471667	11:29	1.00	26	25	0.212522	0	0.022302	0.000163	0	
16	3/14/2002	2002	March	2002.03	25.41656667	-80.31116667	12:10	1.60	25.3	30	0.161237	0	0.013966	0.000284	0	
17	3/14/2002	2002	March	2002.03	25.47056667	-80.32665	12:25	0.60	26	28	0.180629	0	0.017937	0.000108	0	
18	3/14/2002	2002	March	2002.03	25.49001667	-80.33083333	12:35	0.80	26.4	26	0.319411	0	0.036045	0	0	
19	3/14/2002	2002	March	2002.03	25.51868333	-80.31993333	12:45	0.55	26.8	23	0.197307	0	0.018748	0.000116	0	
20	3/14/2002	2002	March	2002.03	25.52736667	-80.30386667	13:00	0.55	26.3	28	0.138696	0	0.012822	0.000367	0.00185	
21	3/14/2002	2002	March	2002.03	25.61016667	-80.30191667	13:20	1.50	27.2	32	0.137699	0	0.011415	0.000232	0	
22	3/14/2002	2002	March	2002.03	25.65496667	-80.26506667	13:40	1.30	26.4	31	0.380464	0	0.041781	0.003835	0	
23	3/14/2002	2002	March	2002.03	25.70058333	-80.2427	13:55	1.60	26.3	31	0.603873	0	0.066175	0.001358	0	
24	3/14/2002	2002	March	2002.03	25.70781667	-80.20123333	14:05	3.50	25.5	33	0.232895	0	0.020728	0.001628	0	
25	3/14/2002	2002	March	2002.03	25.60633333	-80.23171667	15:20	2.20	25.3	36	0.117941	0	0.010846	0.000204	0	
26	3/14/2002	2002	March	2002.03	25.55188333	-80.23948333	15:35	0.95	25.7	36	0.109823	0.00006	0.007475	0.000132	0	
27	3/14/2002	2002	March	2002.03	25.49485	-80.27845	15:50	1.40	26.1	34	0.117039	0	0.006883	0.00157	0	

Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb	Temp	Salinity (‰)	Chl A	Chl B	Chl C	Phycocyanin	Phycocyanin	(FLN-FLP)/(FLN+FLP)
								NTU	°C	ppt	µg/L	µg/L	µg/L	µg/L	µg/L	
1	4/23/2002	2002	April	2002.04	25.46305	-80.31881667	8:25	1.50	27.7	37	0.205886	0	0.009349	0	0	0.768324231
2	4/23/2002	2002	April	2002.04	25.45286667	-80.30605	8:35	1.10	27.2	38	0.143598	0.005744	0.00945	0.000181	0	-0.776176872
3	4/23/2002	2002	April	2002.04	25.43123333	-80.27953333	8:45	1.30	27.6	38	0.163127	0.000057	0.005952	0.004604	0	0.38011275
4	4/23/2002	2002	April	2002.04	25.40706667	-80.24483333	8:55	2.70	27.7	38	0.079805	0	0.003432	0.000313	0	-0.13928113
5	4/23/2002	2002	April	2002.04	25.38383333	-80.2076	9:05	4.70	26.9	37	0.103782	0	0.00482	0.001158	0	-0.035762302
6	4/23/2002	2002	April	2002.04	25.38091667	-80.1788	9:15	3.90	27.3	36	0.124823	0	0.003685	0.002379	0	0.677593521
7	4/23/2002	2002	April	2002.04	25.37443333	-80.15733333	9:25	0.50	26.9	36	0.104548	0.000048	0.002766	0.008172	0	0.812398042
8	4/23/2002	2002	April	2002.04	25.33411667	-80.24006667	9:45	1.40	27.4	37	0.093276	0	0.005287	0.001049	0	-0.675063339
9	4/23/2002	2002	April	2002.04	25.34978333	-80.27731667	9:55	4.20	27.6	37	0.099965	0	0.006228	0.000089	0.001488	-0.828505596
10	4/23/2002	2002	April	2002.04	25.3507	-80.29683333	10:05	1.70	27.9	37	0.15636	0	0.00976	0.001054	0	0.029275809
11	4/23/2002	2002	April	2002.04	25.32531667	-80.33051667	10:15	0.35	27.7	37	0.236837	0	0.017554	0.003711	0.000042	0.391777246
12	4/23/2002	2002	April	2002.04	25.29768333	-80.35978333	10:25	1.30	27.7	37	0.118917	0	0.010661	0.00315	0	-0.571531193
13	4/23/2002	2002	April	2002.04	25.26601667	-80.37738333	0:00	28.1		34	0.171455	0	0.015936	0.001975	0	-0.038880249
14	4/23/2002	2002	April	2002.04	25.23018333	-80.3892	11:30	1.20	28	32	0.182893	0	0.01286	0.001923	0	-0.20328849
15	4/23/2002	2002	April	2002.04	25.2447	-80.41473333	11:40	1.20	28.7	31	0.152003	0	0.014085	0.0002	0	0.539739684
16	4/23/2002	2002	April	2002.04	25.41673333	-80.31096667	12:20	1.80	29	38	0.149429	0	0.011319	0.000235	0.000126	-0.281157998
17	4/23/2002	2002	April	2002.04	25.47068333	-80.3268	12:40	1.20	29.4	35	0.247943	0	0.022001	0.000384	0	-0.104240283
18	4/23/2002	2002	April	2002.04	25.48986667	-80.33026667	12:45	0.95	29.9	32	0.289998	0	0.027626	0.000065	0	-0.246758105
19	4/23/2002	2002	April	2002.04	25.5189	-80.32008333	13:30	0.55	30.4	26	0.194011	0	0.019535	0	0	0.462955032
20	4/23/2002	2002	April	2002.04	25.52721667	-80.30381667	13:50	0.70	30.1	26	0.217167	0	0.020478	0.000102	0	0.07574654
21	4/23/2002	2002	April	2002.04	25.61068333	-80.30215	14:10	0.85	30.9	32	0.293073	0	0.034134	0.000058	0	0.476772616
22	4/23/2002	2002	April	2002.04	25.65481667	-80.26496667	14:25	0.65	29.6	33	0.329415	0	0.02759	0.00025	0	0.474513012
23	4/23/2002	2002	April	2002.04	25.70038333	-80.24253333	14:40	1.80	29.6	29	2.077911	0	0.192263	0.00425	0.00265	-0.419204913
24	4/23/2002	2002	April	2002.04	25.70745	-80.2014	14:50	0.45	28.8	34	0.306814	0	0.027907	0.000631	0	-0.648349285
25	4/23/2002	2002	April	2002.04	25.60608333	-80.23196667	15:45	1.70	28.6	37	0.150918	0.000164	0.011689	0.000392	0	-0.022678186
26	4/23/2002	2002	April	2002.04	25.5515	-80.23996667	16:00	1.40	28.6	37	0.082892	0	0.006496	0.000041	0	0.537260616
27	4/23/2002	2002	April	2002.04	25.49488333	-80.2785	16:15	1.40	29.1	38	0.117858	0	0.007204	0.0014	0	-0.281983471
1	5/23/2002	2002	May	2002.05	25.46328333	-80.31861667		1.40	25.2	39	0.336829	0	0.022389	0.000944	0.001605	-0.216957606
2	5/23/2002	2002	May	2002.05	25.45291667	-80.30575		2.80	25.4	39	0.27658	0	0.012882	0.004175	0.002067	-0.564569961
3	5/23/2002	2002	May	2002.05	25.4309	-80.27936667		1.20	25.6	39	0.286886	0	0.016396	0.004004	0.003371	0.81377206
4	5/23/2002	2002	May	2002.05	25.40708333	-80.24448333		0.65	25.4	38	0.313612	0	0.022831	0.004145	0.000143	0.976262711
9	5/23/2002	2002	May	2002.05	25.35	-80.27756667		1.00	25.5	37	0.207715	0	0.014953	0.001307	0	-0.883352326
10	5/23/2002	2002	May	2002.05	25.35051667	-80.2985		0.25	25.6	37	0.216252	0	0.017054	0.001313	0.016732	-0.902068012
11	5/23/2002	2002	May	2002.05	25.3256	-80.33115		0.25	26.1	37	0.36583	0.000137	0.025443	0.005633	0	-0.640372269
12	5/23/2002	2002	May	2002.05	25.2977	-80.35983333		1.10	25.8	38	0.609662	0	0.057956	0.008329	0	-0.322730522
13	5/23/2002	2002	May	2002.05	25.26568333	-80.37753333		0.45	26.1	38	0.42486	0	0.036997	0.003596	0	0.687383126
14	5/23/2002	2002	May	2002.05	25.23036667	-80.3894		0.40	26.1	36	0.535565	0	0.056675	0.004878	0	0.691167574
15	5/23/2002	2002	May	2002.05	25.24443333	-80.41465		0.55	26	35	0.356762	0	0.037918	0.001844	0	-0.335229722
16	5/23/2002	2002	May	2002.05	25.41676667	-80.31078333		1.20	25.9	38	0.404305	0	0.036523	0.000738	0	-0.378382331
17	5/23/2002	2002	May	2002.05	25.47043333	-80.32668333		0.00	26.1	39	0.177213	0	0.017739	0	0	0.861307671
18	5/23/2002	2002	May	2002.05	25.48986667	-80.33031667		0.05	26.3	40	0.297472	0	0.029111	0.00015	0	0.209964413
19	5/23/2002	2002	May	2002.05	25.51881667	-80.32		0.35	26.6	38	0.437822	0	0.0427	0.000471	0	0.360122297
20	5/23/2002	2002	May	2002.05	25.52715	-80.304		0.15	26.6	40	0.339005	0	0.036582	0.000142	0	-0.694171467
21	5/23/2002	2002	May	2002.05	25.61068333	-80.30216667		0.50	27.2	36	0.364541	0	0.042415	0.001076	0	0.089303905
22	5/23/2002	2002	May	2002.05	25.6548	-80.26488333		3.60	26.8	35	0.934707	0	0.084936	0.030477	0.008965	0.304467885
23	5/23/2002	2002	May	2002.05	25.7002	-80.24236667		0.40	27.4	35	0.994227	0	0.11515	0.023916	0.002198	-0.63971794
24	5/23/2002	2002	May	2002.05	25.70735	-80.20161667		1.90	26.7	37	0.447712	0	0.045605	0.002938	0	-0.534975369
25	5/23/2002	2002	May	2002.05	25.60598333	-80.2318		0.65	26.8	36	0.196769	0.00028	0.0245	0.002372	0	-0.690448014
26	5/23/2002	2002	May	2002.05	25.55158333	-80.23988333		0.95	26.7	37	0.209702	0.000069	0.011587	0.001765	0	-0.885180995

Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb	Temp	Salinity (‰)	CH A	CH B	CH C	Phycocyanin	Phycocyanin	(FLN-FLP)(FLN+FLP)	
1	7/19/2002	2002	July	2002.07	25.46308	-80.3188		1.40	30.7		28	0.256616	0.004536	0.016401	0.001937	0	-0.741550217
2	7/19/2002	2002	July	2002.07	25.45283	-80.306		3.30	31.1		28	0.377087	0.005671	0.026914	0.001684	0.001484	-0.472917777
3	7/19/2002	2002	July	2002.07	25.43083	-80.2796		2.50	31.3		31	0.272295	0.000105	0.013859	0.002625	0	-0.003383277
4	7/19/2002	2002	July	2002.07	25.407	-80.2447		1.60	30.8		33	0.178216	0	0.008904	0.002183	0	-0.661129568
5	7/19/2002	2002	July	2002.07	25.38383	-80.2075		6.00	30.7		35	0.149542	0.00004	0.008582	0.003564	0.000066	-0.90295532
6	7/19/2002	2002	July	2002.07	25.38083	-80.1788		2.80	30.5		36	0.174795	0.002933	0.009834	0.005278	0	-0.369
8	7/19/2002	2002	July	2002.07	25.33417	-80.2402		2.80	30.6		35	0.168591	0	0.009306	0.002018	0	0.357128588
9	7/19/2002	2002	July	2002.07	25.34983	-80.2775		2.00	30.6		31	0.225733	0.009666	0.015356	0.004163	0	-0.603232404
10	7/19/2002	2002	July	2002.07	25.35058	-80.2988		0.50	31		28	0.566579	0.024794	0.042905	0.004198	0.001485	-0.854789712
11	7/19/2002	2002	July	2002.07	25.32525	-80.3307		0.15	31.3		27	0.464617	0.017218	0.034494	0.00469	0.001441	-0.645705521
12	7/19/2002	2002	July	2002.07	25.29767	-80.3599		0.85	31.4		24	0.321027	0.000141	0.02066	0.00183	0.006702	-0.904698166
13	7/19/2002	2002	July	2002.07	25.266	-80.3773		0.85	31.5		24	0.36004	0.000345	0.026485	0.002592	0.010473	0.896929513
14	7/19/2002	2002	July	2002.07	25.23017	-80.3891		0.50	31.6		25	0.59843	0.000174	0.052564	0.003269	0.049746	0.598911379
15	7/19/2002	2002	July	2002.07	25.24467	-80.4148		1.20	31.2		16	0.990688	0	0.022322	0.00024	0.50118	-0.711709423
16	7/19/2002	2002	July	2002.07	25.41667	-80.3111		4.30	31.3		28	0.283655	0	0.020996	0.001235	0.004951	-0.231170865
17	7/19/2002	2002	July	2002.07	25.47042	-80.3267		0.55	30.7		28	0.375326	0	0.03017	0.002403	0.003904	-0.129551719
18	7/19/2002	2002	July	2002.07	25.48983	-80.3304		0.20	30.6		21	0.620985	0.004734	0.051018	0.00198	0.011853	-0.269971936
19	7/19/2002	2002	July	2002.07	25.51883	-80.32		0.80	31.1		13	0.467871	0.000028	0.028066	0.00062	0.208619	-0.004653613
20	7/19/2002	2002	July	2002.07	25.52717	-80.3038		1.00	30.4		11	0.906256	0	0.078949	0.001145	0.327186	-0.879063345
21	7/19/2002	2002	July	2002.07	25.61067	-80.3002		0.85	32.4		19	1.09376	0	0.087405	0.01256	0.055215	-0.807258662
22	7/19/2002	2002	July	2002.07	25.65483	-80.265		2.80	29.2		3	1.48065	0.151414	0.044276	0.015648	0.445633	-0.401755763
23	7/19/2002	2002	July	2002.07	25.70033	-80.2427		1.30	32.1		23	1.073401	0.010166	0.050573	0.02881	0.487202	0.079672375
24	7/19/2002	2002	July	2002.07	25.70733	-80.2013		0.60	31.4		24	0.563602	0.000069	0.026825	0.013074	0.098068	-0.809711521
25	7/19/2002	2002	July	2002.07	25.60625	-80.2318		1.40	31.2		32	0.388107	0.00003	0.03043	0.008789	0.001522	-0.042210284
26	7/19/2002	2002	July	2002.07	25.55167	-80.2398		1.60	31.5		30	0.360144	0.000125	0.025477	0.013932	0.046605	-0.360799001
27	7/19/2002	2002	July	2002.07	25.49483	-80.2784		2.10	31.5		30	0.67049	0.00707	0.055841	0.018832	0.004211	0.956977391
1	8/14/2002	2002	August	2002.08	25.46308	-80.3188	8.43	2.00	30.2		22	0.323943	0.000086	0.019922	0.001171	0.01398	-0.825538869
2	8/14/2002	2002	August	2002.08	25.45283	-80.306	8.54	2.70	30.4		26	0.309141	0.000163	0.016805	0.001816	0.000883	-0.711219967
3	8/14/2002	2002	August	2002.08	25.43083	-80.2796	9.04	2.70	30.2		31	0.283437	0.000175	0.013413	0.004005	0	-0.68420055
4	8/14/2002	2002	August	2002.08	25.407	-80.2447	9.15	2.80	30.4		34	0.315947	0	0.013316	0.011475	0.02287	-0.745447228
5	8/14/2002	2002	August	2002.08	25.38383	-80.2075	9.26	5.10	30.3		35	0.223548	0.000077	0.013004	0.002492	0.020884	-0.864830776
6	8/14/2002	2002	August	2002.08	25.38083	-80.1788	9.36	3.00	30.2		36	0.330719	0.000153	0.011845	0.020798	0.006007	-0.3418951
8	8/14/2002	2002	August	2002.08	25.33417	-80.2402	9.51	2.20	30.3		34	0.232147	0.002294	0.016534	0.003167	0	-0.83649169
9	8/14/2002	2002	August	2002.08	25.34983	-80.2775	10.02	6.70	30.6		34	0.338986	0.004083	0.025322	0.002403	0.002625	0.119374106
10	8/14/2002	2002	August	2002.08	25.35058	-80.2988	10.09	1.50	30.4		33	0.521585	0.014432	0.048517	0.00394	0	-0.229443346
11	8/14/2002	2002	August	2002.08	25.32525	-80.3307	10.19	0.35	30.3		32	0.7945	0.027312	0.091774	0.004039	0	-0.869768926
12	8/14/2002	2002	August	2002.08	25.29767	-80.3599	10.28	1.60	30.4		28	0.301923	0	0.021795	0.003811	0	0.543594125
13	8/14/2002	2002	August	2002.08	25.266	-80.3773	10.39	0.55	30.3		26	0.397584	0.005712	0.037369	0.003828	0	-0.705916473
14	8/14/2002	2002	August	2002.08	25.23017	-80.3891	10.49	0.70	30.3		24	1.033107	0.031124	0.11971	0.003864	0	-0.362011173
15	8/14/2002	2002	August	2002.08	25.24467	-80.4148	10.58	1.60	30.6		22	0.944369	0.006328	0.02687	0.003634	0.571475	-0.07140008
16	8/14/2002	2002	August	2002.08	25.41667	-80.3111	11.44	3.70	30.7		30	0.369224	0	0.027087	0.002631	0.004928	0.100461163
17	8/14/2002	2002	August	2002.08	25.47042	-80.3267	11.59	1.00	30.6		21	0.801777	0.019638	0.069258	0.002917	0.015254	-0.213155263
18	8/14/2002	2002	August	2002.08	25.48983	-80.3304	12.07	1.10	31		19	0.612176	0.007313	0.060602	0.001778	0.00966	-0.427825013
19	8/14/2002	2002	August	2002.08	25.51883	-80.32	12.17	1.60	31.2		18	0.77855	0	0.056656	0.001203	0.015172	0.005959476
20	8/14/2002	2002	August	2002.08	25.52717	-80.3038	12.29	2.10	30.6		20	0.445334	0	0.028416	0.003764	0.02783	-0.477740131
21	8/14/2002	2002	August	2002.08	25.61067	-80.3002	12.50	1.90	30.7		25	0.607605	0.006297	0.047292	0.012916	0.019192	-0.546421385
22	8/14/2002	2002	August	2002.08	25.65483	-80.265	13.05	1.30	30.8		26	0.495924	0.00009	0.027405	0.011215	0.024053	0.137354497
23	8/14/2002	2002	August	2002.08	25.70033	-80.2427	13.18	1.70	30.7		27	1.374896	0.019989	0.050408	0.028334	0.409688	-0.653981763
24	8/14/2002	2002	August	2002.08	25.70733	-80.2013	13.31	1.80	30.2		31	0.733375	0.032524	0.082595	0.00494	0	-0.091985863
25	8/14/2002	2002	August	2002.08	25.60625	-80.2318	14.37	3.10	30.5		35	0.297087	0.000024	0.019017	0.002374	0	-0.706218363
26	8/14/2002	2002	August	2002.08	25.55167	-80.2398	14.48	5.00	30.3		36	0.283457	0.003353	0.019883	0.002548	0	-0.14723351
27	8/14/2002	2002	August	2002.08	25.49483	-80.2784	15.04	3.40	30.6		32	0.398722	0.009132	0.032776	0.001183	0	-0.154808846

Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb	Temp	Salinity (‰)	Chl A	Chl B	Chl C	Phycocyanin	Phycocyanin (FLN-FLP)	(FLN-FLP)/(FLN+FLP)
								NTU	°C	PPT	µg/L	µg/L	µg/L	µg/L	µg/L	
1	9/27/2002	2002	September	2002.09	25.46308	-80.3188	9:00	0.45	28.9	34	0.321264	0.000106	0.019148	0.000336	0.013722	0.006555204
2	9/27/2002	2002	September	2002.09	25.45283	-80.306	9:05	0.95	29	33	0.297413	0	0.015197	0.001368	0.003093	0.119633966
3	9/27/2002	2002	September	2002.09	25.43083	-80.2796	9:20	1.00	29.1	32	0.269366	0.004137	0.015317	0.000692	0.000824	-0.357723577
4	9/27/2002	2002	September	2002.09	25.407	-80.2447	9:35	1.20	29.2	33	0.208019	0.006146	0.012118	0.001483	0.000733	-0.704955151
5	9/27/2002	2002	September	2002.09	25.38383	-80.2075		2.10	28.7	34	0.238481	0.000151	0.011253	0.002204	0.001149	-0.972725574
6	9/27/2002	2002	September	2002.09	25.38083	-80.1788		1.70	29.3	34	0.239068	0.000156	0.011261	0.019773	0.00197	-0.931867962
8	9/27/2002	2002	September	2002.09	25.33417	-80.2402		3.70	28.9	35	0.226039	0.000202	0.013064	0.001087	0	-0.674983337
9	9/27/2002	2002	September	2002.09	25.34983	-80.2775	10:30	0.65	29.3	31	0.346258	0.004847	0.032854	0.00376	0.001136	0.259834369
10	9/27/2002	2002	September	2002.09	25.35058	-80.2988	10:40	0.55	29.4	27	0.402032	0.010676	0.03543	0.002501	0.000477	-0.897217452
11	9/27/2002	2002	September	2002.09	25.32525	-80.3307		0.65	29.2	25	0.568088	0.013136	0.054758	0.003461	0.001163	-0.123256298
12	9/27/2002	2002	September	2002.09	25.29767	-80.3599	11:05	2.70	29.4	24	0.471223	0	0.034907	0.008717	0.071373	-0.417325275
13	9/27/2002	2002	September	2002.09	25.266	-80.3773	11:20	0.45	29.6	22	0.436177	0.000056	0.024956	0.009134	0.058224	0.562438351
14	9/27/2002	2002	September	2002.09	25.23017	-80.3891	11:25	1.50	29.4	24	1.290676	0.060747	0.181514	0.009053	0.001417	0.596977018
15	9/27/2002	2002	September	2002.09	25.24467	-80.4148	11:40	1.60	29.6	18	1.313564	0.014282	0.04418	0.002425	1.433895	-0.095952643
16	9/27/2002	2002	September	2002.09	25.41667	-80.3111	12:25	2.10	30.1	33	0.305267	0.005035	0.030301	0.001516	0.003435	0.517160946
17	9/27/2002	2002	September	2002.09	25.47042	-80.3267	12:40	1.10	30	34	0.355501	0.000082	0.024947	0.004434	0.005179	-0.586577434
18	9/27/2002	2002	September	2002.09	25.48983	-80.3304	12:50	0.80	29.7	27	1.018649	0	0.080307	0.003368	0.068787	0.583603432
19	9/27/2002	2002	September	2002.09	25.51883	-80.32	13:00	2.90	30	16	0.569291	0.006975	0.037617	0.00204	0.064993	-0.850885213
20	9/27/2002	2002	September	2002.09	25.52717	-80.3038	13:05	0.80	30.1	23	0.511475	0.000114	0.041809	0.002745	0.014164	-0.617870924
21	9/27/2002	2002	September	2002.09	25.61067	-80.3002	13:30	0.55	30.3	17	0.674425	0.00022	0.039855	0.002956	0.012307	-0.713224894
22	9/27/2002	2002	September	2002.09	25.65483	-80.265		1.30	30.3	21	0.5801	0.026303	0.019237	0.004567	0.227107	-0.565679265
23	9/27/2002	2002	September	2002.09	25.70033	-80.2427	12:00	1.30	29.9	22	1.544405	0.020546	0.120276	0.008398	0.18412	-0.494174092
24	9/27/2002	2002	September	2002.09	25.70733	-80.2013	12:15	1.20	29.7	26	0.572741	0.000148	0.048632	0.004401	0.062907	-0.206284756
1	10/21/2002	2002	October	2002.10	25.46308	-80.3188		0.00	26.9	26	0.292592	0.013766	0.036998	0.001745	0	-0.844892073
2	10/21/2002	2002	October	2002.10	25.45283	-80.306		0.00	27	29	0.329891	0.009078	0.035307	0.001346	0.00193	-0.853253284
3	10/21/2002	2002	October	2002.10	25.43083	-80.2796	8:40	0.00	27	32	0.307469	0.003642	0.019591	0.004474	0.013132	-0.749757346
4	10/21/2002	2002	October	2002.10	25.407	-80.2447	8:50	0.00	27.2	35	0.34292	0.000219	0.022405	0.004977	0.001935	-0.903941829
5	10/21/2002	2002	October	2002.10	25.38383	-80.2075	9:00	0.20	27.1	34	0.285079	0.003341	0.016258	0.004362	0	0.214227532
6	10/21/2002	2002	October	2002.10	25.38083	-80.1788	9:05	0.00	27.7	34	0.347376	0.000114	0.019947	0.053145	0	-0.976516798
8	10/21/2002	2002	October	2002.10	25.33417	-80.2402	9:20	0.00	27.3	34	0.282195	0.002315	0.018496	0.006499	0	-0.186368238
9	10/21/2002	2002	October	2002.10	25.34983	-80.2775	9:30	0.40	27.1	34	0.346804	0.003835	0.030454	0.004628	0.193622	-0.474757662
10	10/21/2002	2002	October	2002.10	25.35058	-80.2988	9:40	0.00	27	33	1.311161	0.058754	0.177726	0.015761	0.001735	0.503636993
11	10/21/2002	2002	October	2002.10	25.32525	-80.3307	9:50	0.00	27.3	33	0.607115	0.006051	0.057994	0.006584	0.001307	0.00727922
12	10/21/2002	2002	October	2002.10	25.29767	-80.3599	10:00	0.05	27	29	0.51572	0	0.052397	0.004026	0	-0.549517179
13	10/21/2002	2002	October	2002.10	25.266	-80.3773	10:05	0.00	26.9	28	0.527706	0.006315	0.048861	0.004666	0.002566	0.364792138
14	10/21/2002	2002	October	2002.10	25.23017	-80.3891	10:15	0.35	26.9	27	2.040077	0.091741	0.279945	0.003035	0.003562	-0.090833159
15	10/21/2002	2002	October	2002.10	25.24467	-80.4148	10:25	0.10	26.9	23	1.668191	0.027588	0.071266	0.004331	0.351642	-0.284477149
16	10/21/2002	2002	October	2002.10	25.41667	-80.3111	11:05	0.50	27.1	30	0.495047	0.005042	0.046675	0.002743	0.0011	0.295498084
17	10/21/2002	2002	October	2002.10	25.47042	-80.3267		0.00	26.8	24	0.57874	0.020774	0.063446	0.005992	0.008128	0.724369748
18	10/21/2002	2002	October	2002.10	25.48983	-80.3304		0.10	26.7	18	0.854037	0.011206	0.091478	0.007486	0.026916	-0.804295407
19	10/21/2002	2002	October	2002.10	25.51883	-80.32		0.00	26.6	16	1.094988	0.00852	0.095556	0.005161	0.014025	-0.685474372
20	10/21/2002	2002	October	2002.10	25.52717	-80.3038		0.00			0.454147	0	0.044469	0.003906	0	-0.315763692
21	10/21/2002	2002	October	2002.10	25.61067	-80.3002		0.00			0.708089	0	0.074022	0.006829	0.00716	-0.844443101
22	10/21/2002	2002	October	2002.10	25.65483	-80.265		0.00			0.918368	0.102669	0.053763	0.03401	0.04097	0.256220578
23	10/21/2002	2002	October	2002.10	25.70033	-80.2427		0.00			0.725855	0.059076	0.083551	0.02818	0.025764	-0.229644495
24	10/21/2002	2002	October	2002.10	25.70733	-80.2013		0.00			0.657558	0.006717	0.054936	0.027758	0.033198	-0.037490811
25	10/21/2002	2002	October	2002.10	25.60625	-80.2318		0.00			0.31545	0.000109	0.022173	0.004572	0	-0.402229399
26	10/21/2002	2002	October	2002.10	25.55167	-80.2398		0.00			0.402102	0.000093	0.025812	0.007925	0	0.847511526
27	10/21/2002	2002	October	2002.10	25.49483	-80.2784		0.00			0.3088	0.000134	0.019388	0.003152	0	-0.574344023

Table 1

Station	Date	Year	Month	Year.Month	Latitude	Longitude	Time	Turb	Temp	Salinity (field)	Chl A	Chl B	Chl C	Phycocyanin	Phycocyanin	(FLN-FLP)(FLN-FLP)
								NTU	°C	ppt	µg/L	µg/L	µg/L	µg/L	µg/L	
1	11/11/2002	2002	November	2002.11	25.46308	-80.3188		0.70			0.662846	0.049679	0.066205	0.001963	0.003455	
2	11/11/2002	2002	November	2002.11	25.45283	-80.306		0.35			0.485355	0.034001	0.054375	0.001369	0.015292	
3	11/11/2002	2002	November	2002.11	25.43083	-80.2796		0.15			0.380916	0.000164	0.026815	0.002452	0	
4	11/11/2002	2002	November	2002.11	25.407	-80.2447		0.60			0.386046	0.00878	0.029624	0.00464	0.039578	
5	11/11/2002	2002	November	2002.11	25.38383	-80.2075		1.60			0.272991	0.002708	0.019224	0.002481	0.006277	
6	11/11/2002	2002	November	2002.11	25.38083	-80.1788		0.35			0.256808	0.000086	0.011381	0.012359	0.013804	
8	11/11/2002	2002	November	2002.11	25.33417	-80.2402		0.90			0.285976	0.003196	0.018542	0.009054	0	
9	11/11/2002	2002	November	2002.11	25.34983	-80.2775		0.00			0.39159	0.00994	0.030663	0.003743	0	
10	11/11/2002	2002	November	2002.11	25.35058	-80.2988		0.05			0.461411	0.012342	0.035793	0.006067	0	
11	11/11/2002	2002	November	2002.11	25.32525	-80.3307		0.15			0.619205	0.024182	0.076668	0.002466	0.002298	
12	11/11/2002	2002	November	2002.11	25.29767	-80.3599		0.00			1.715981	0.130927	0.348912	0.004023	0.00307	
13	11/11/2002	2002	November	2002.11	25.266	-80.3773		0.05			0.523657	0.029408	0.058339	0.001806	0	
14	11/11/2002	2002	November	2002.11	25.23017	-80.3891		0.65			1.173235	0.06452	0.158894	0.000377	0	
15	11/11/2002	2002	November	2002.11	25.24467	-80.4148		1.40			1.214645	0.070503	0.096643	0.001078	0.004036	
16	11/11/2002	2002	November	2002.11	25.41667	-80.3111		1.80			0.484159	0.013705	0.054022	0.000192	0	
17	11/11/2002	2002	November	2002.11	25.47042	-80.3267		1.90			0.746313	0.030899	0.080969	0.002669	0	
18	11/11/2002	2002	November	2002.11	25.48983	-80.3304		1.50			0.644023	0.00886	0.068935	0.000128	0	
19	11/11/2002	2002	November	2002.11	25.51883	-80.32		5.90			0.576582	0.009056	0.063233	0.000161	0.007463	
20	11/11/2002	2002	November	2002.11	25.52717	-80.3038		1.10			0.485041	0.012649	0.049658	0.000605	0	

Figure 1. Location of sampling stations 1-27 in south Biscayne Bay, canals, and canal flow structures.

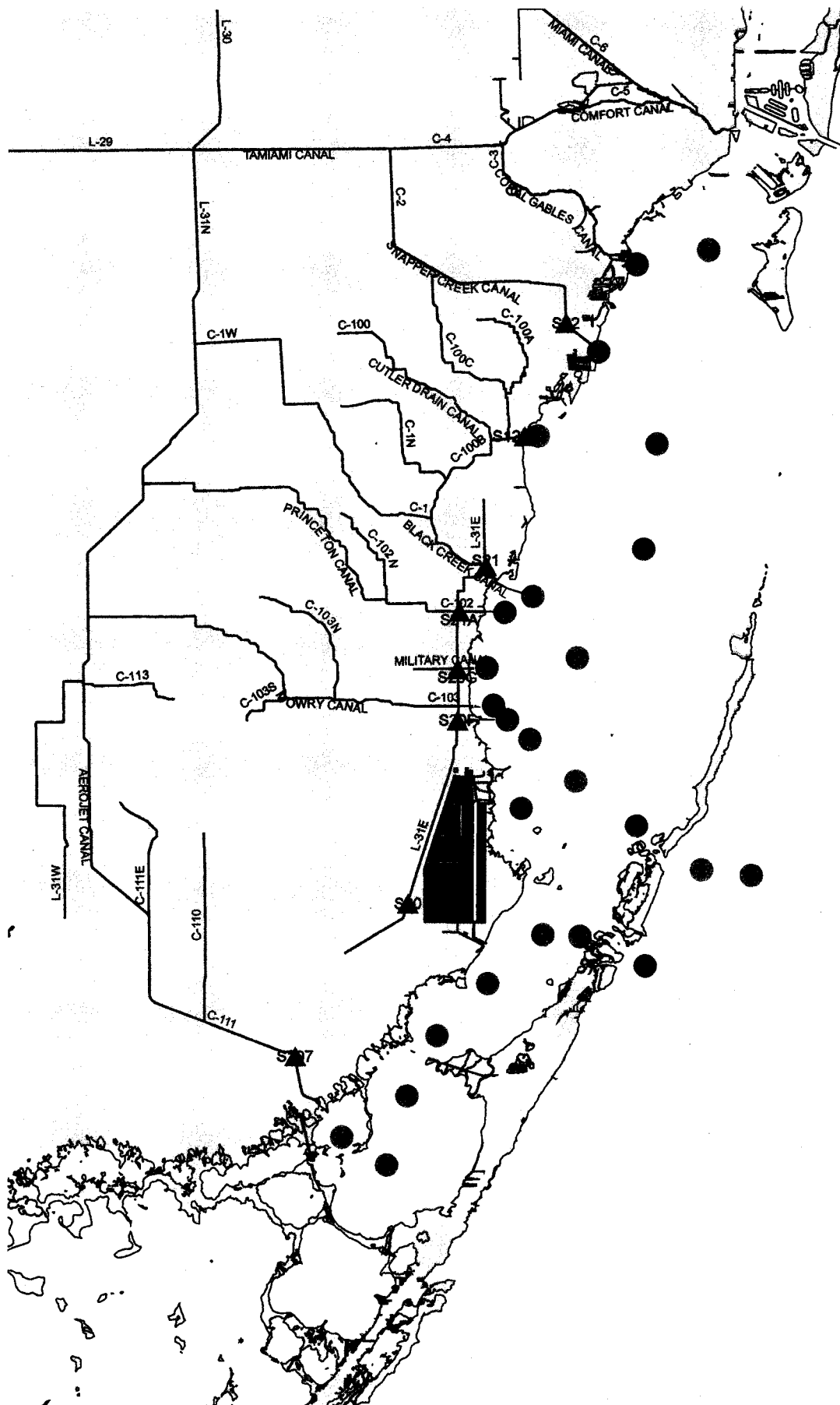


Figure 2. Average monthly rainfall at S123 near the mouth of Cutler Canal.

Average Monthly Rainfall
S123

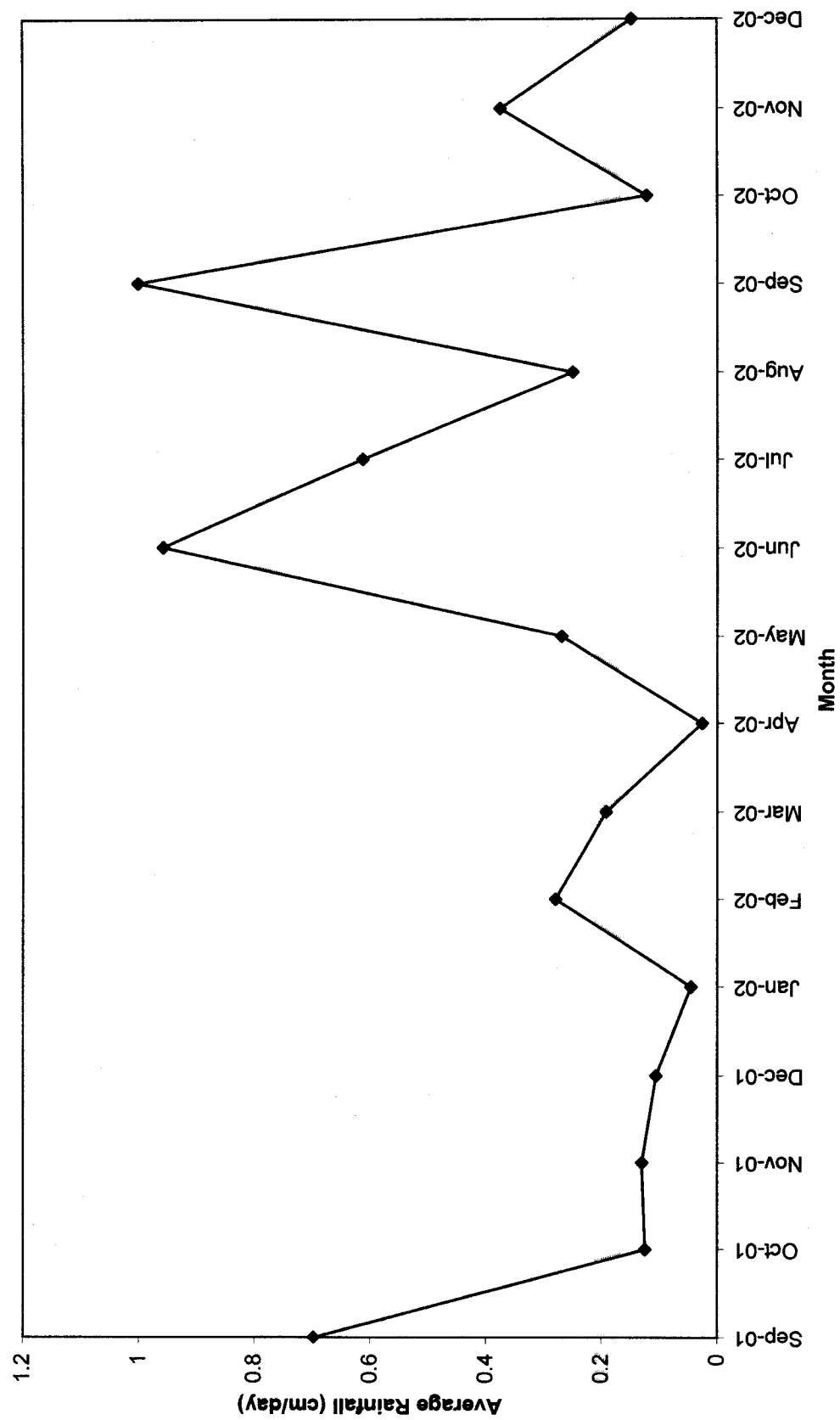


Figure 3. Average salinity in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

Legend

Salinity

ppt

- < 20
- 20 - 22
- 22 - 24
- 24 - 26
- 26 - 28
- 28 - 30
- 30 - 32
- 32 - 34
- 34 - 36

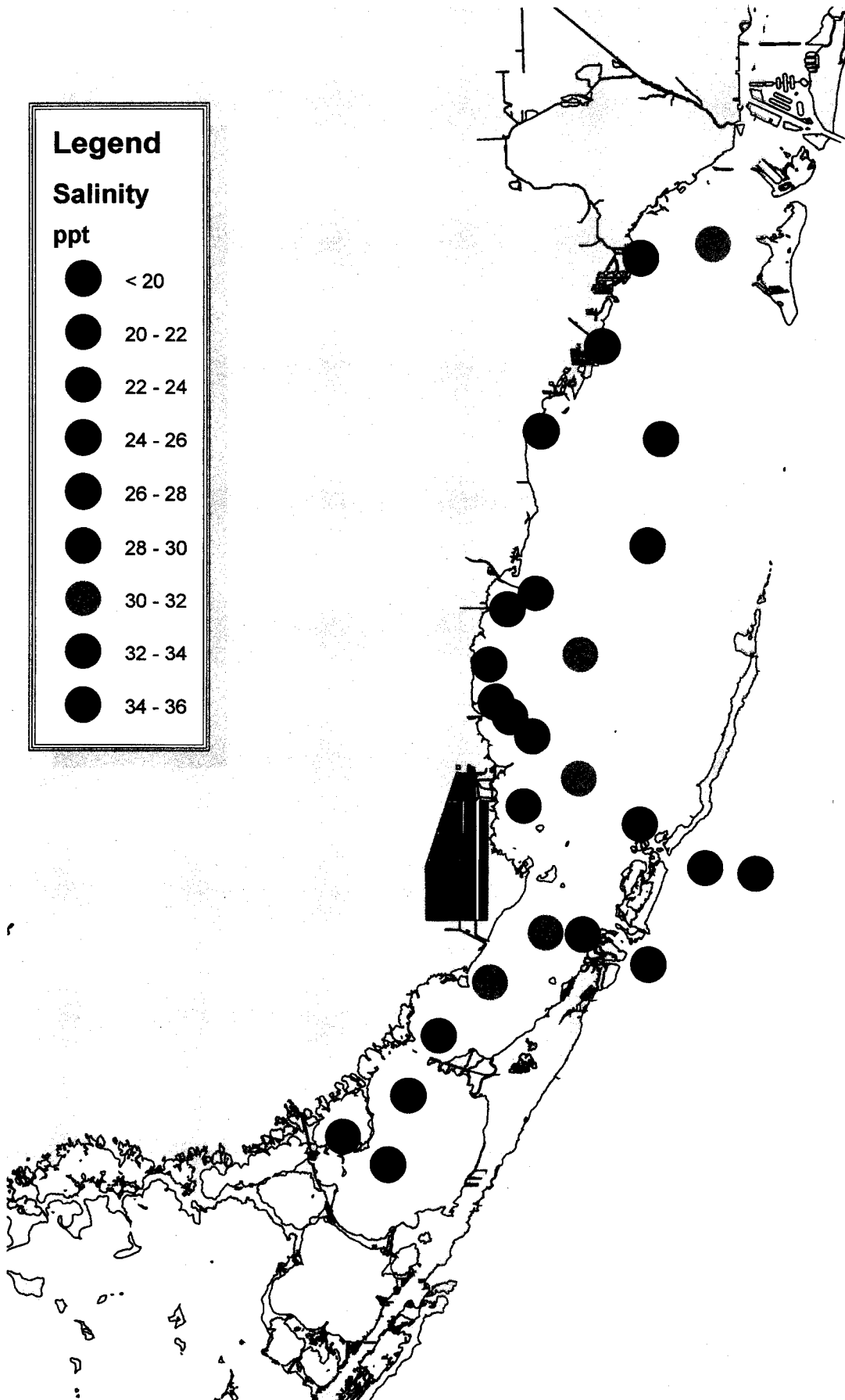


Figure 4. Average chlorophyll a in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

Legend

Chl A

ug/L

- < 0.20
- 0.20 - 0.25
- 0.25 - 0.30
- 0.30 - 0.35
- 0.35 - 0.40
- > 0.40

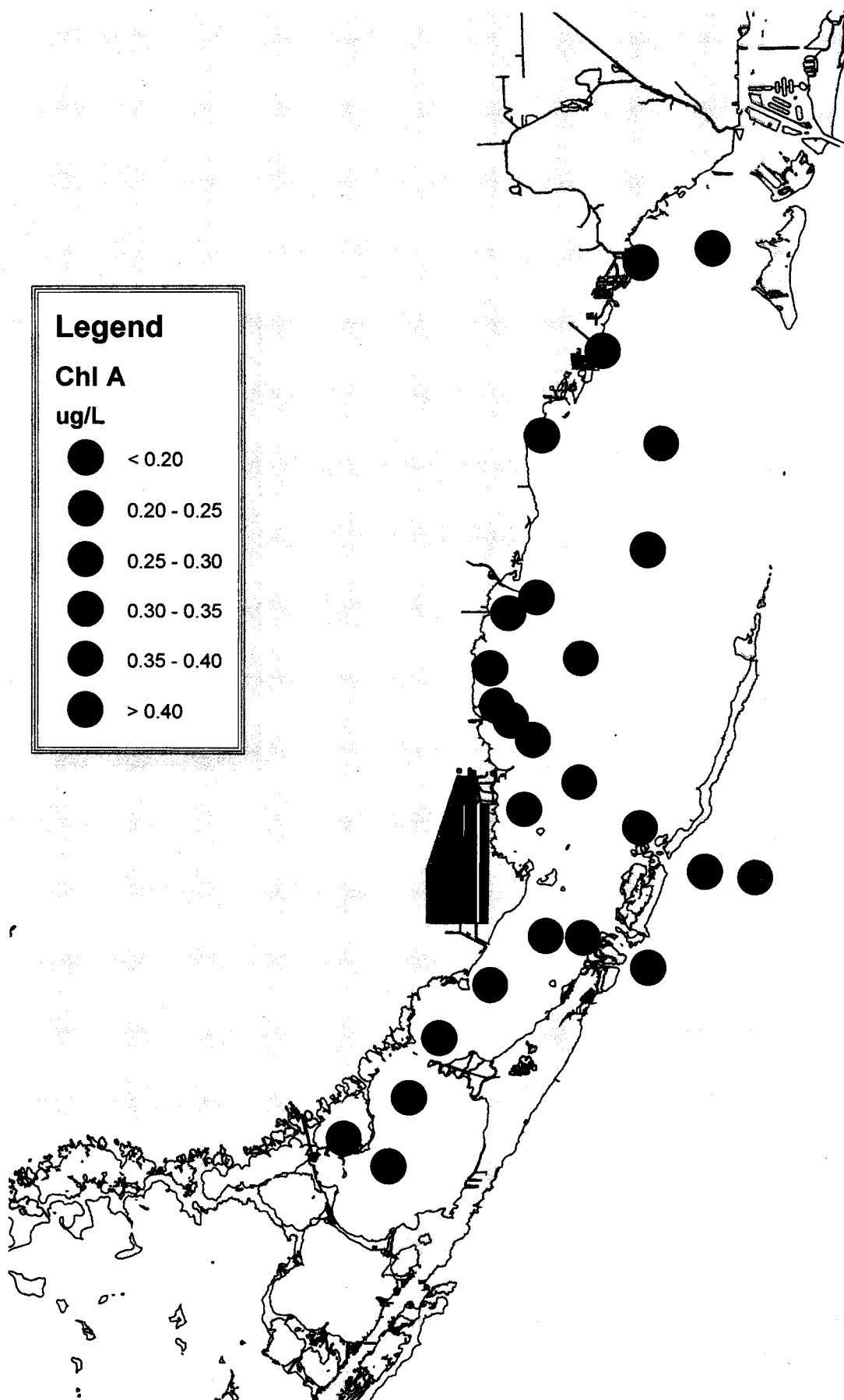


Figure 5. Overall relationship between phytoplankton abundance (as chlorophyll a) and salinity in south Biscayne Bay.

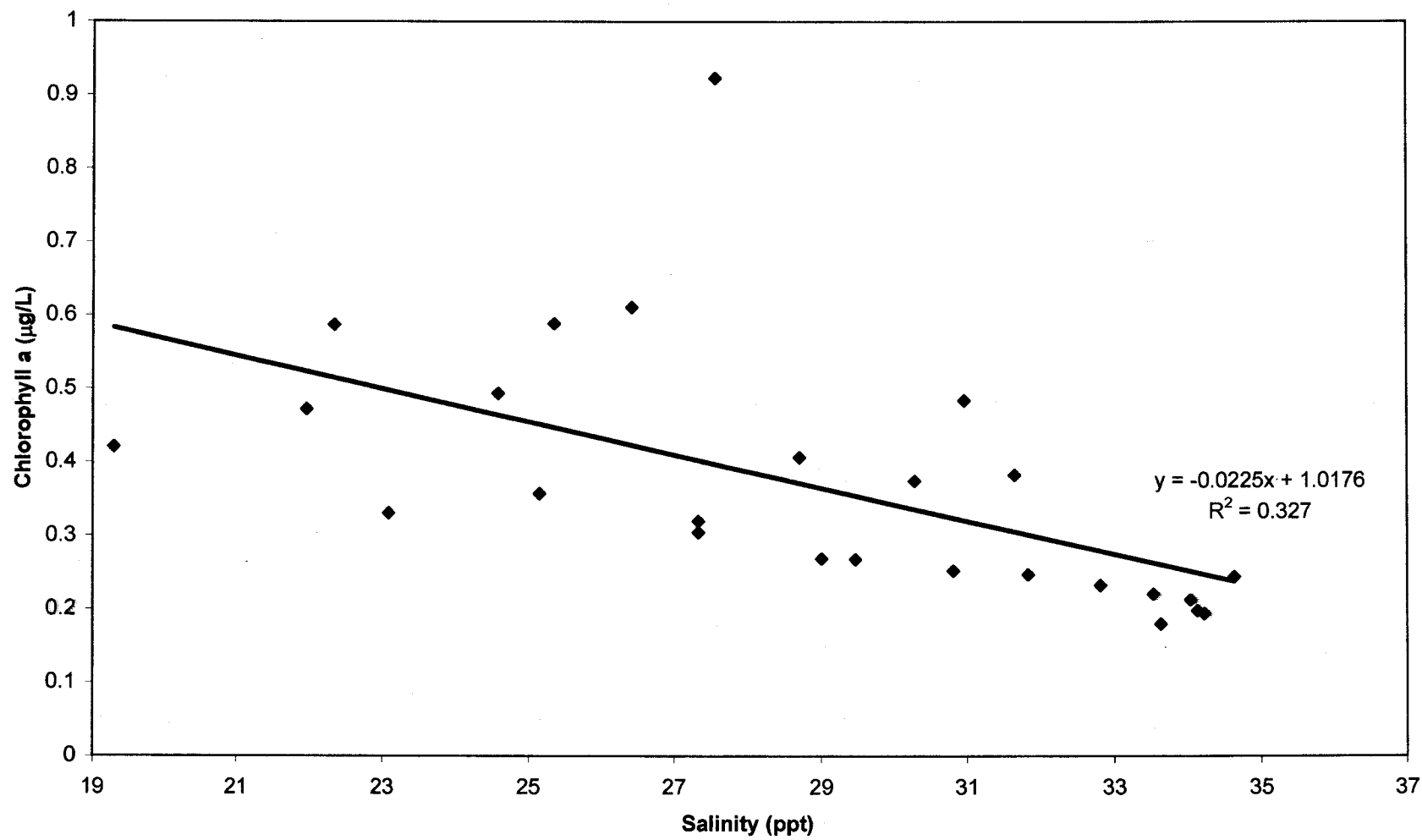


Figure 6. Time course of water flow through the Aerojet Canal (C111) at the S197 structure, and salinity and phytoplankton abundance as chlorophyll a at station 15 near the mouth of the Aerojet Canal. Note that the salinity scale is reversed.

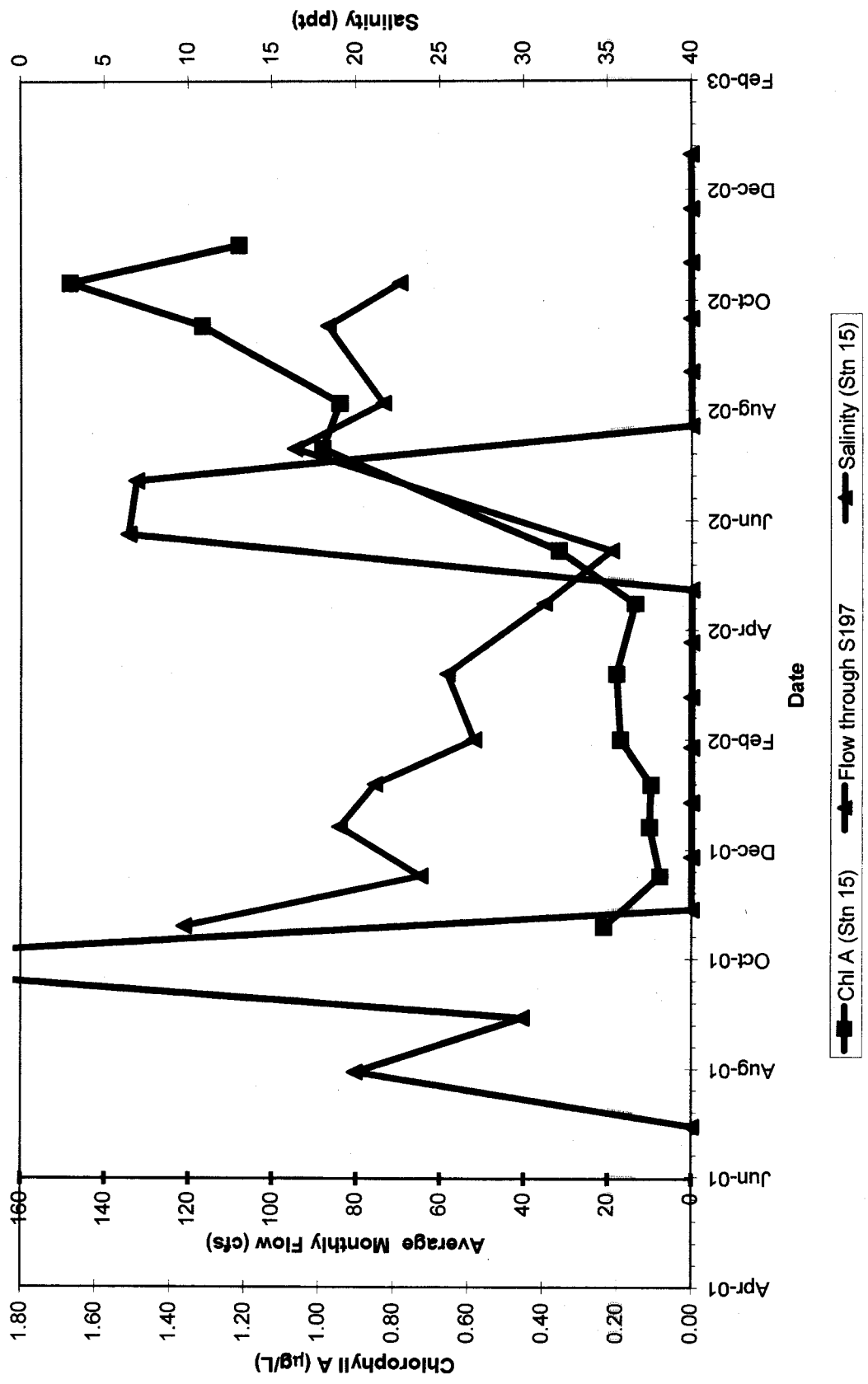


Figure 7. Time course of water flow through the Mowry Canal (C103) at the S20F structure, and salinity and phytoplankton abundance as chlorophyll a at station 17 near the mouth of the Mowry Canal. Note that the salinity scale is reversed.

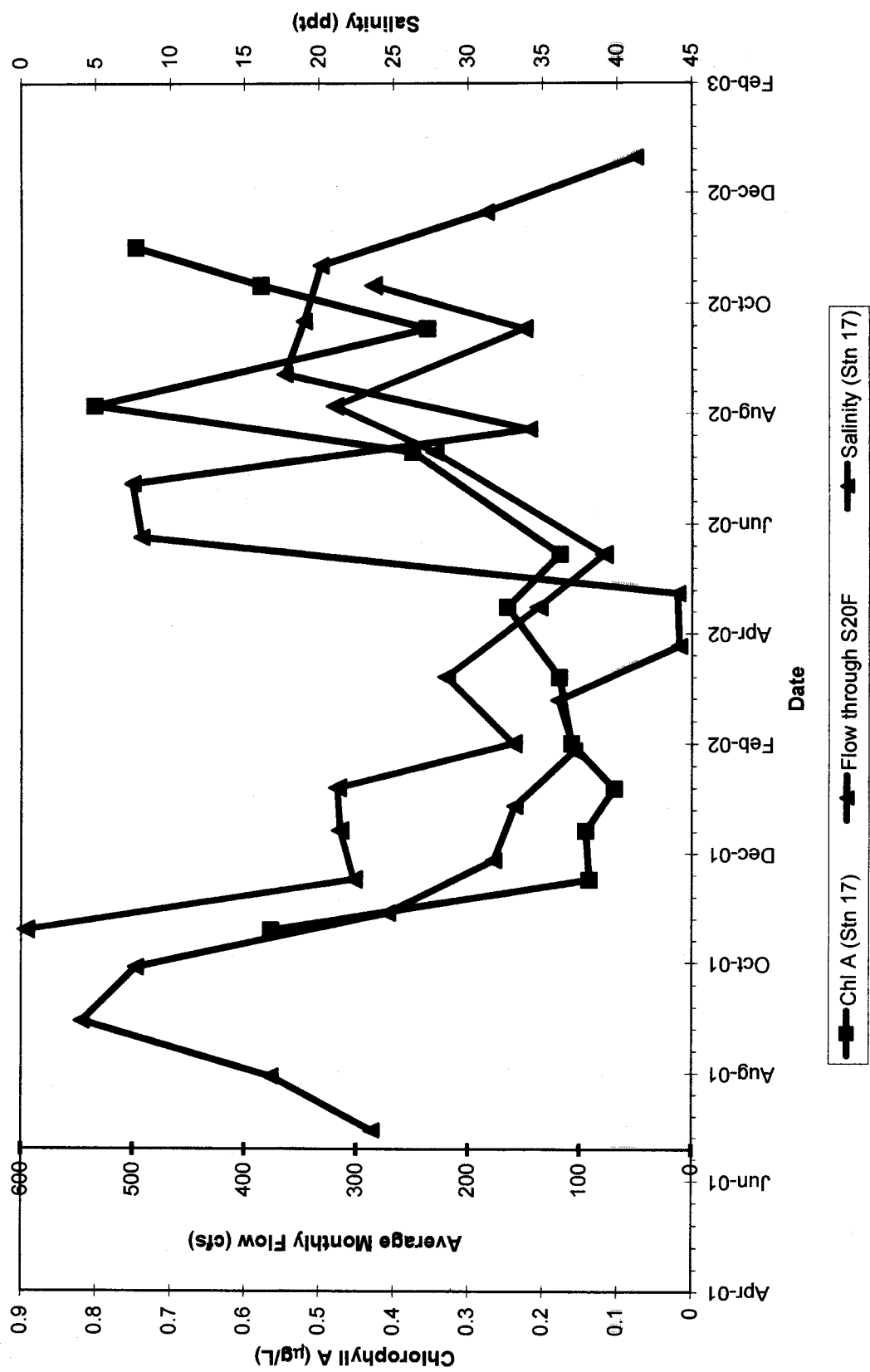


Figure 8. Time course of water flow through the Military Canal at the S20G structure, and salinity and phytoplankton abundance as chlorophyll a at station 18 near the mouth of the Military Canal. Note that the salinity scale is reversed.

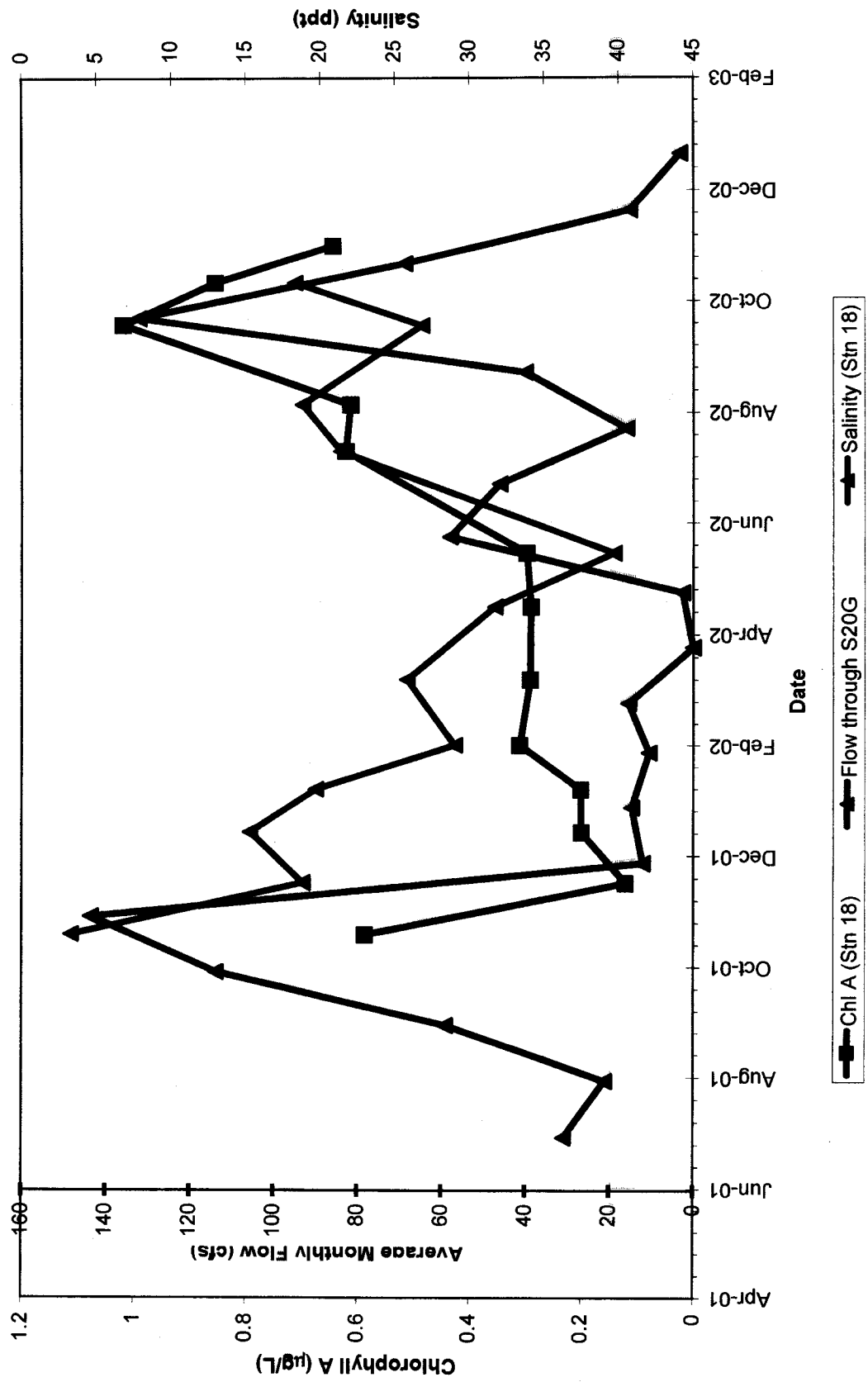


Figure 9. Time course of water flow through the Princeton Canal (C102) at the S21A structure, and salinity and phytoplankton abundance as chlorophyll a at station 19 near the mouth of the Princeton Canal. Note that the salinity scale is reversed.

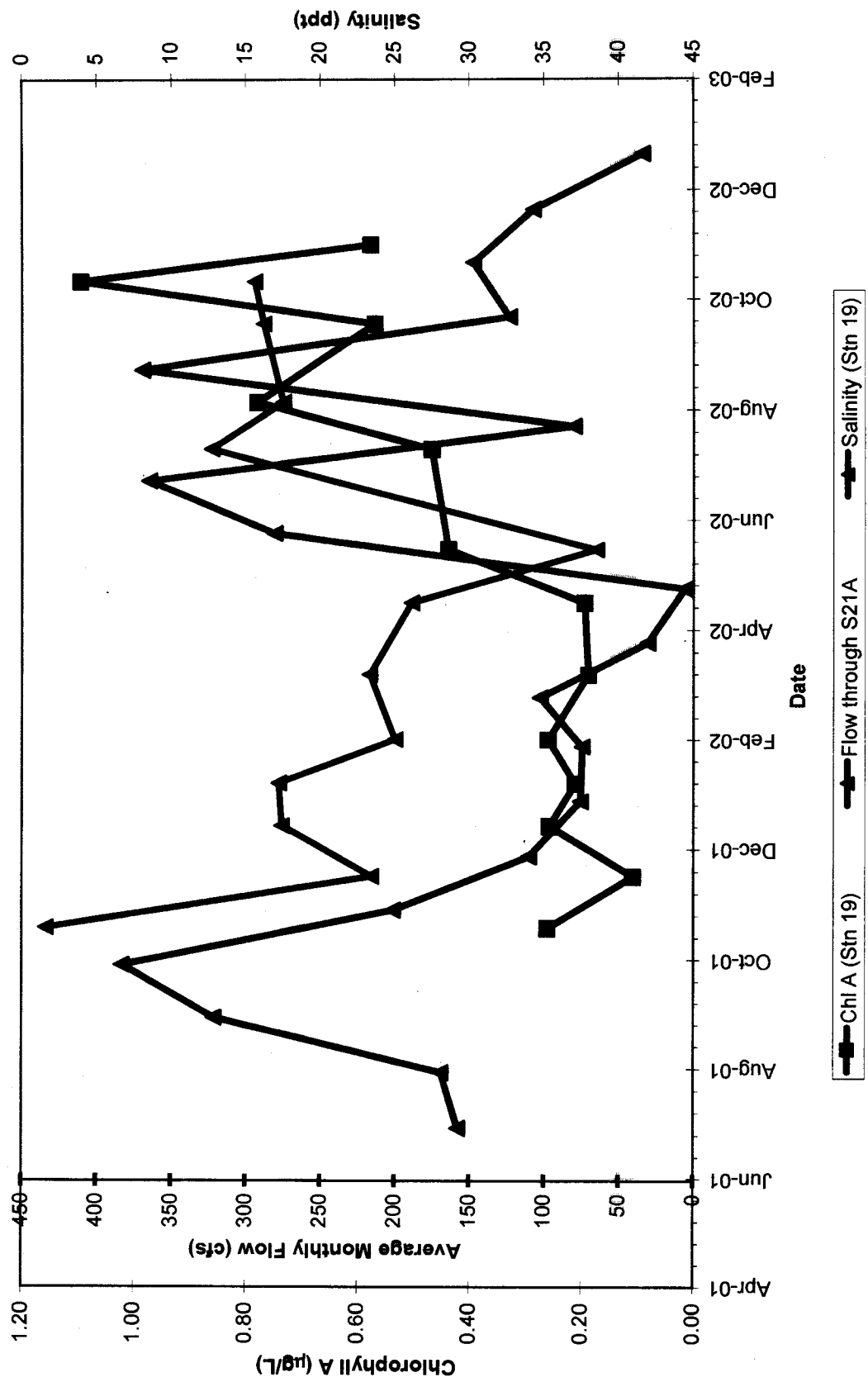


Figure 10. Time course of water flow through the Black Creek Canal (C1) at the S21 structure, and salinity and phytoplankton abundance as chlorophyll a at station 20 near the mouth of the Black Creek Canal. Note that the salinity scale is reversed.

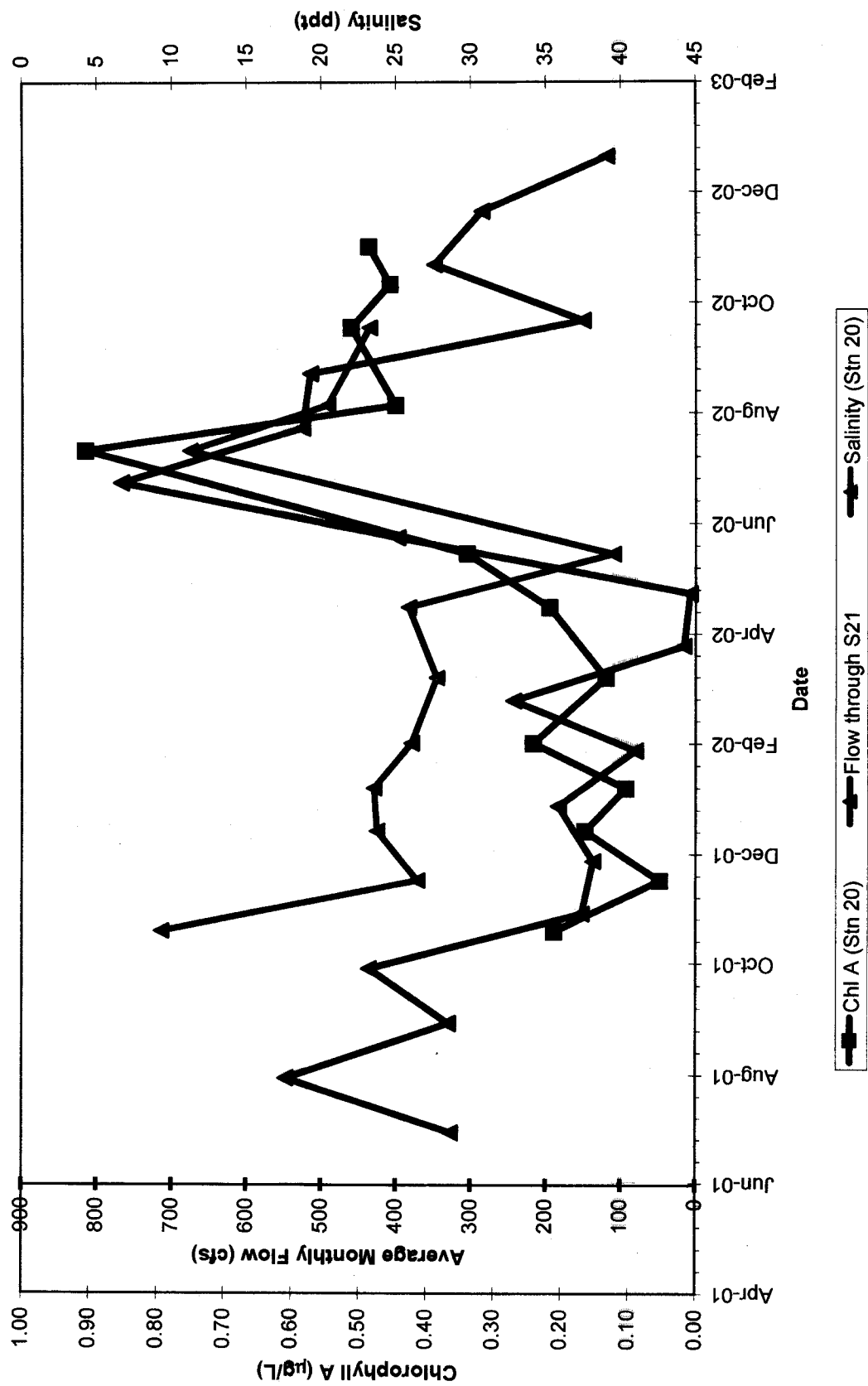


Figure 11. Time course of water flow through the Cutler Canal (C100) at the S123 structure, and salinity and phytoplankton abundance as chlorophyll a at station 21 near the mouth of the Cutler Canal. Note that the salinity scale is reversed.

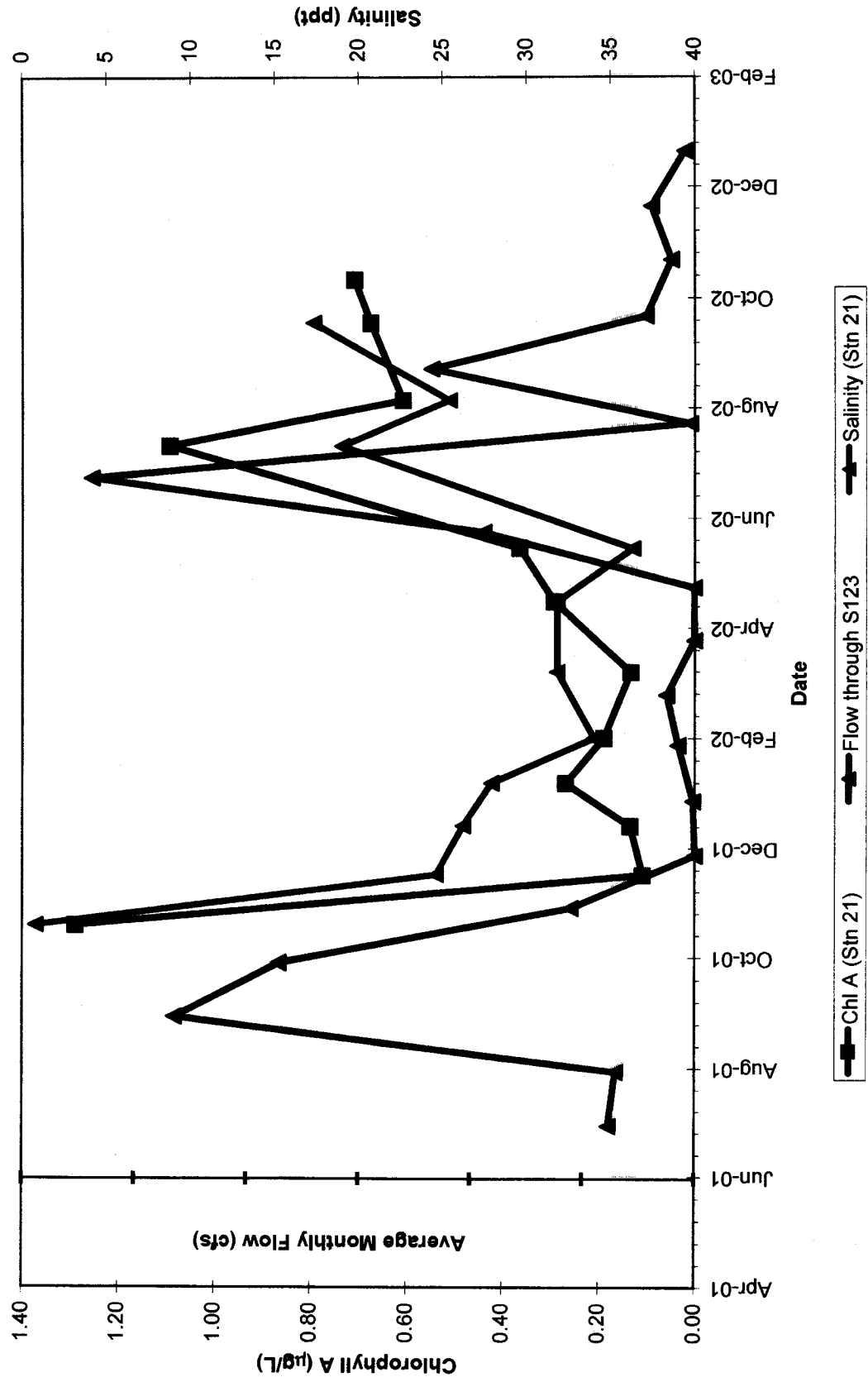


Figure 12. Time course of water flow through the Snapper Creek Canal (C2) at the S22 structure, and salinity and phytoplankton abundance as chlorophyll a at station 22 near the mouth of the Snapper Creek Canal. Note that the salinity scale is reversed.

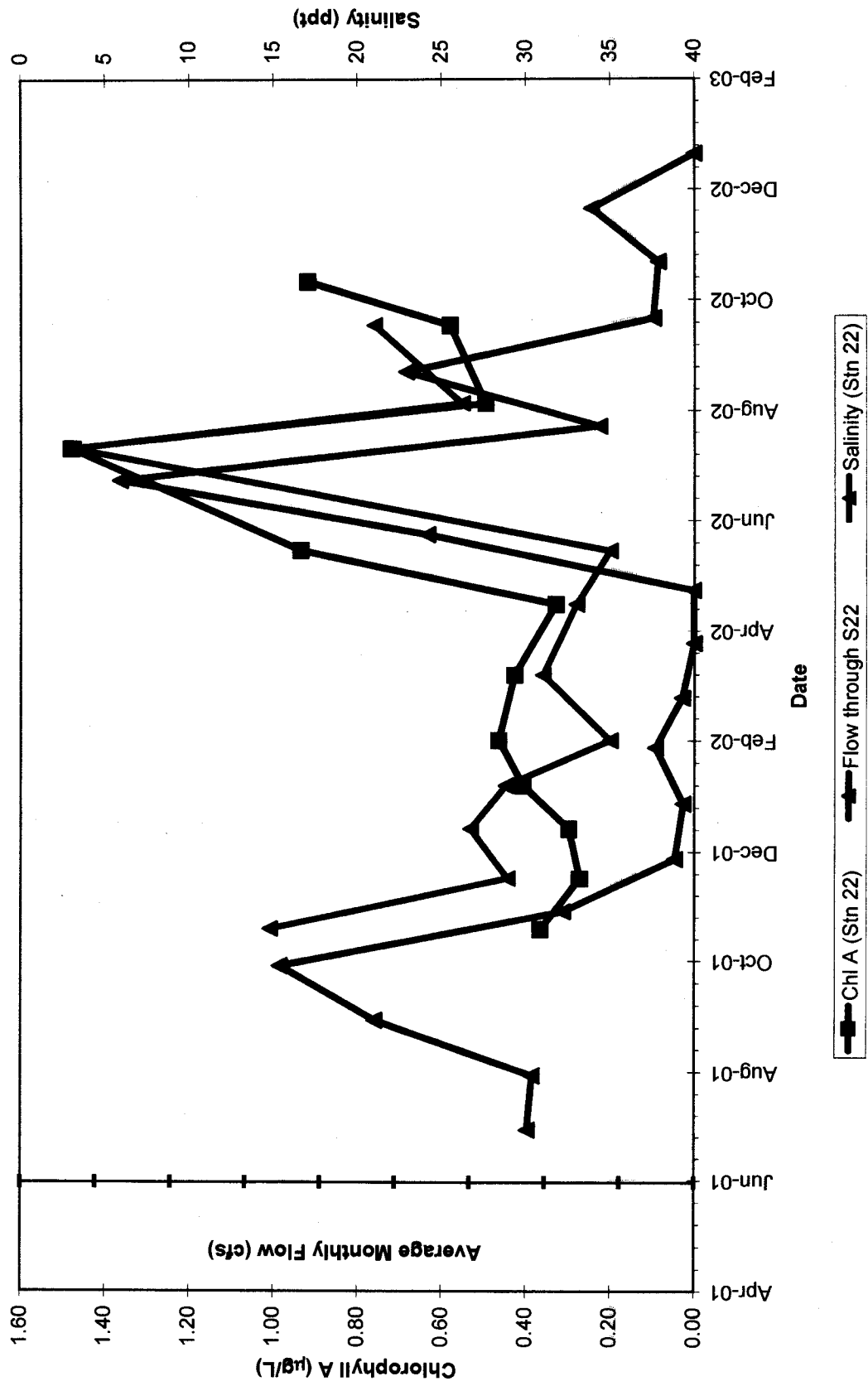


Figure 13. Time course of water flow through the Coral Gables Canal (C3) at the G93 structure, and salinity and phytoplankton abundance as chlorophyll a at station 23 near the mouth of the Coral Gables Canal. Note that the salinity scale is reversed.

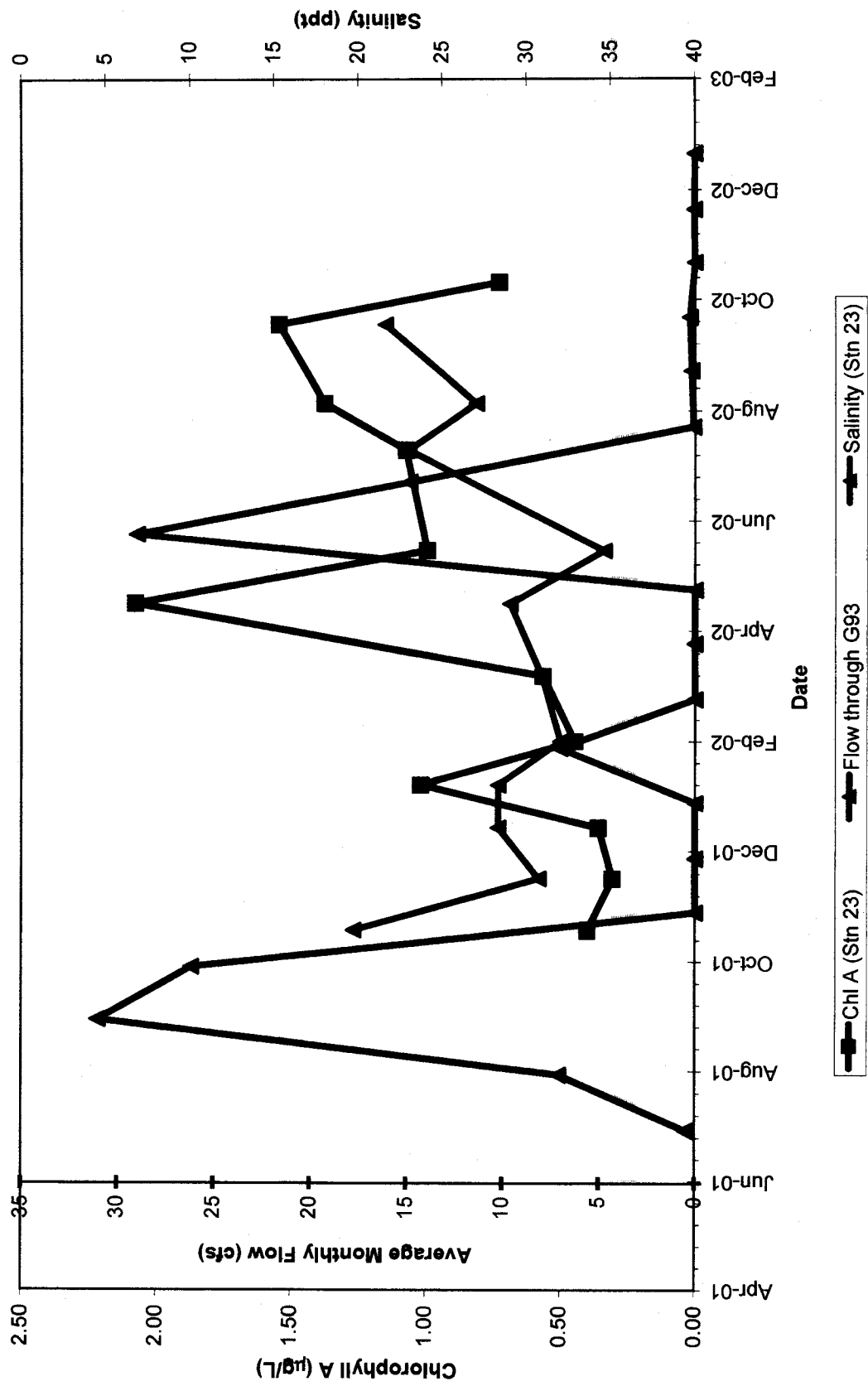


Figure 14. Average chlorophyll c/ chlorophyll a ratio in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

Legend

Chl C / Chl A

- < 0.05
- 0.05 - 0.06
- 0.06 - 0.07
- 0.07 - 0.08
- 0.08 - 0.09
- > 0.09

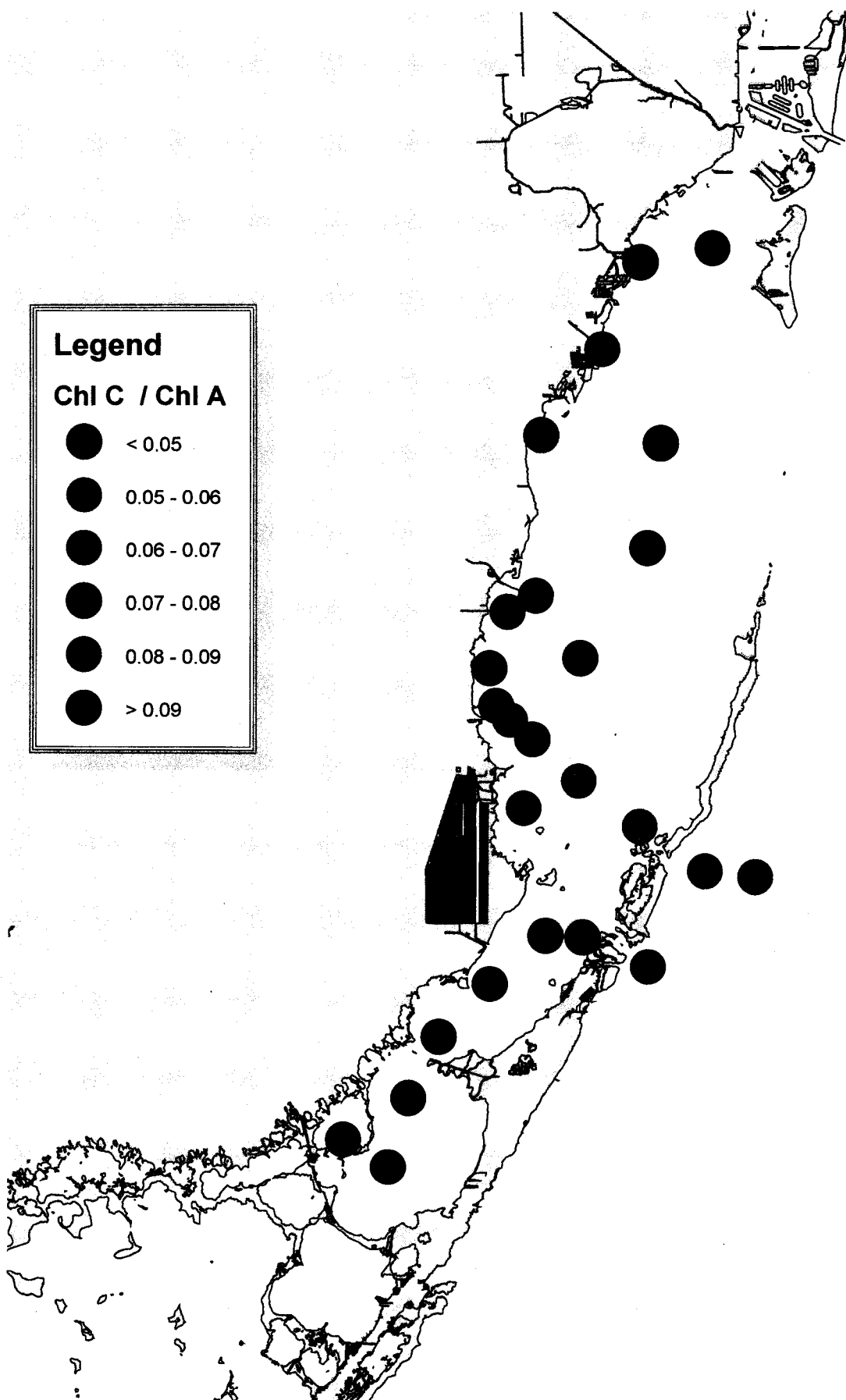


Figure 15. Overall relationship between chlorophyll c and phytoplankton abundance (as chlorophyll a) in south Biscayne Bay.

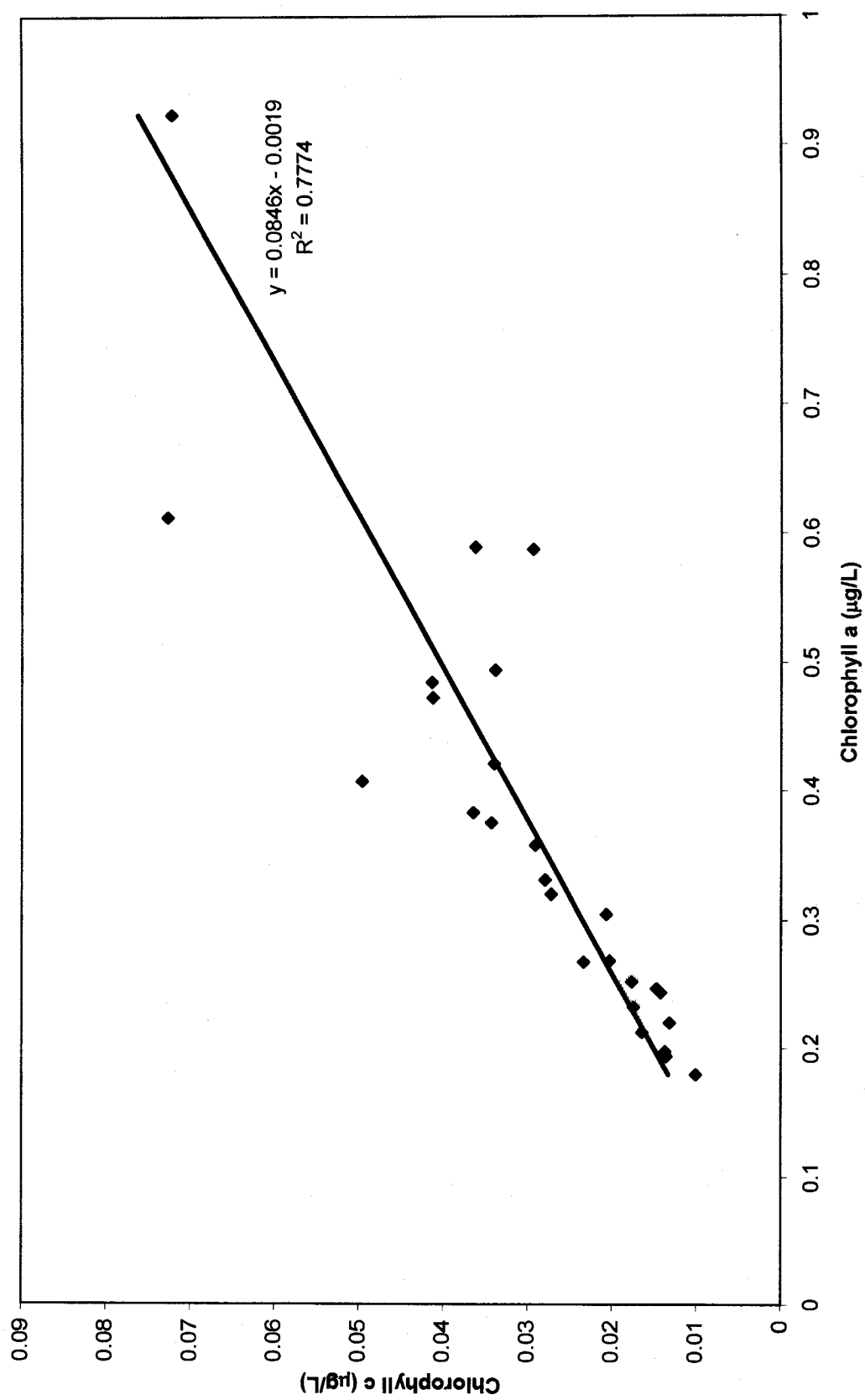


Figure 16. Overall relationship between chlorophyll c/ chlorophyll a ratio and phytoplankton abundance (as chlorophyll a) in south Biscayne Bay.

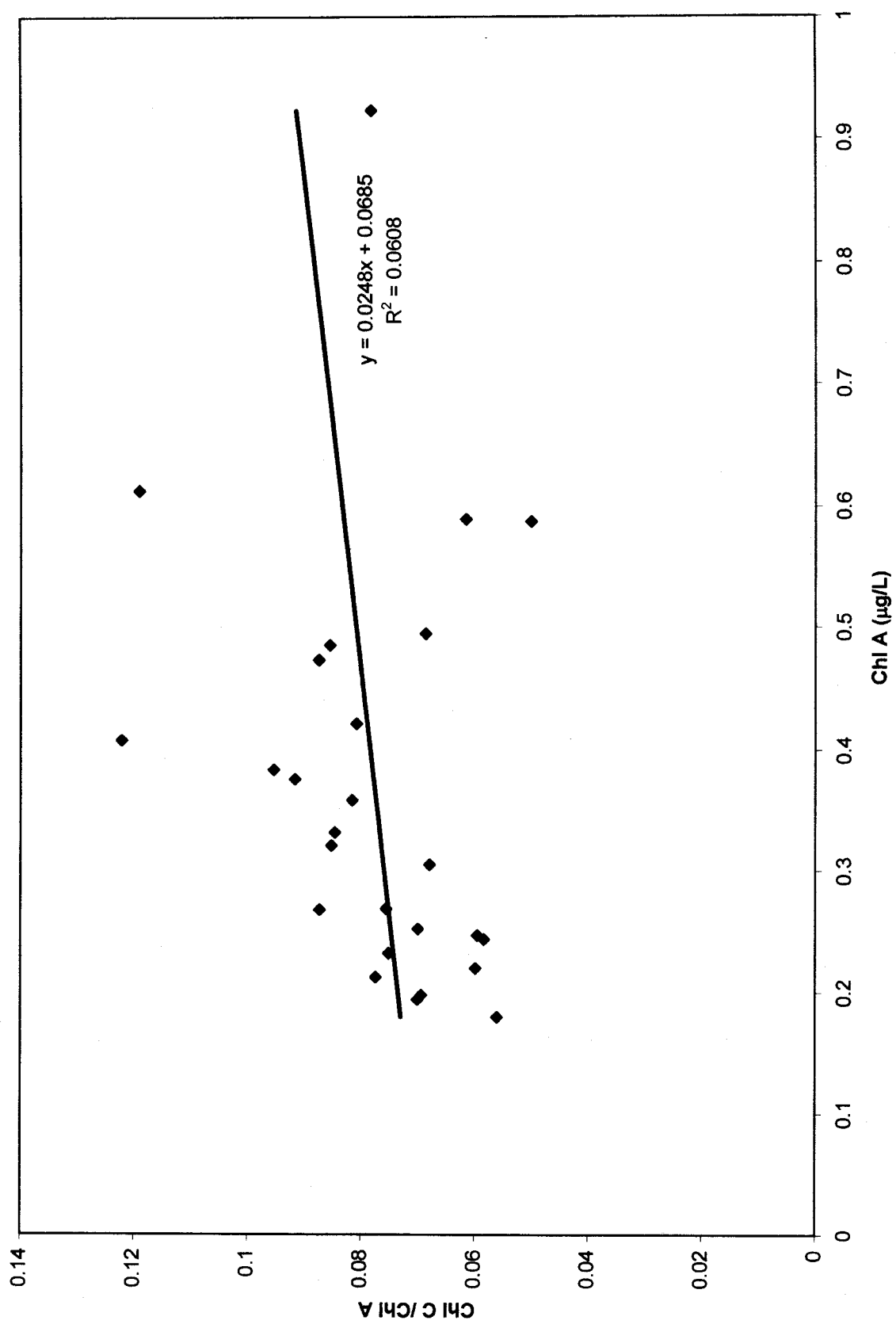


Figure 17. Overall relationship between chlorophyll c/ chlorophyll a ratio and salinity in south Biscayne Bay.

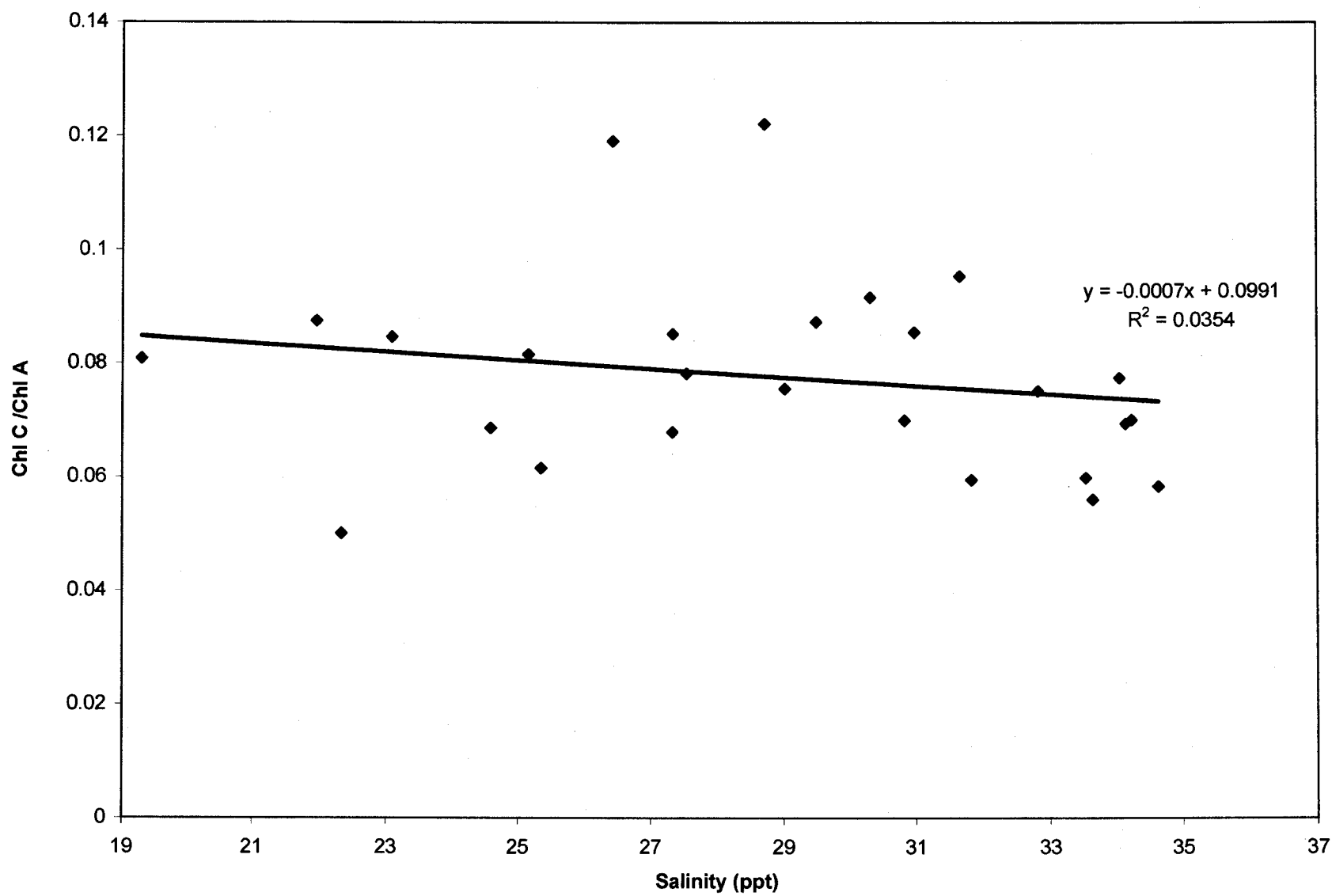


Figure 18. Time course of chlorophyll c/ chlorophyll a ratio at station 15 near mouth of Aerojet Canal.

Station 15

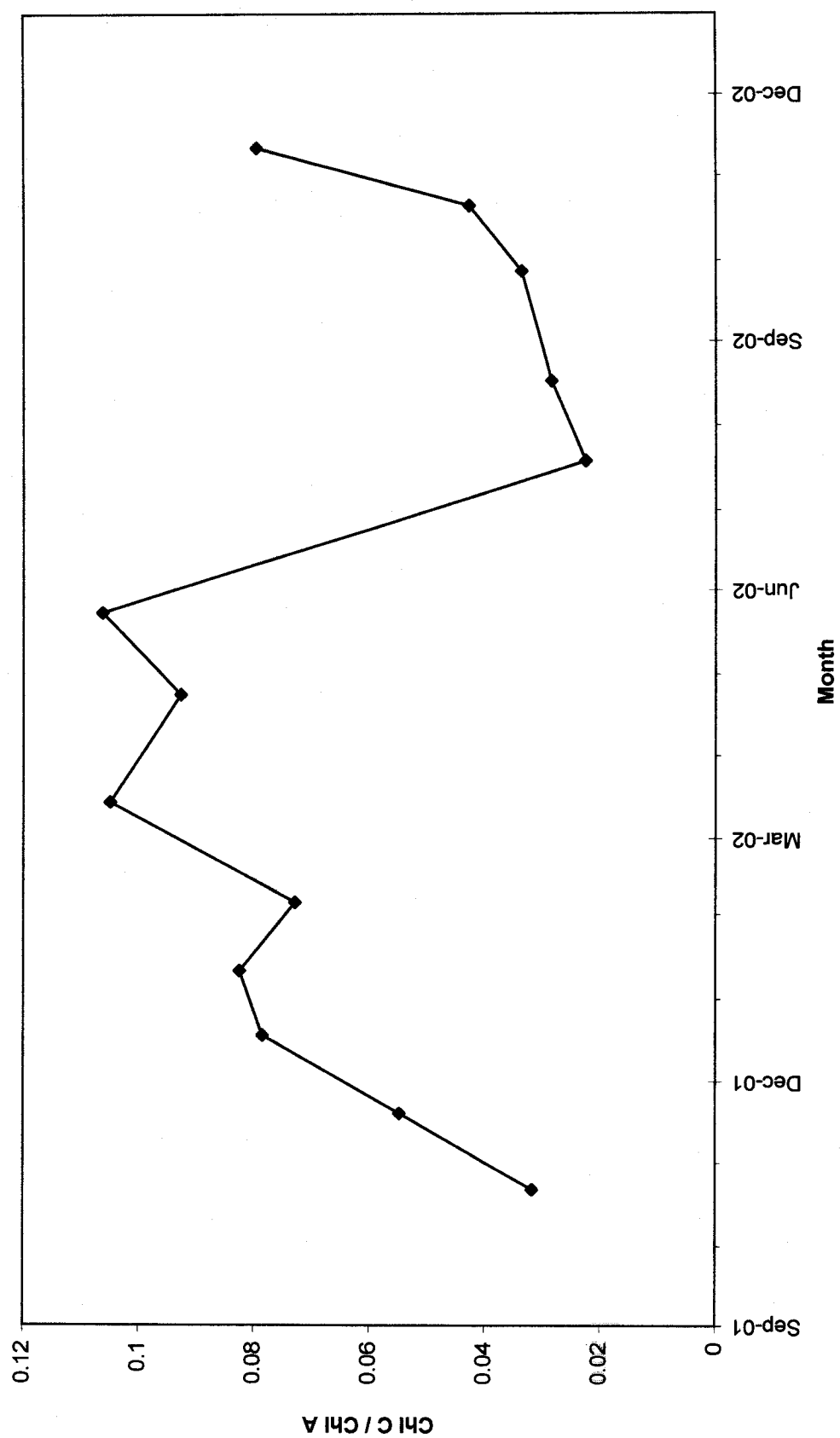


Figure 19. Time course of average chlorophyll c/ chlorophyll a ratio at stations 13 and 14 in Barnes Sound.

Stations 13, 14

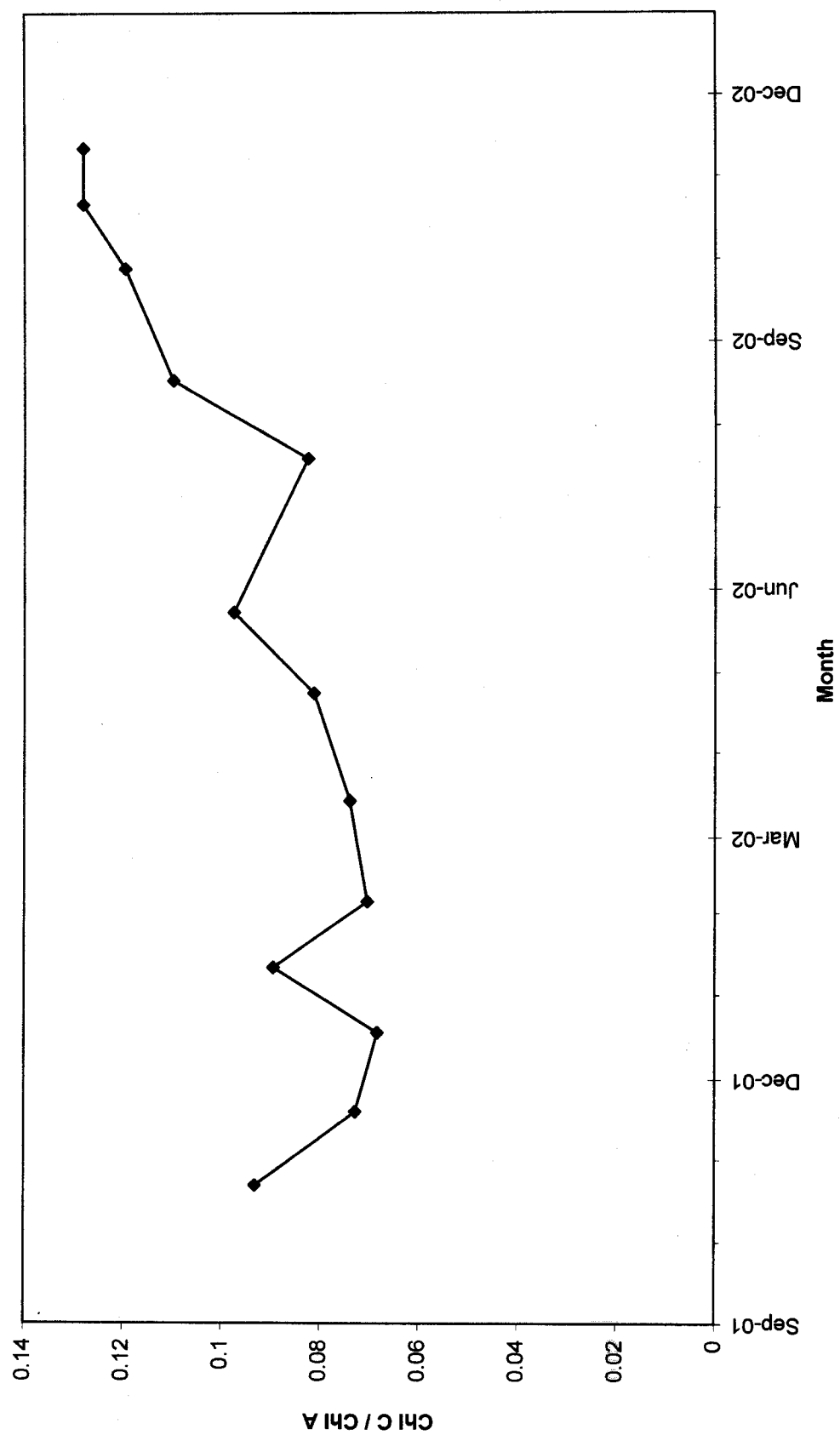


Figure 20. Time course of average chlorophyll c/ chlorophyll a ratio at stations 10, 11, and 12 in Card Sound.

Stations 10, 11, 12

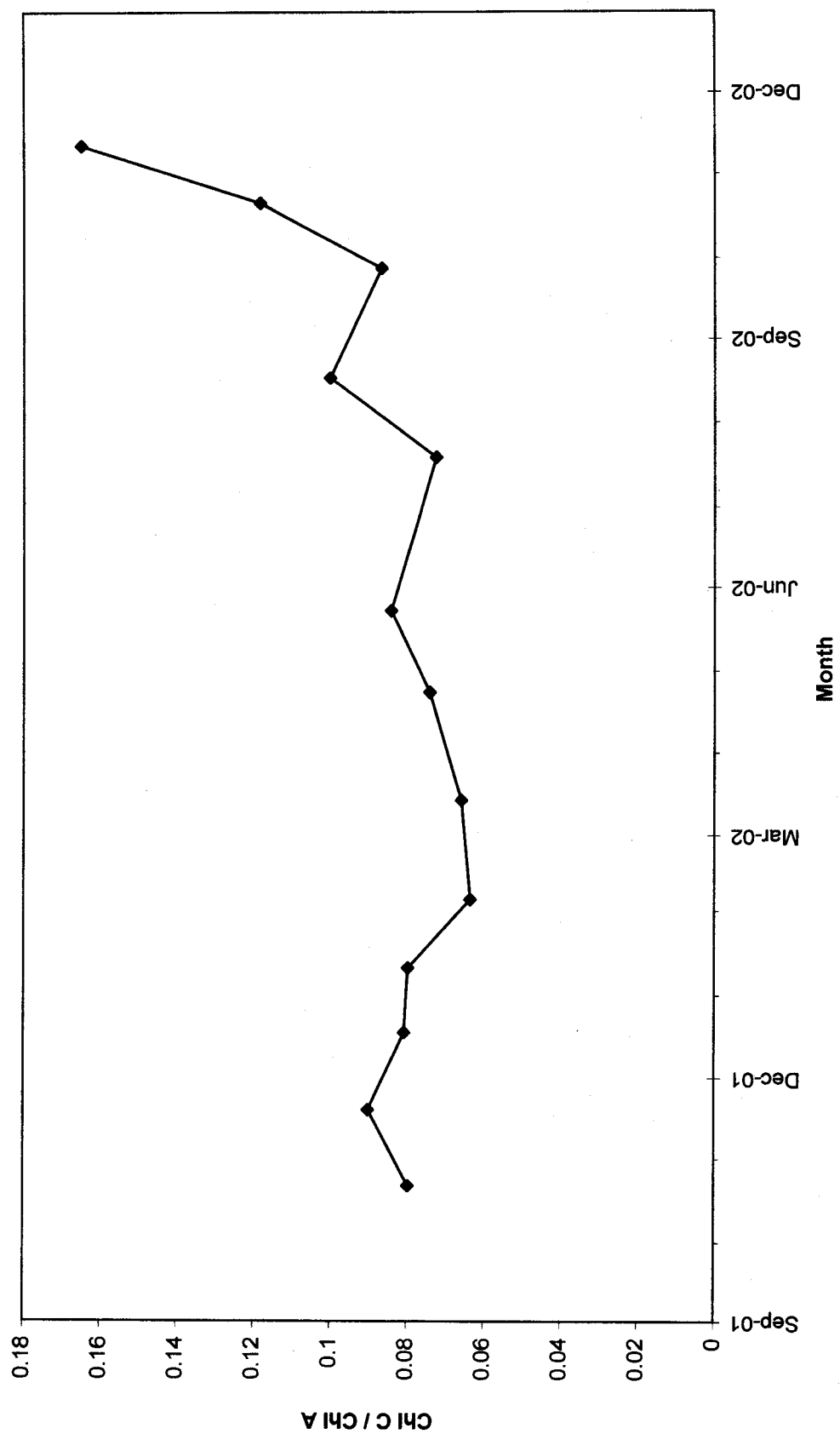


Figure 21. Time course of average chlorophyll c/ chlorophyll a ratio at stations 17, 18, 19, and 20 near the mouths of Mowry, Military, Princeton and Black Creek Canals.

Stations 17, 18, 19, 20

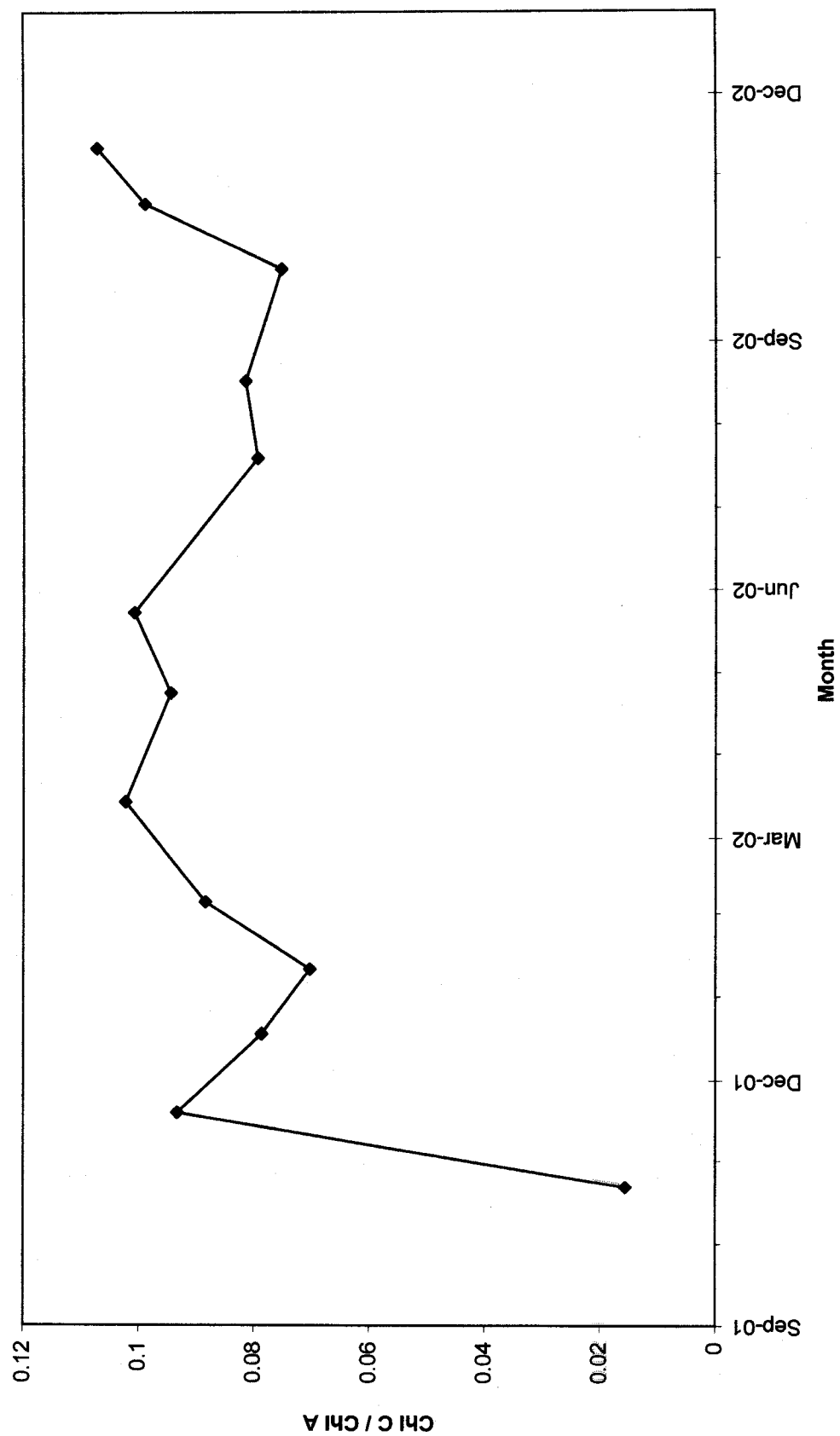


Figure 22. Time course of average chlorophyll c/ chlorophyll a ratio at stations 21, 22, and 23 near the mouths of Cutler, Snapper Creek, and Coral Gables Canals.

Stations 21, 22, 23

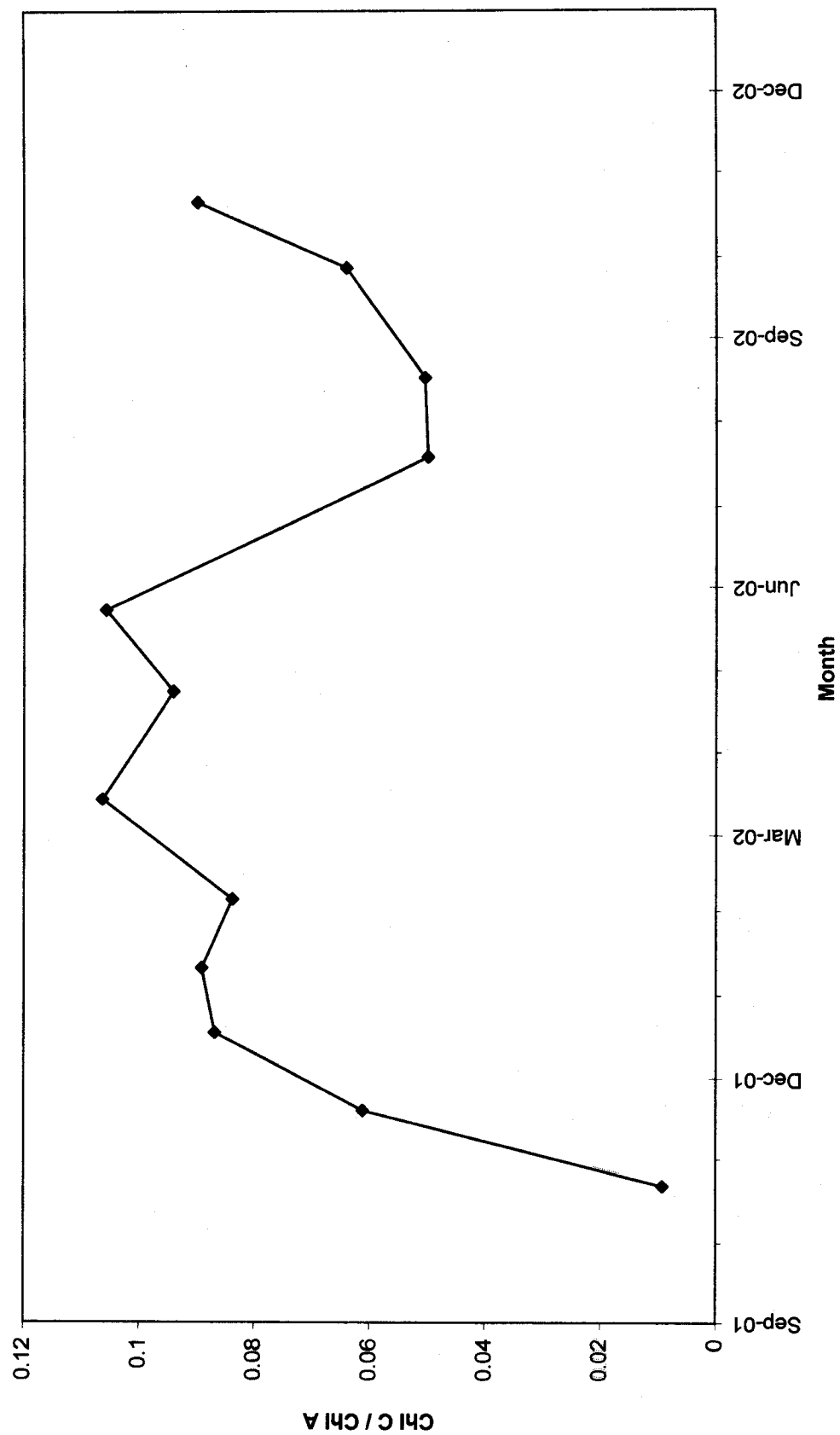


Figure 23. Time course of chlorophyll c/ chlorophyll a ratio at station 24 near Key Biscayne.

Station 24

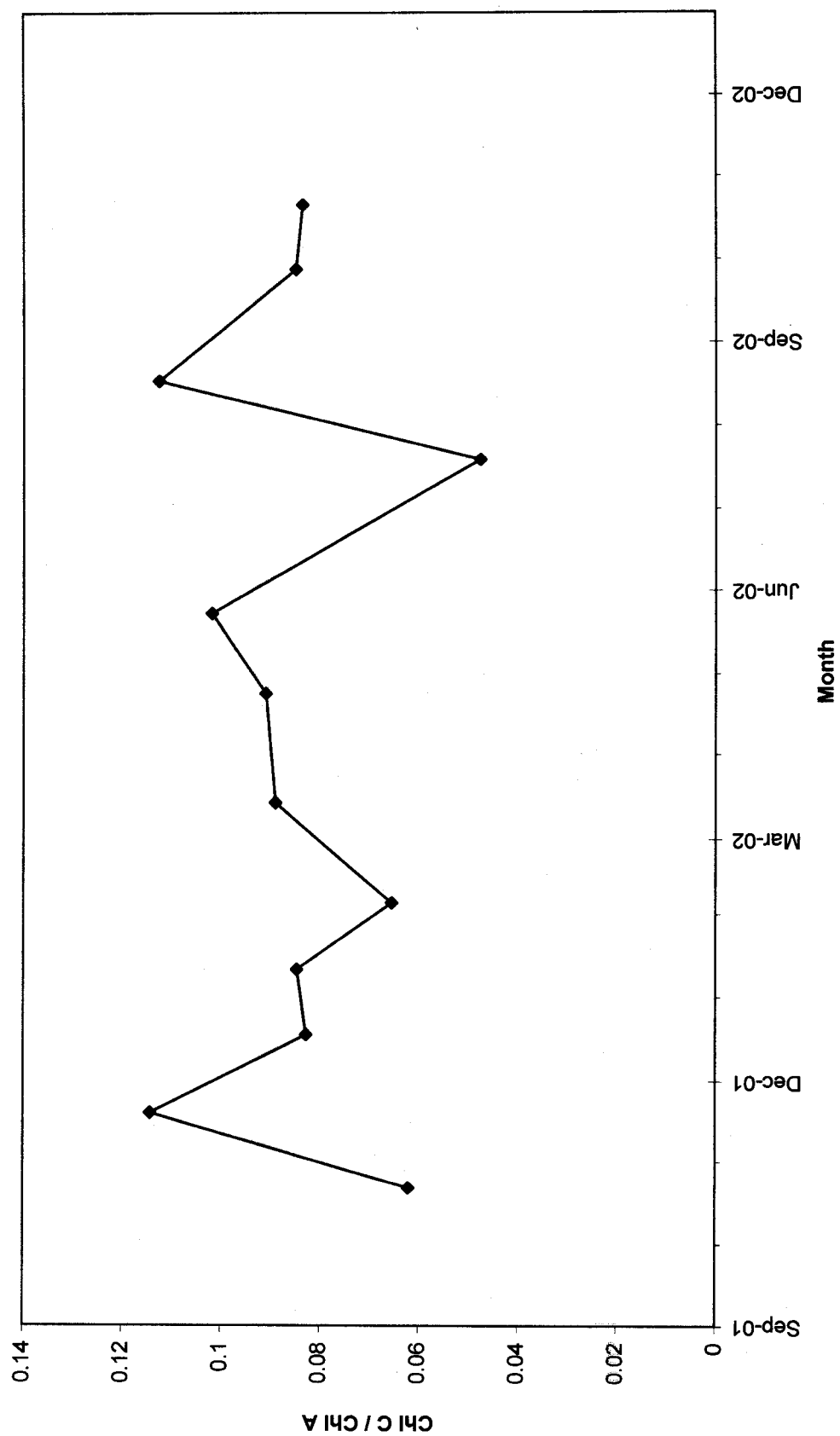


Figure 24. Time course of average chlorophyll c/ chlorophyll a ratio at stations 25, 26, and 27 in central south Biscayne Bay.

Stations 25, 26, 27

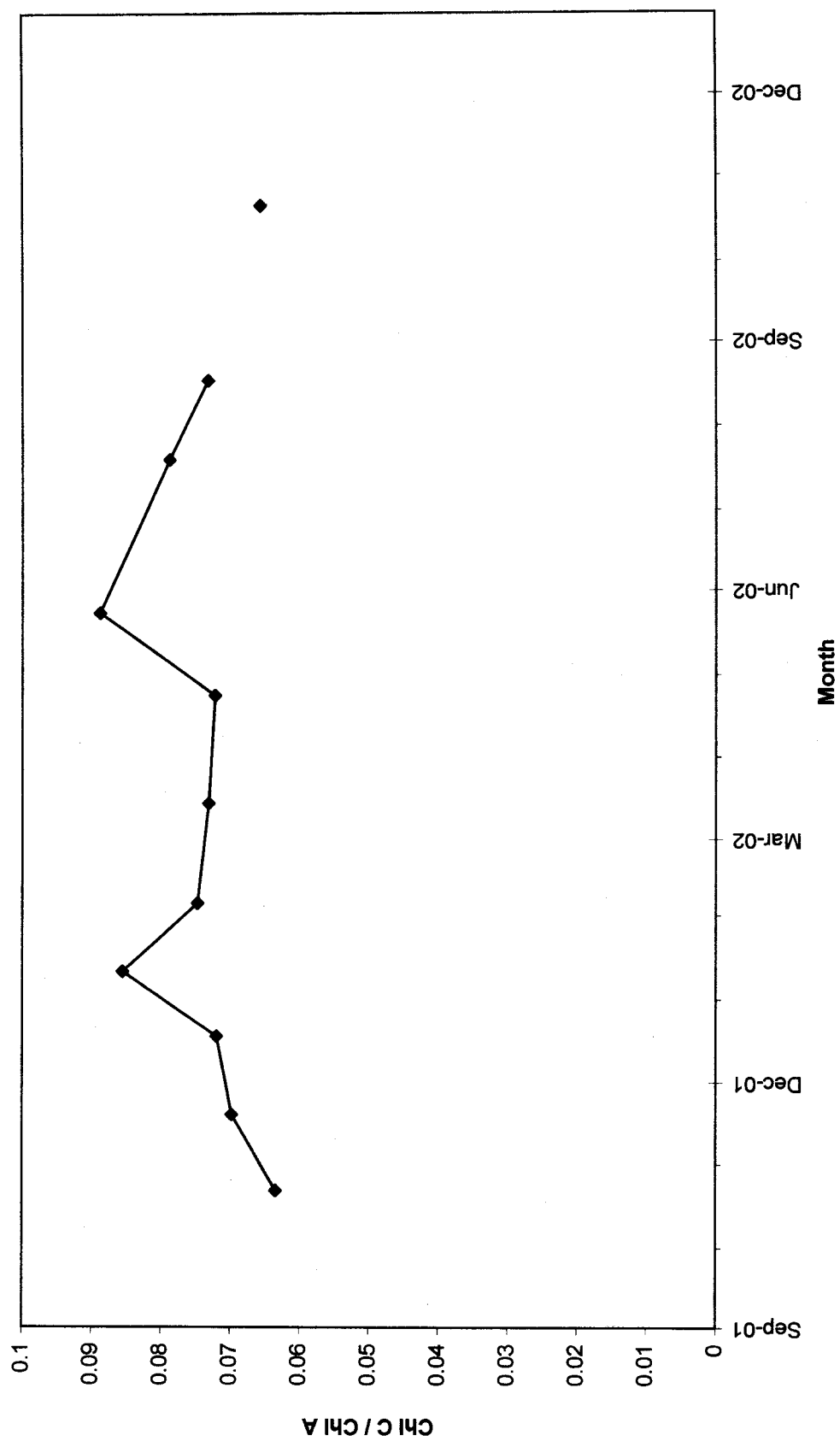


Figure 25. Time course of average chlorophyll c/ chlorophyll a ratio at stations 5, 6, and 8 offshore east of Elliot Key and Key Largo.

Stations 5, 6, 8

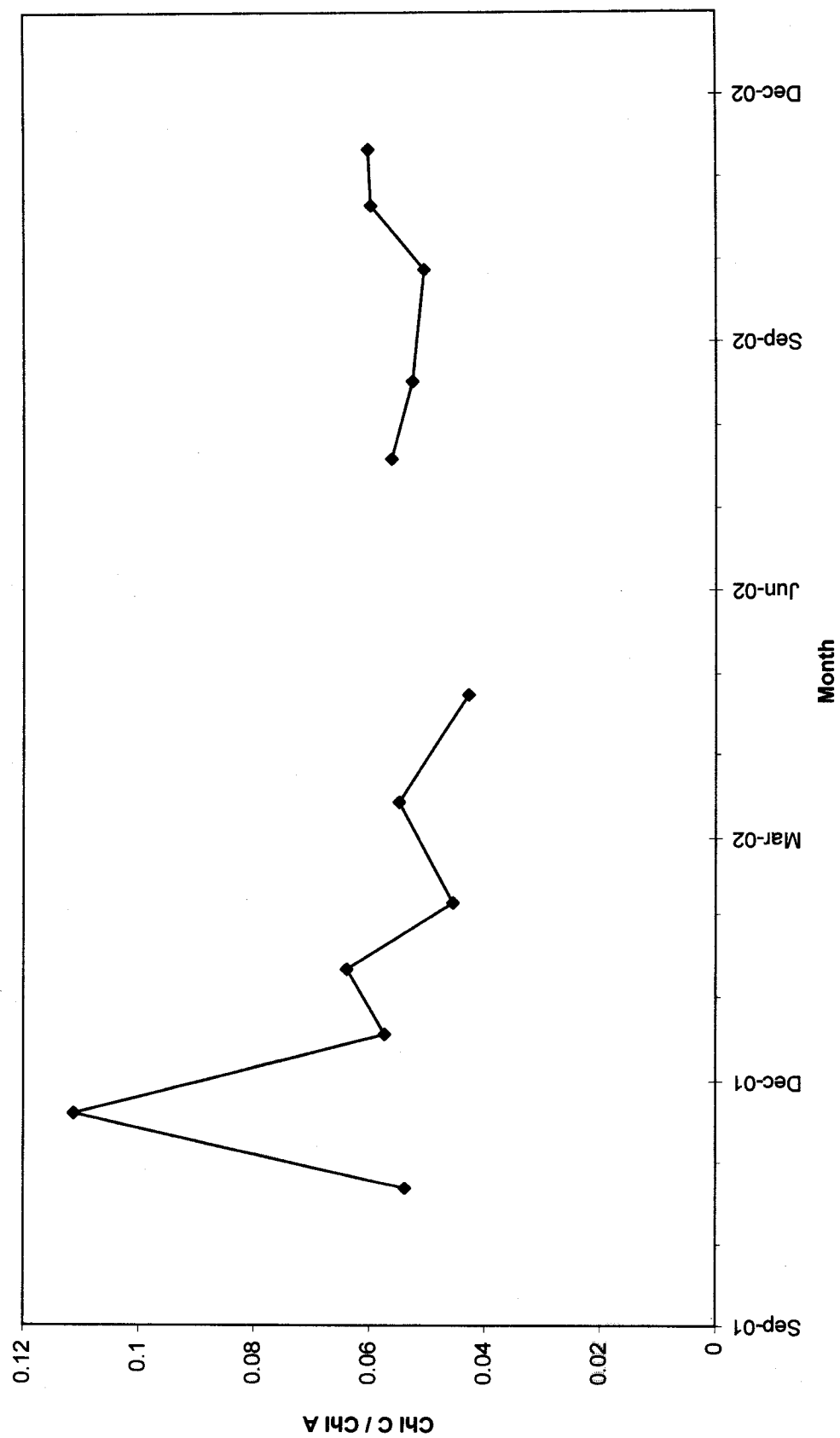


Figure 26. Average chlorophyll b/ chlorophyll a ratio in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

Legend

Chl B / Chl A

- < 0.001
- 0.001 - 0.002
- 0.002 - 0.004
- 0.004 - 0.008
- 0.008 - 0.016
- > 0.016

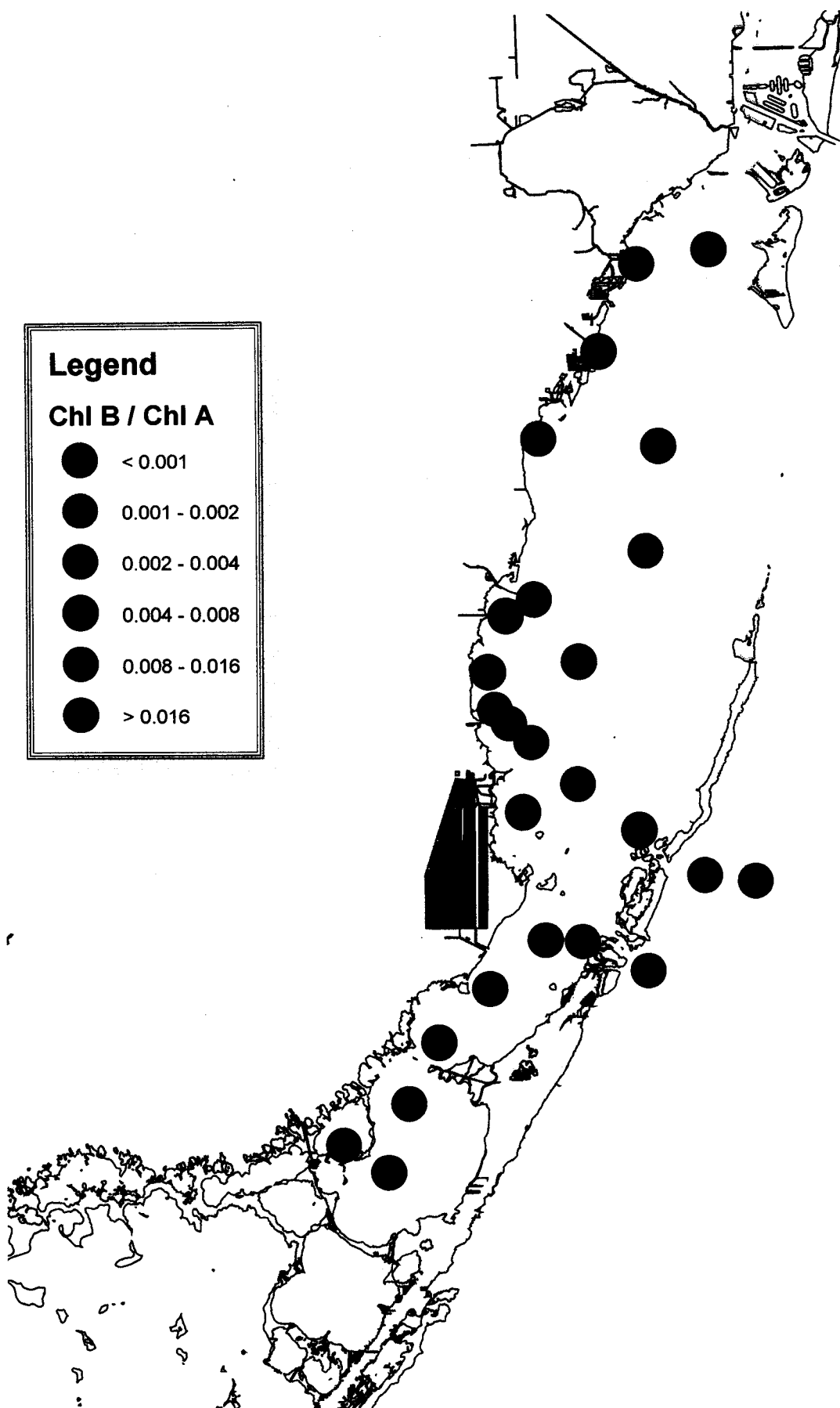


Figure 27. Overall relationship between chlorophyll b/ chlorophyll a ratio and phytoplankton abundance (as chlorophyll a) in south Biscayne Bay.

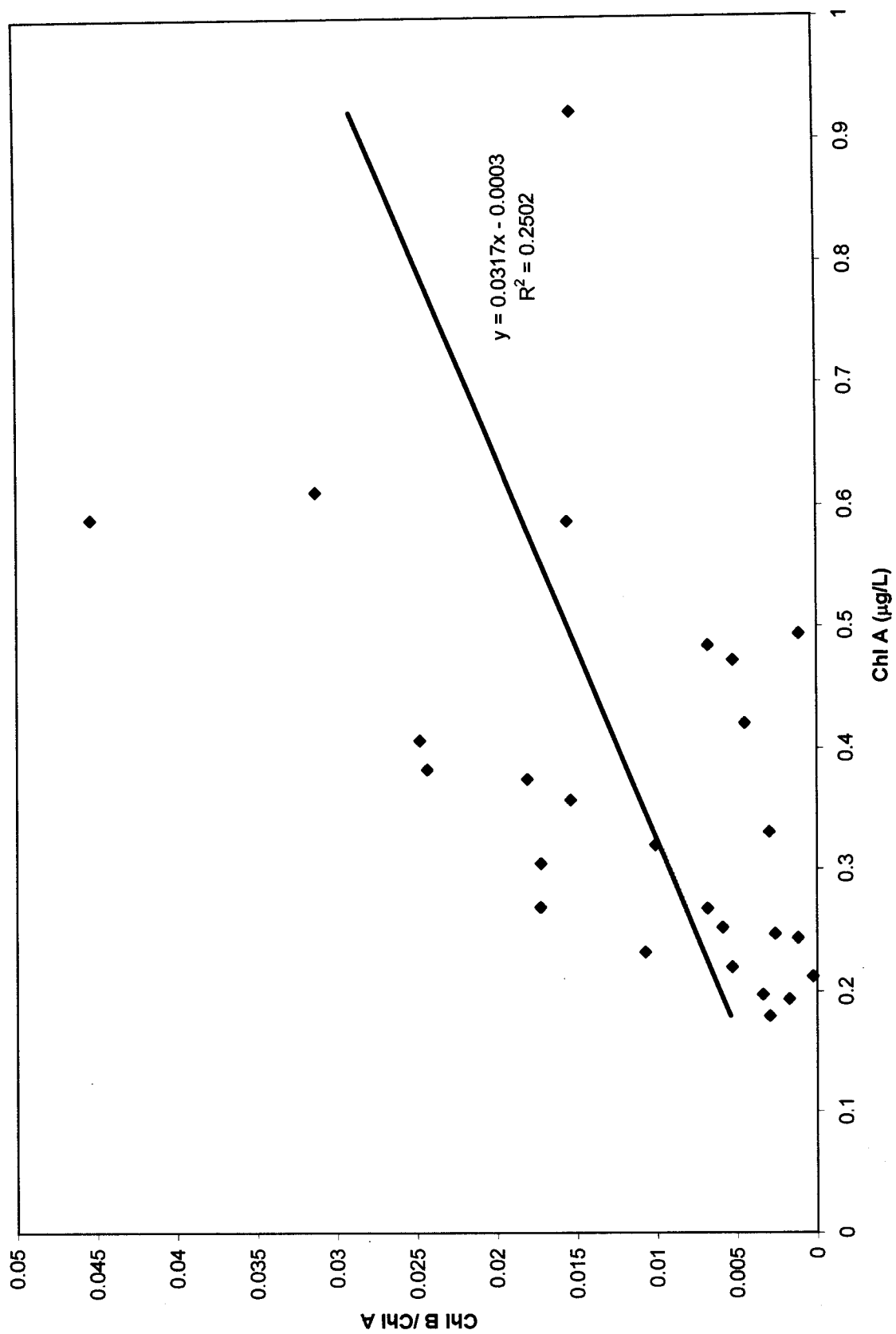


Figure 28. Overall relationship between chlorophyll b/ chlorophyll a ratio and salinity in south Biscayne Bay.

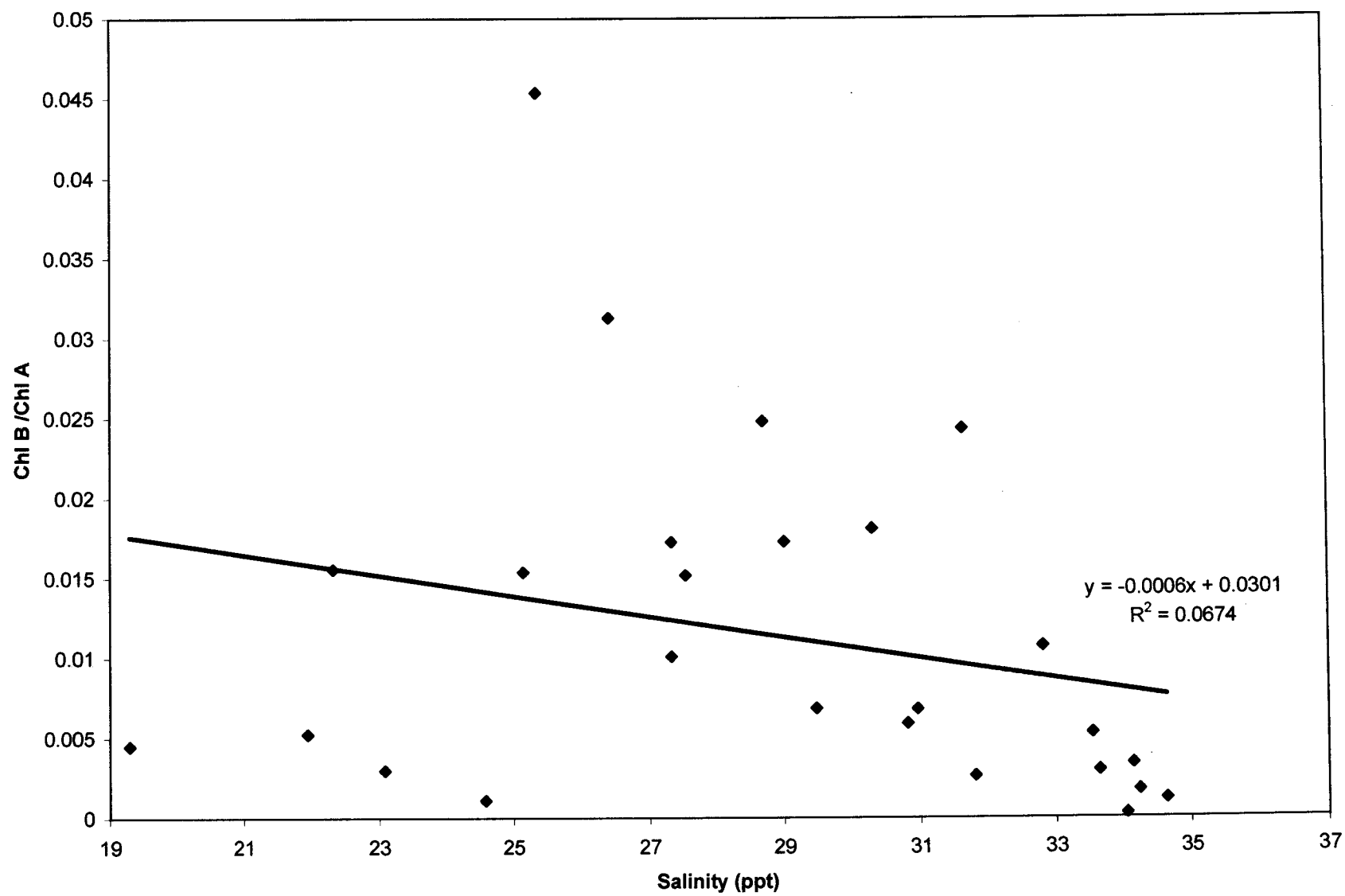


Figure 29. Time course of chlorophyll b/ chlorophyll a ratio at station 15 near mouth of Aerojet Canal.

Station 15

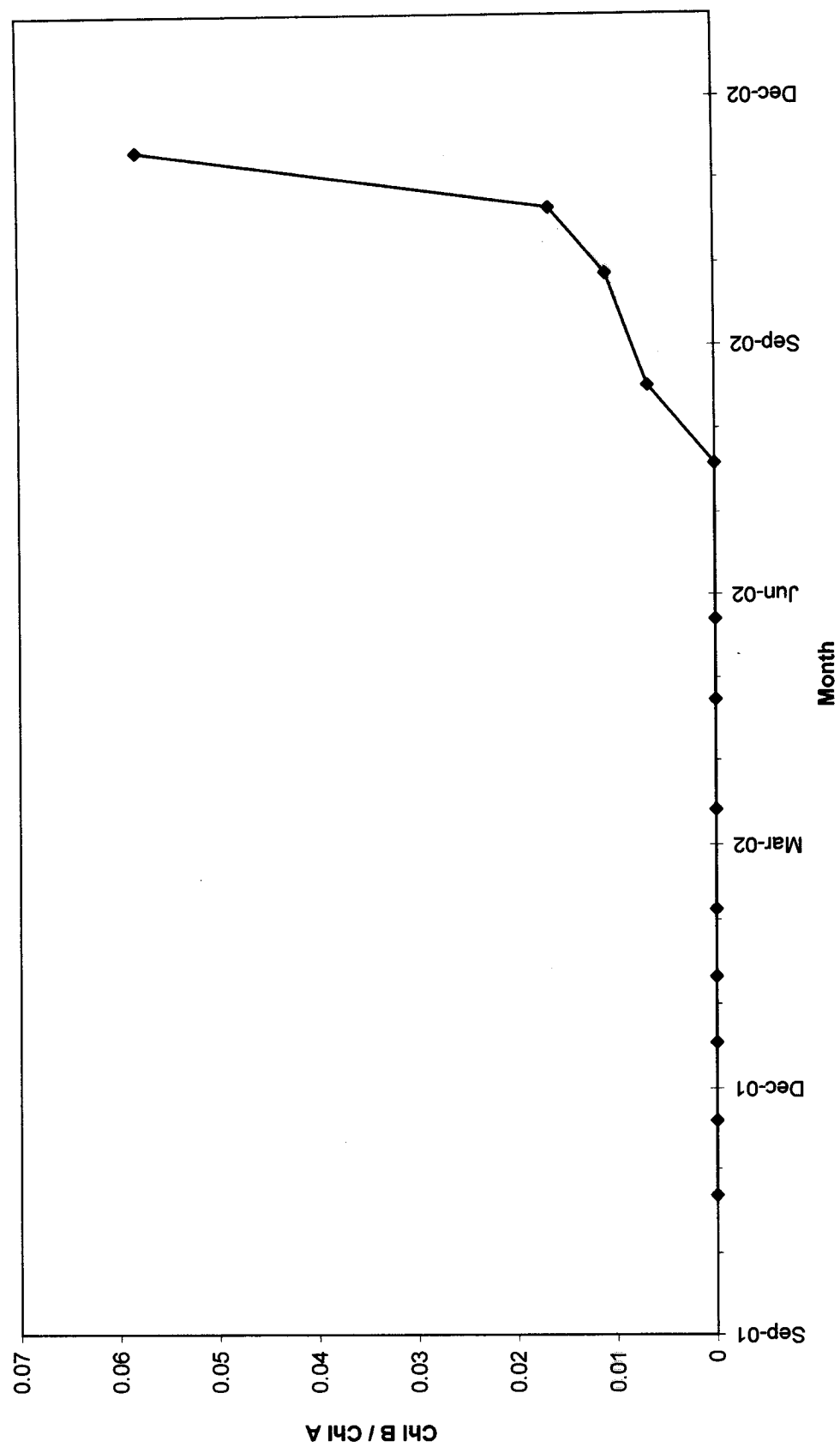


Figure 13

Figure 30. Time course of average chlorophyll b/ chlorophyll a ratio at stations 13 and 14 in Barnes Sound.

Stations 13, 14

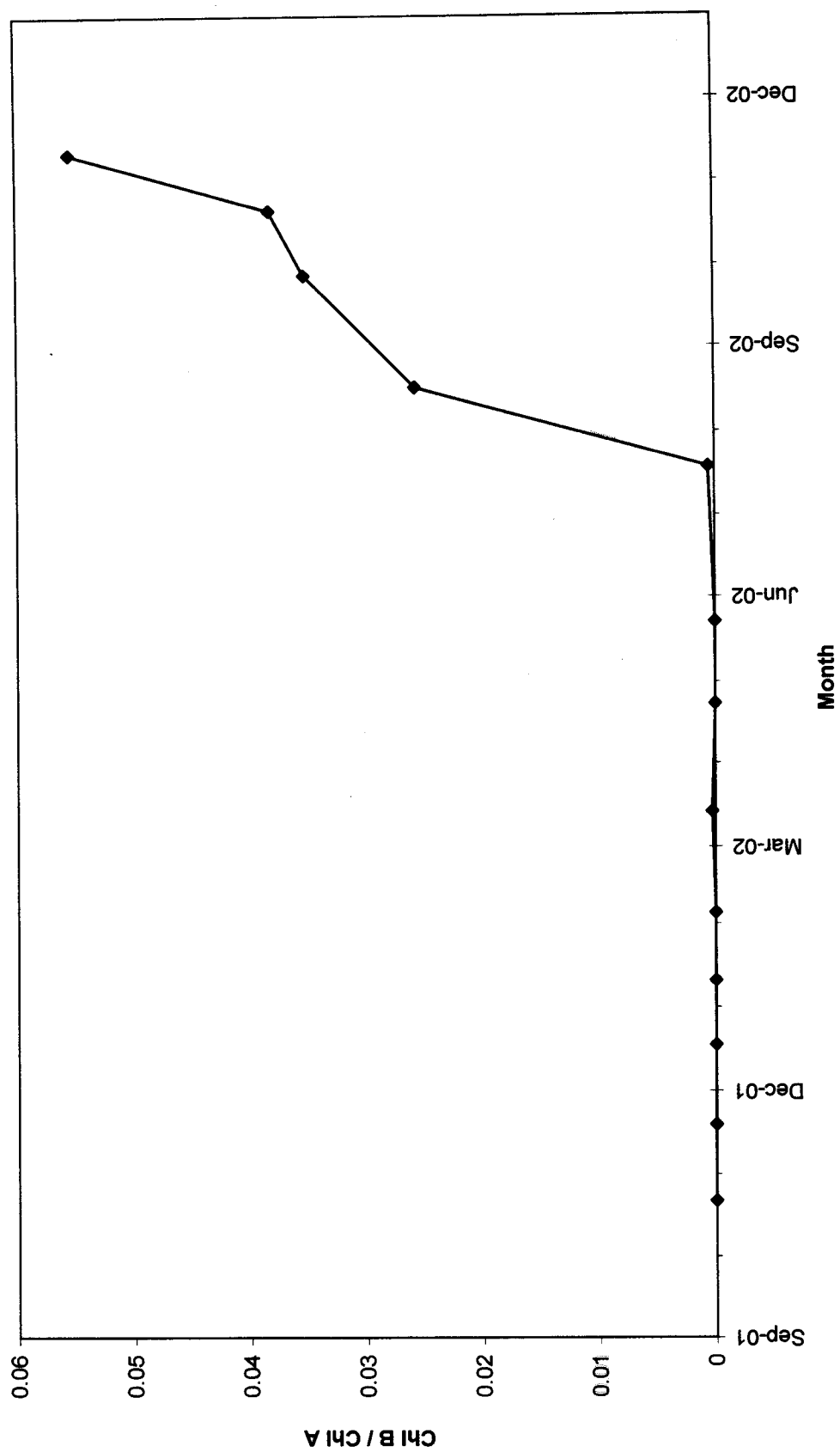


Figure 31. Time course of average chlorophyll b/ chlorophyll a ratio at stations 10, 11, and 12 in Card Sound.

Stations 10, 11, 12

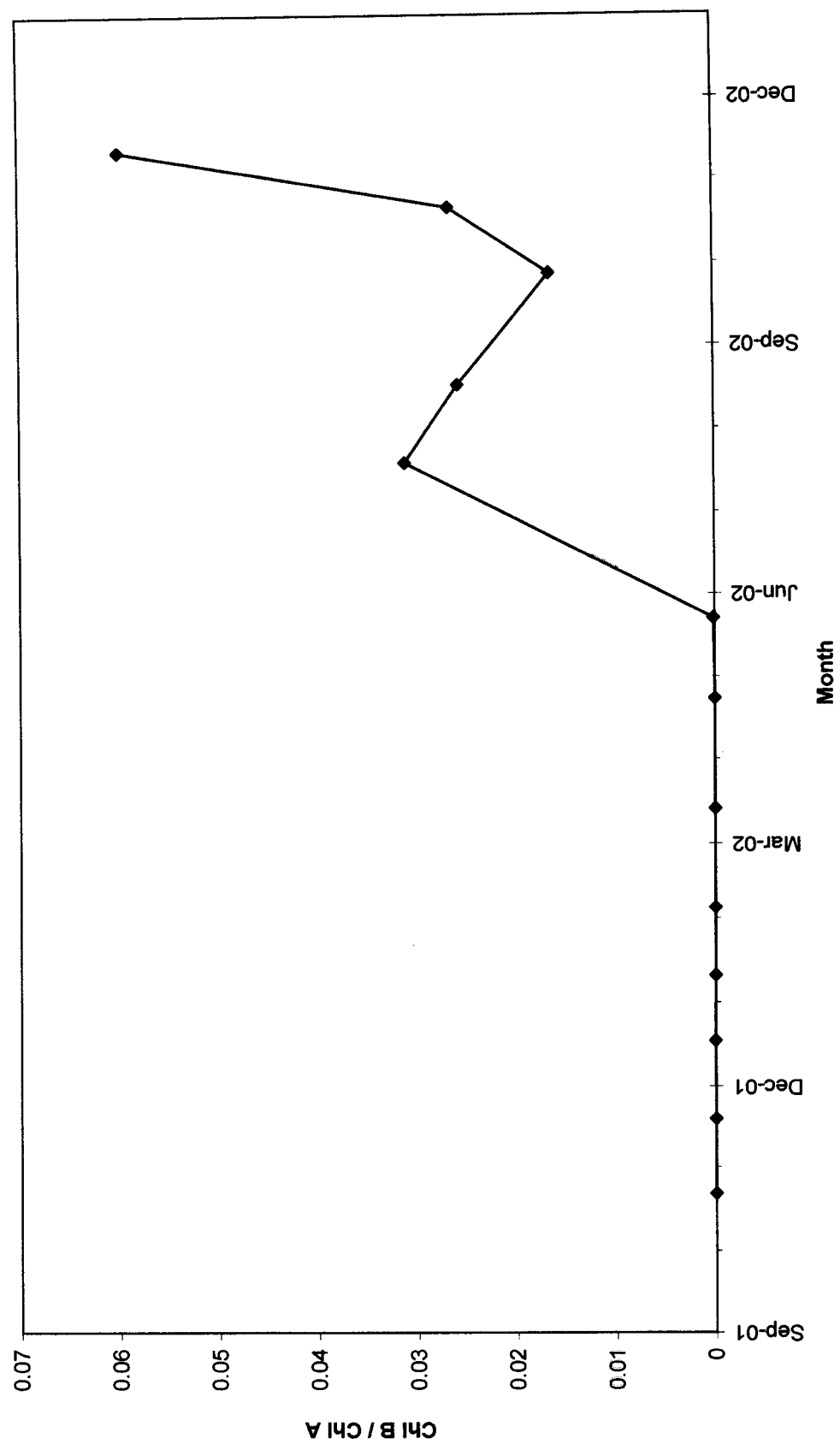


Figure 32. Time course of average chlorophyll b/ chlorophyll a ratio at stations 17, 18, 19, and 20 near the mouths of Mowry, Military, Princeton and Black Creek Canals.

Stations 17, 18, 19, 20

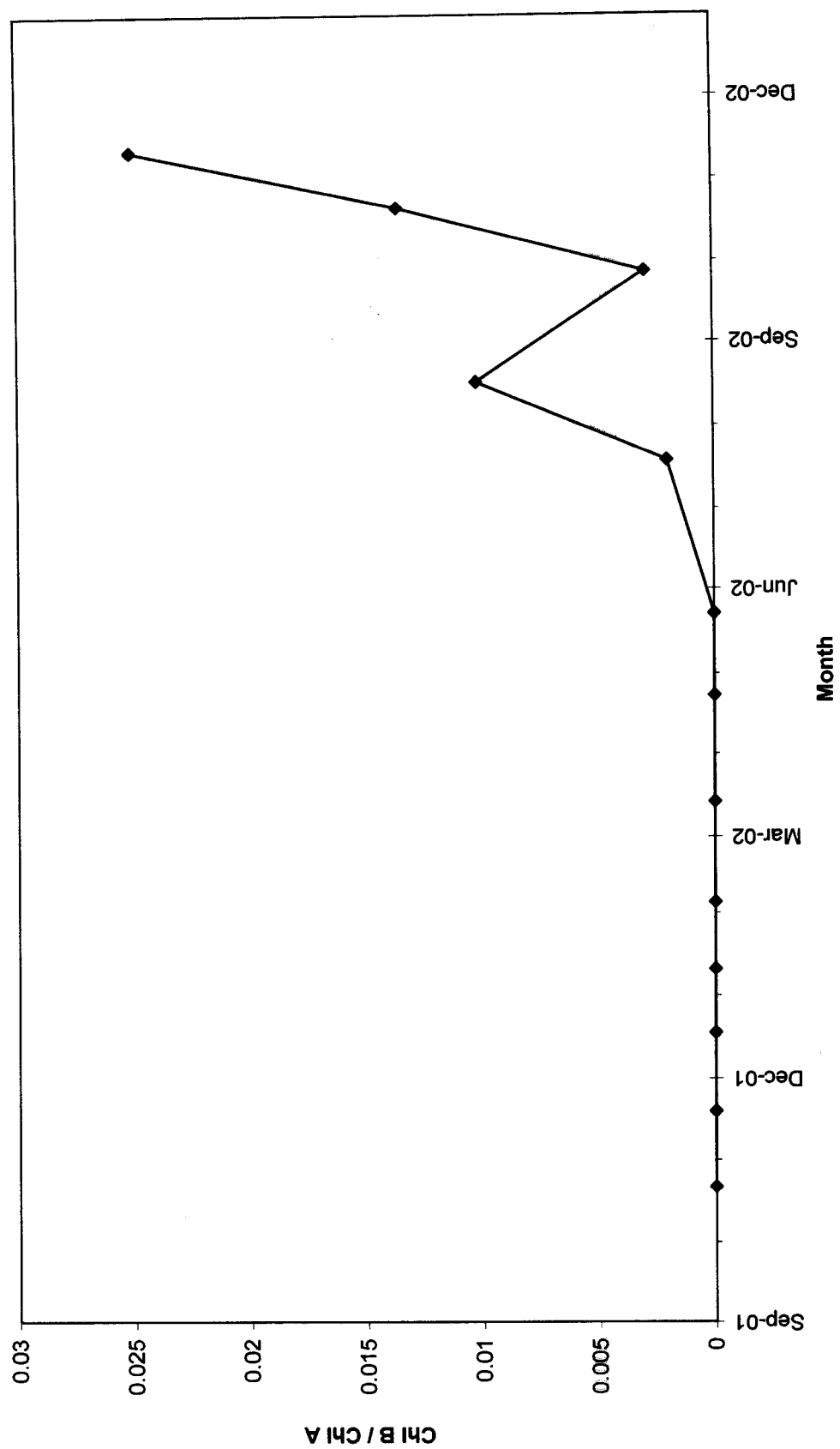


Figure 33. Time course of average chlorophyll b/ chlorophyll a ratio at stations 21, 22, and 23 near the mouths of Cutler, Snapper Creek, and Coral Gables Canals.

Stations 21, 22, 23

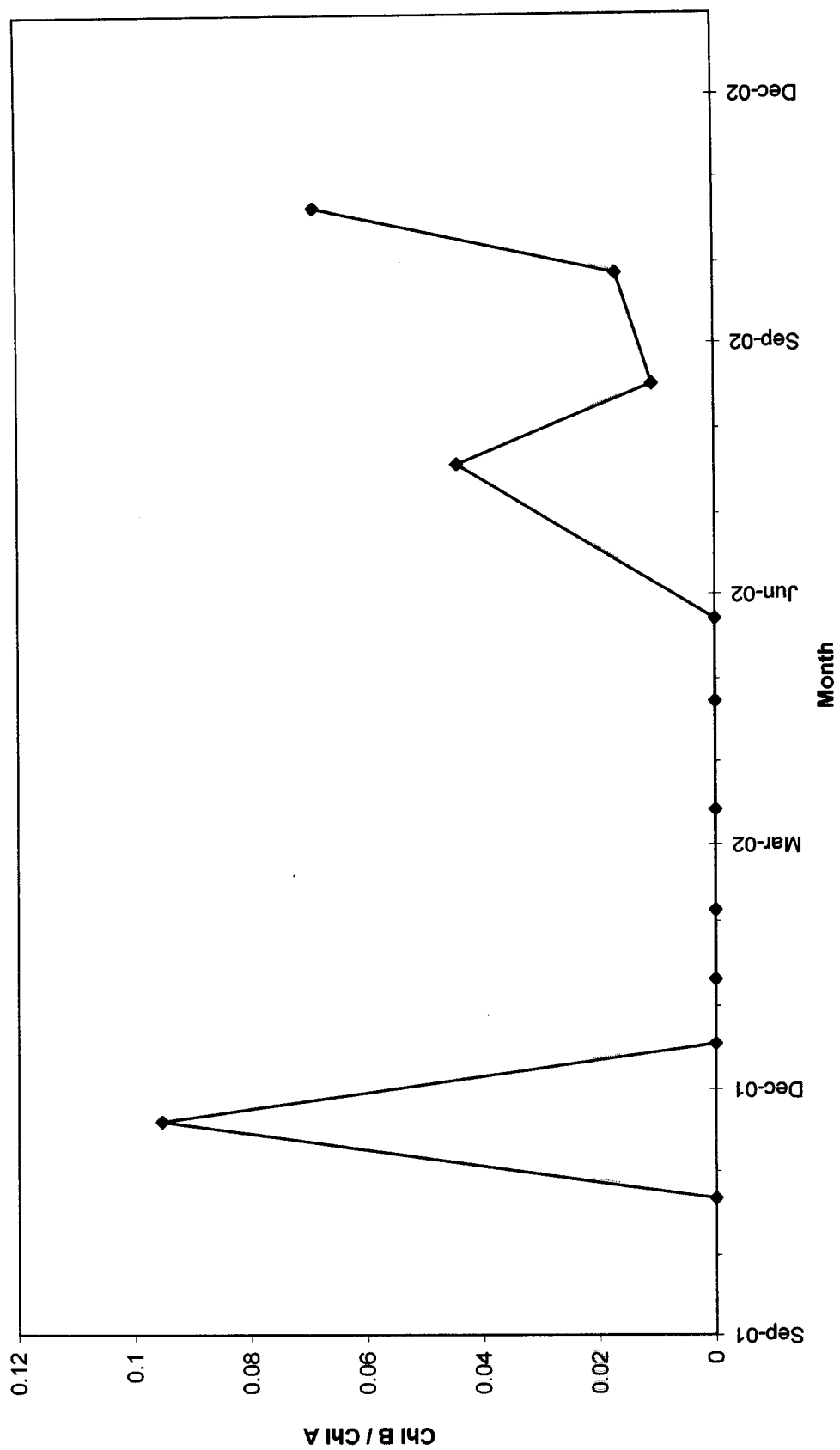


Figure 34. Time course of chlorophyll b/ chlorophyll a ratio at station 24 near Key Biscayne.

Station 24

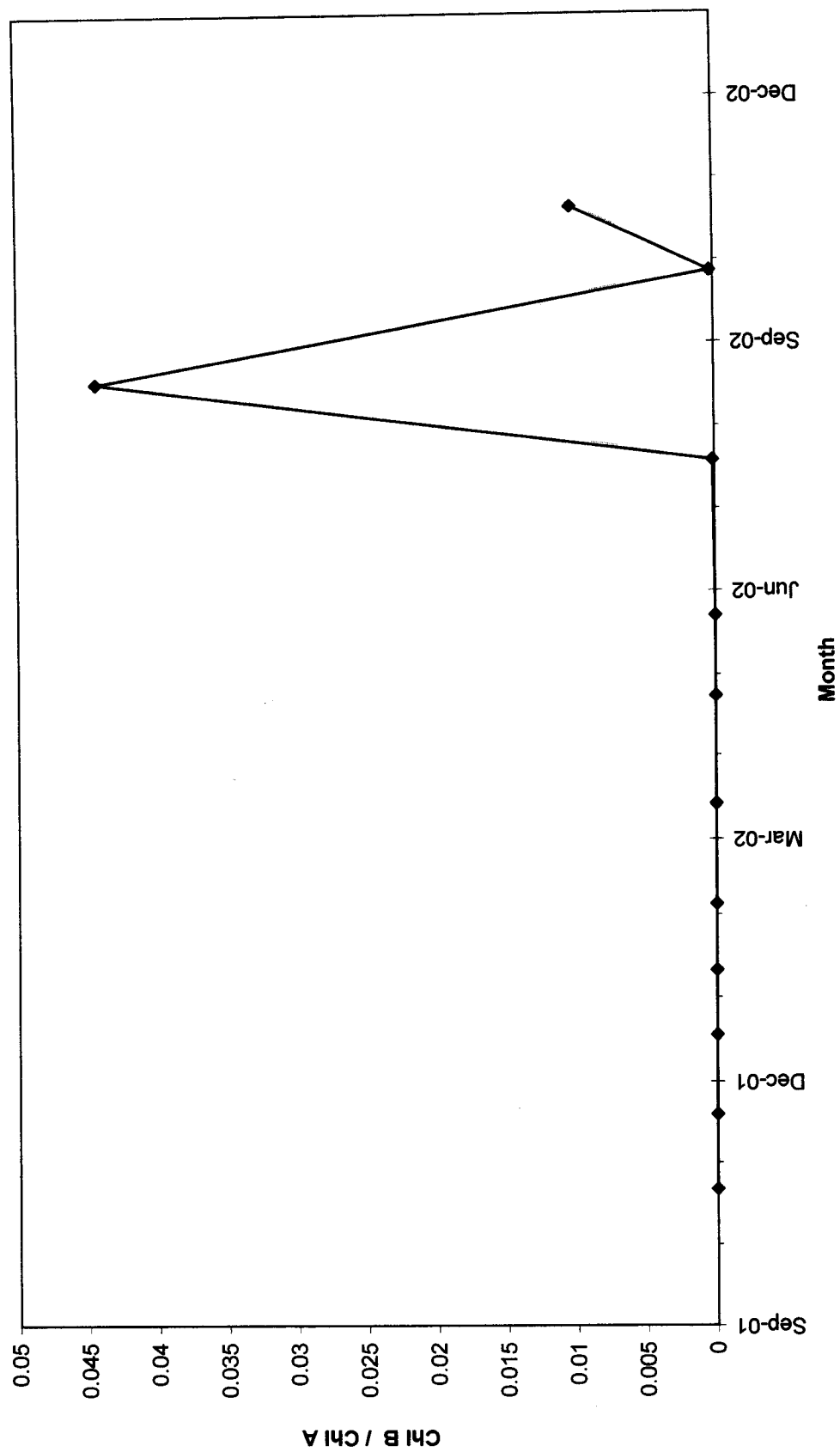


Figure 35. Time course of average chlorophyll b/ chlorophyll a ratio at stations 25, 26, and 27 in central south Biscayne Bay.

Stations 25, 26, 27

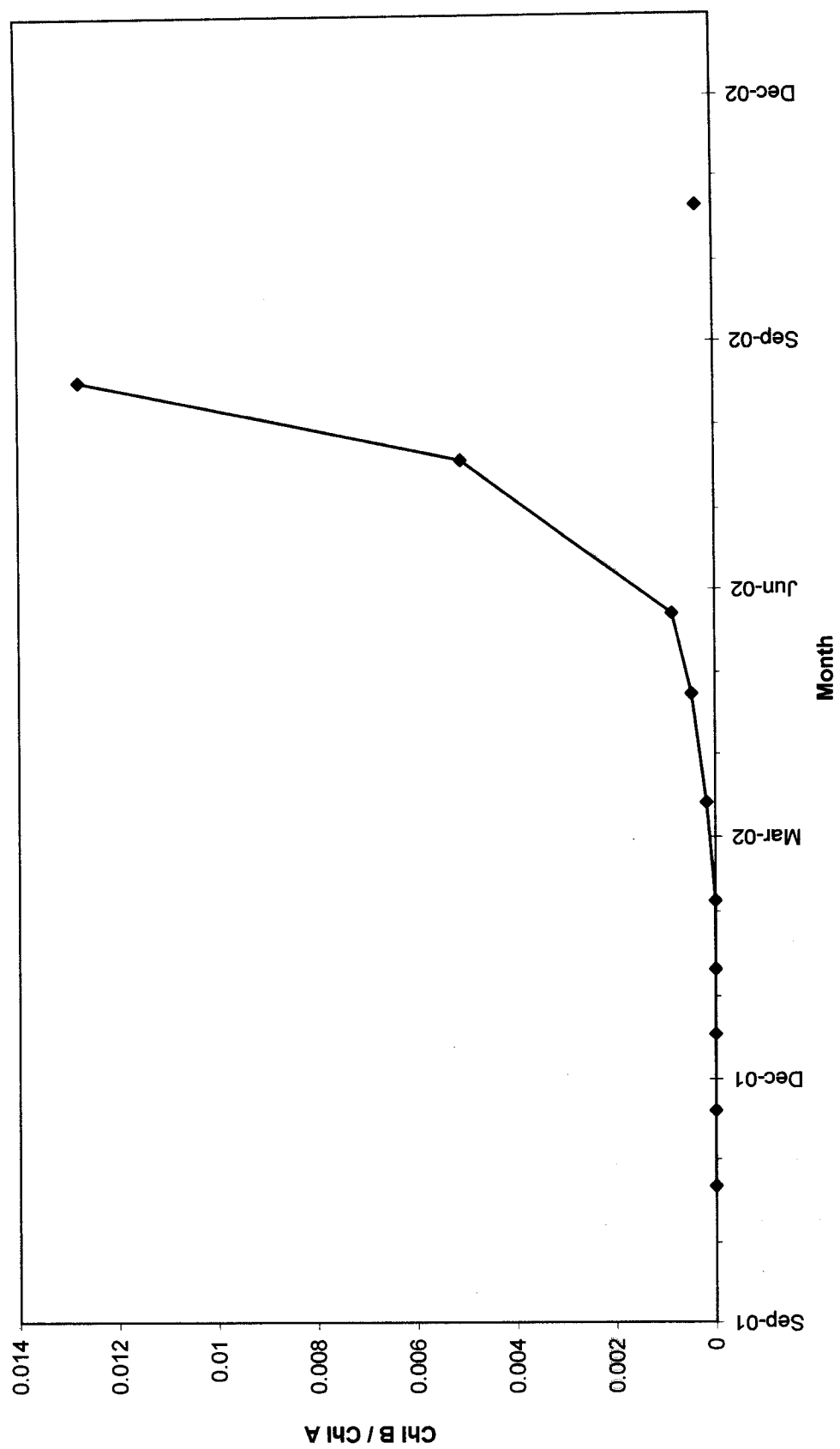


Figure 36. Time course of average chlorophyll b/ chlorophyll a ratio at stations 5, 6, and 8 offshore east of Elliot Key and Key Largo.

Stations 5, 6, 8

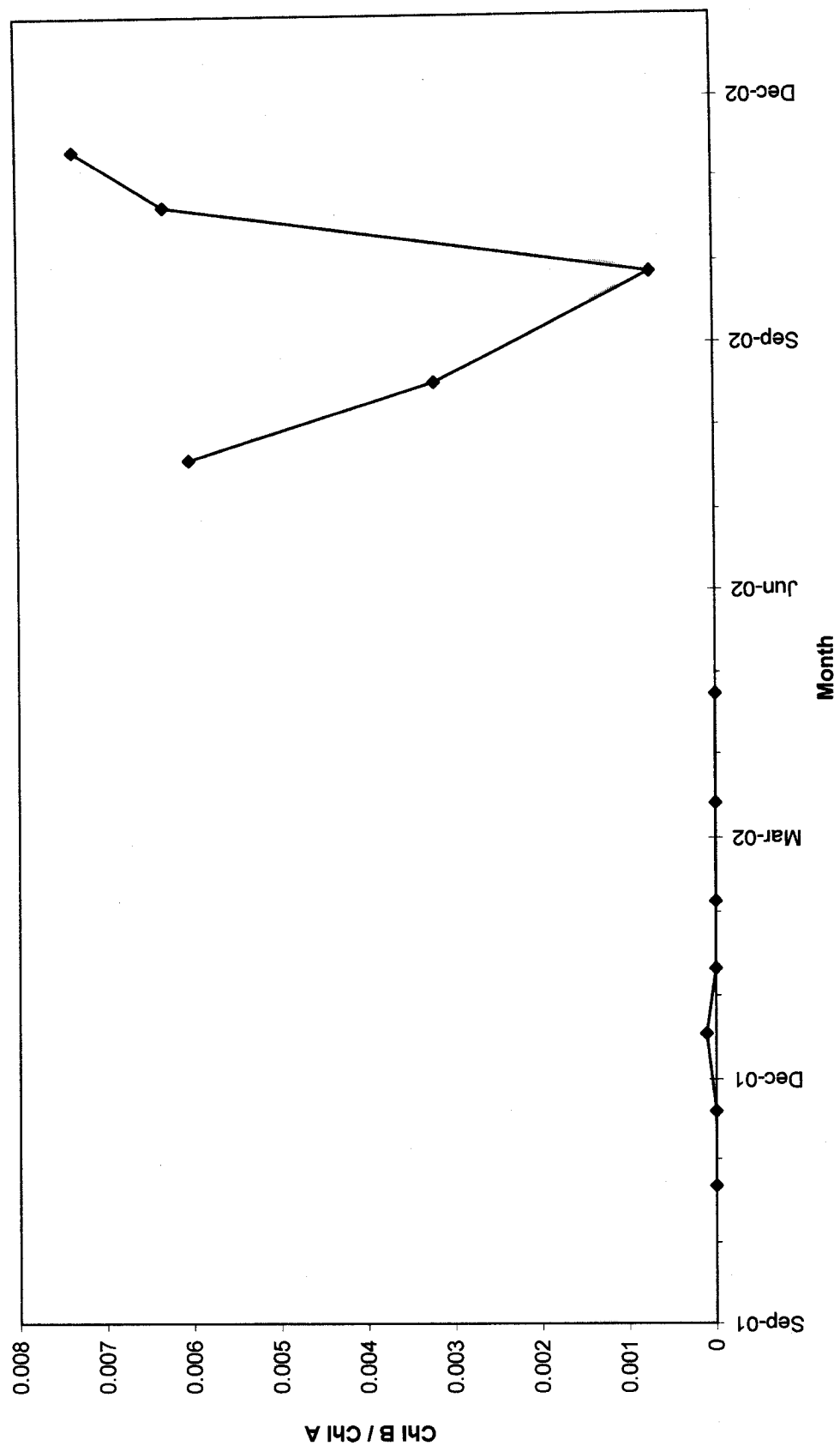


Figure 37. Average phycocyanin/ chlorophyll a ratio in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

Legend

PC / Chl A

- < 0.01
- 0.01 - 0.02
- 0.02 - 0.04
- 0.04 - 0.08
- 0.08 - 0.16
- > 0.16

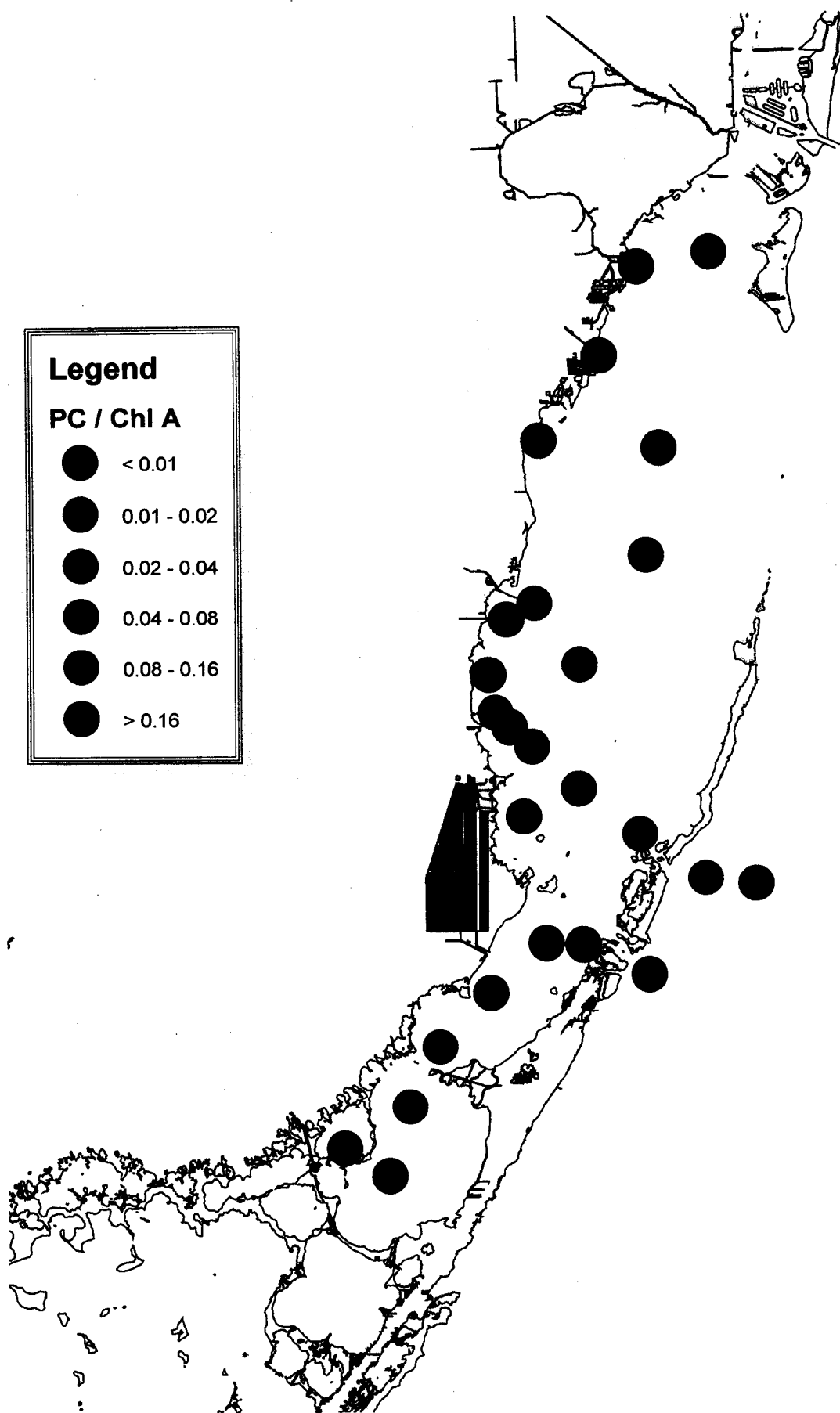


Figure 38. Overall relationship between phycocyanin/ chlorophyll a ratio and phytoplankton abundance (as chlorophyll a) in south Biscayne Bay.

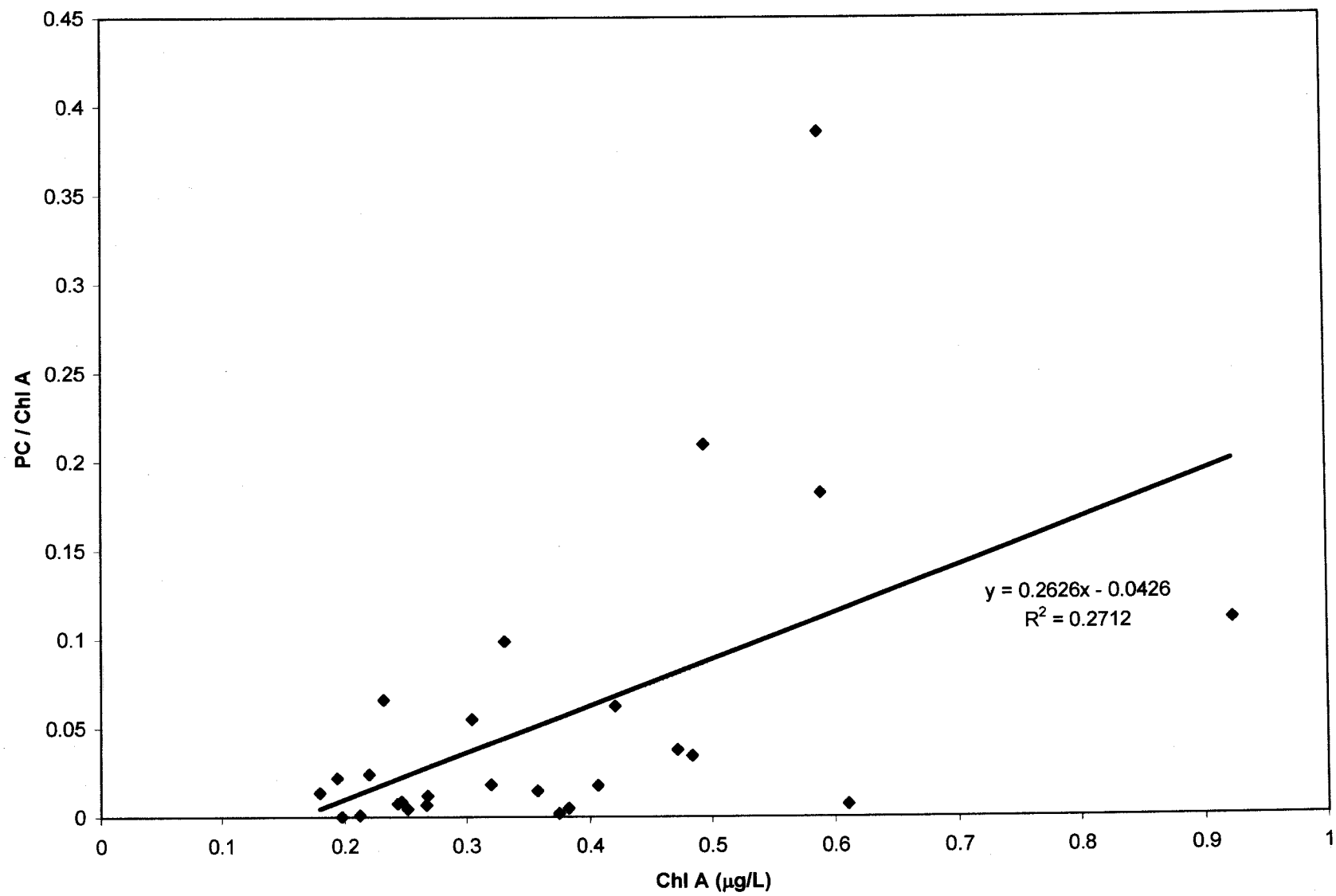


Figure 39. Overall relationship between phycocyanin/ chlorophyll a ratio and salinity in south Biscayne Bay.

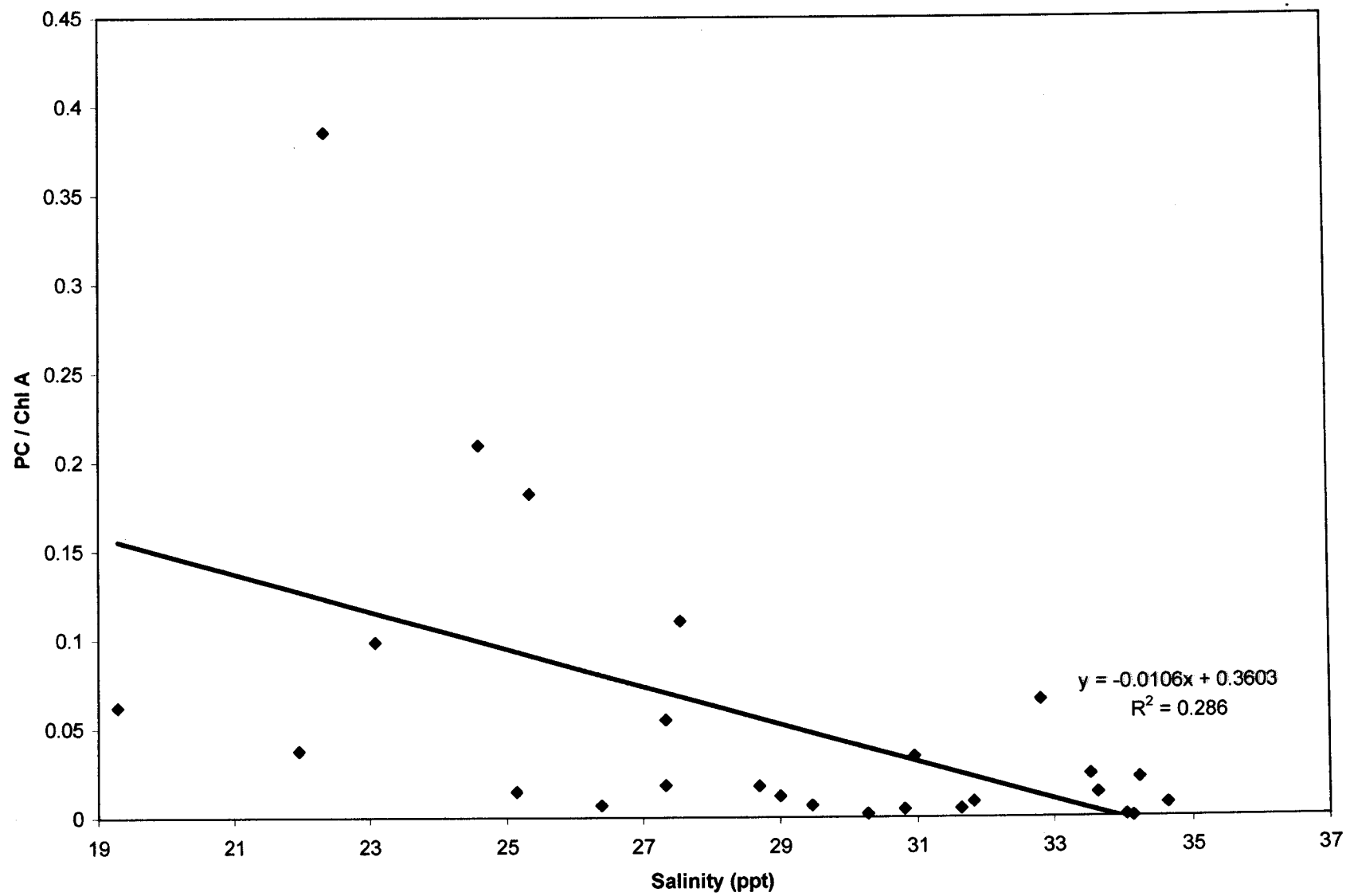


Figure 40. Time course of phycocyanin/ chlorophyll a ratio at station 15 near mouth of Aerojet Canal.

Station 15

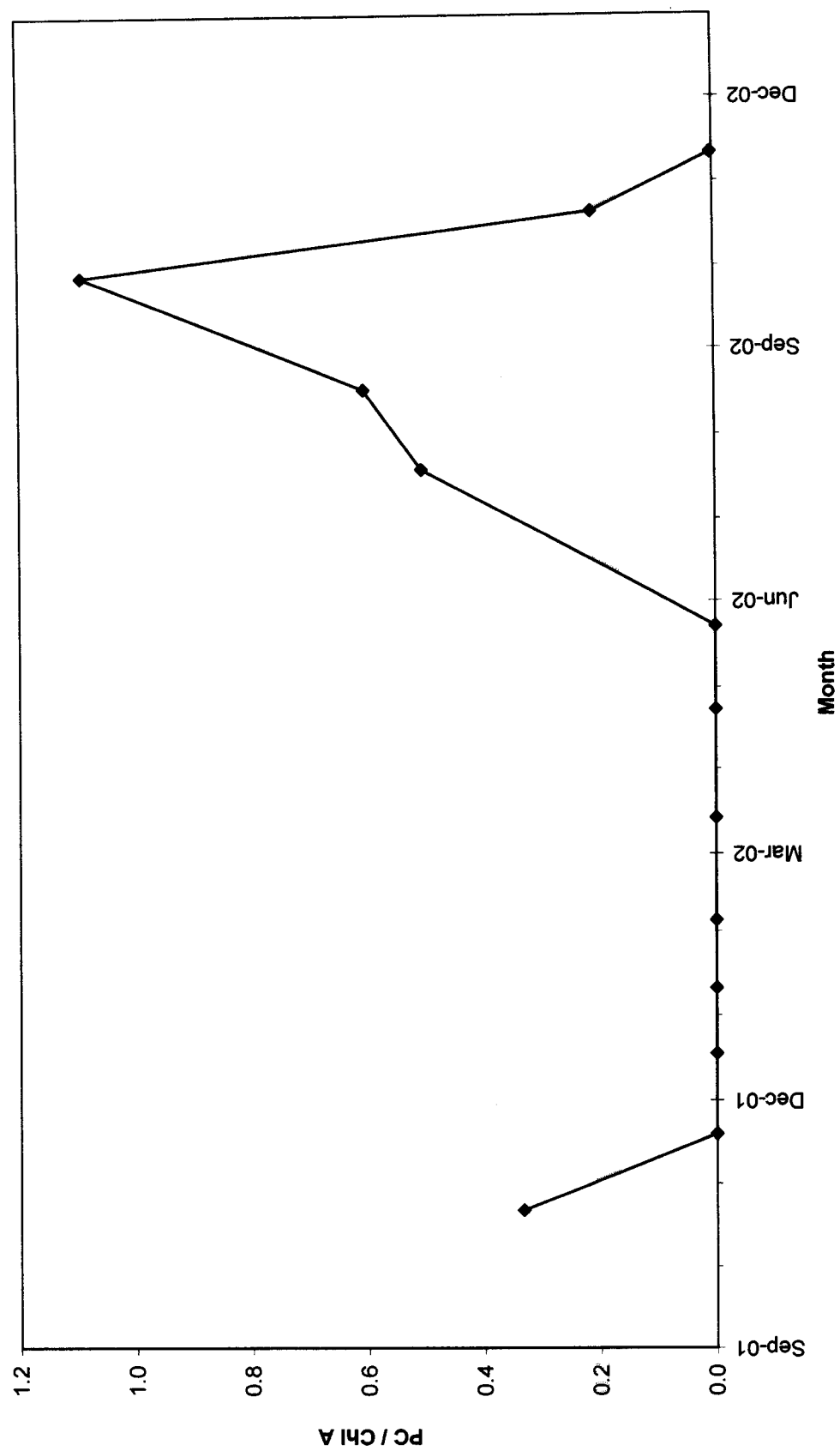


Figure 41. Time course of average phycocyanin/ chlorophyll a ratio at stations 13 and 14 in Barnes Sound.

Stations 13, 14

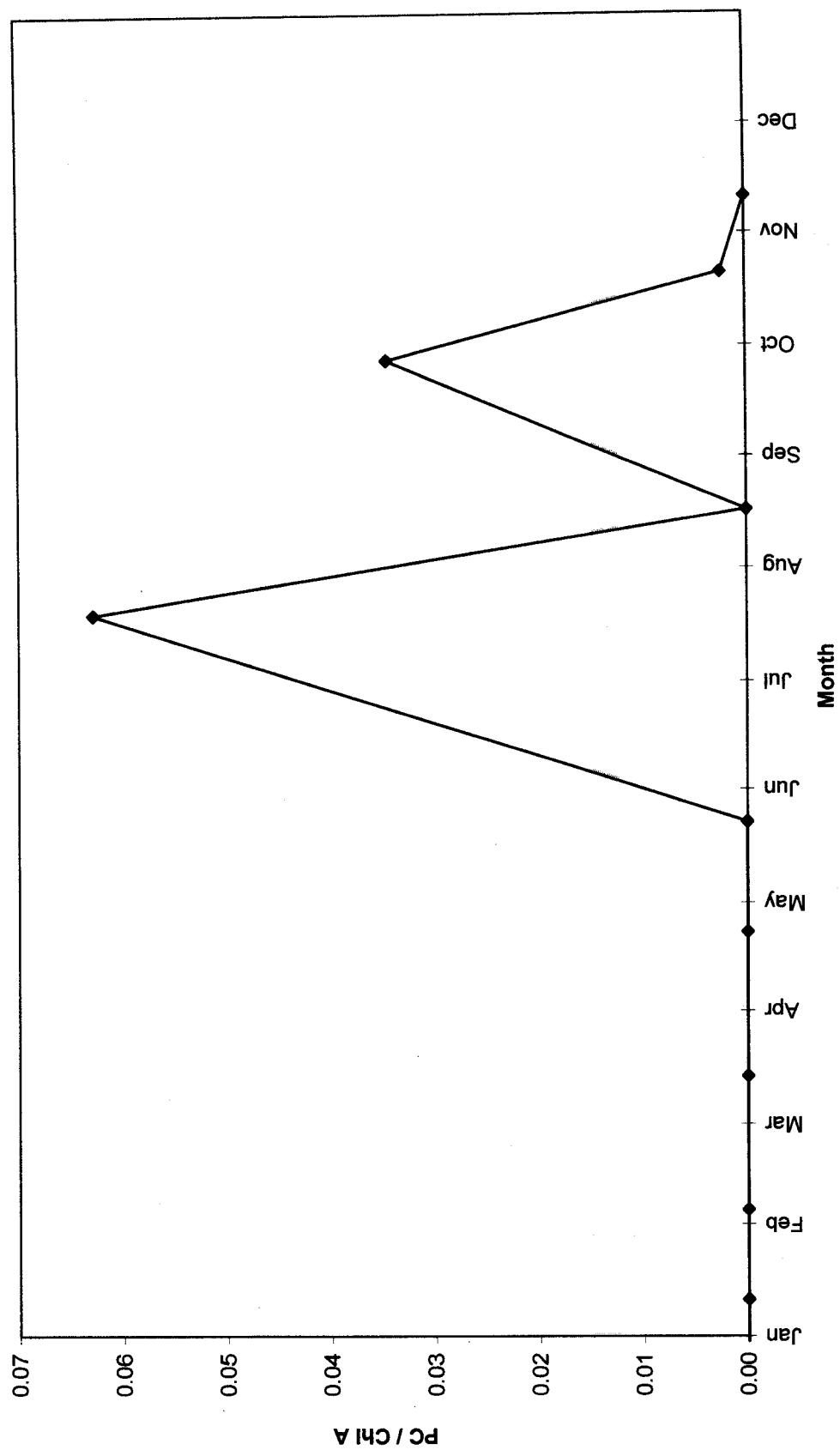


Figure 6

Figure 42. Time course of average phycocyanin/ chlorophyll a ratio at stations 10, 11, and 12 in Card Sound.

Stations 10, 11, 12

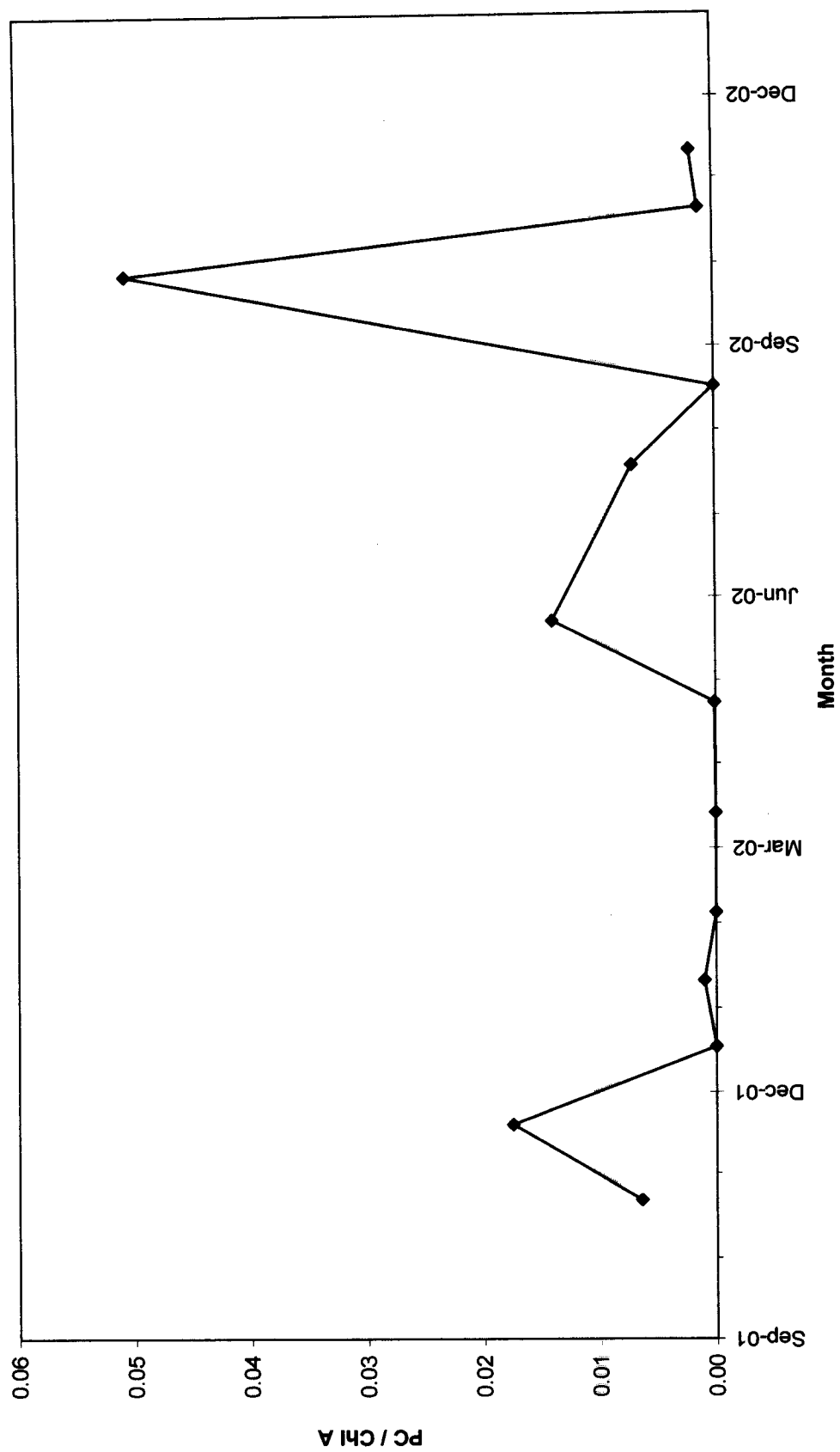


Figure 43. Time course of average phycocyanin/ chlorophyll a ratio at stations 17, 18, 19, and 20 near the mouths of Mowry, Military, Princeton and Black Creek Canals.

Stations 17, 18, 19, 20

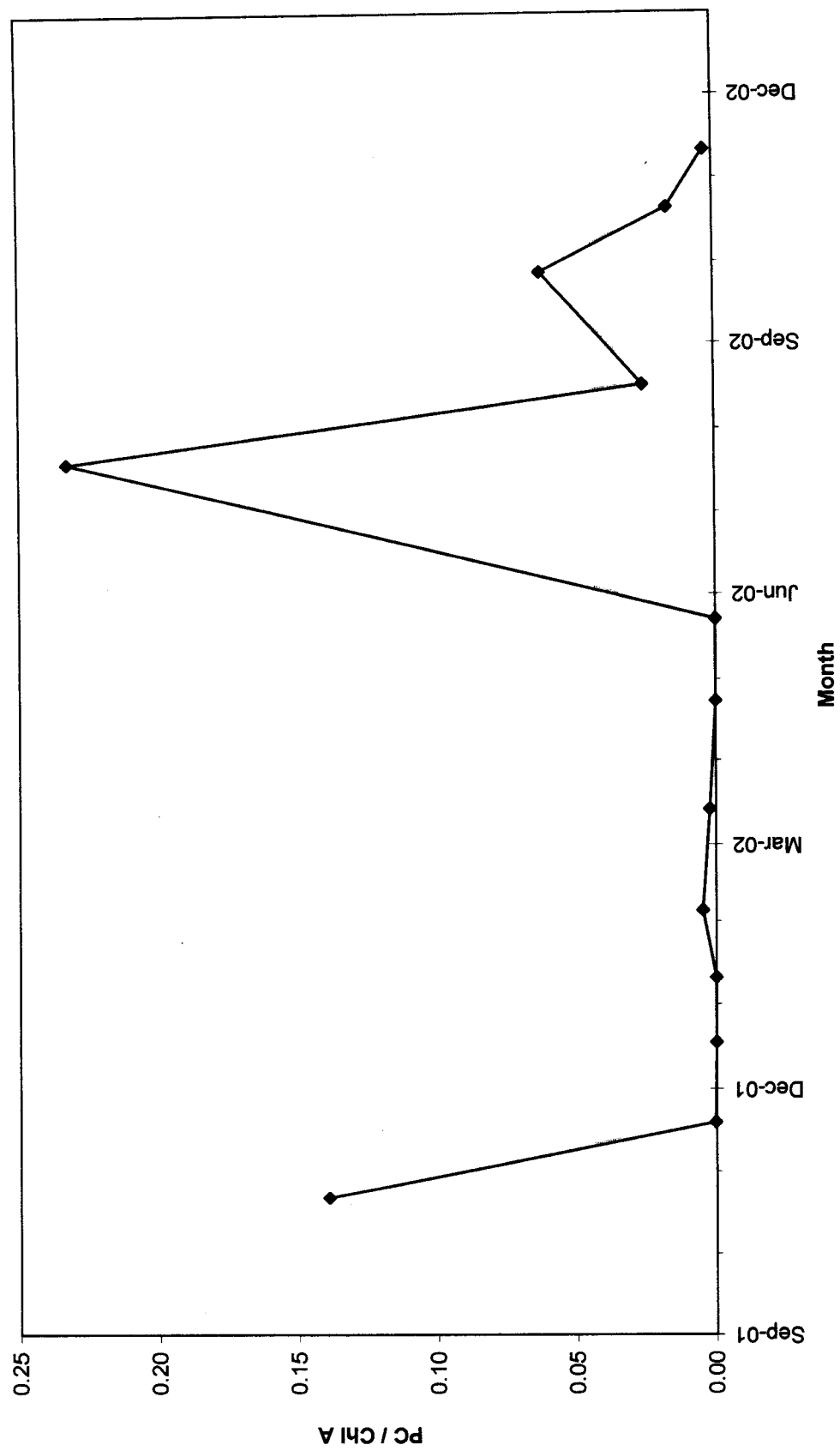


Figure 44. Time course of average phycocyanin/ chlorophyll a ratio at stations 21, 22, and 23 near the mouths of Cutler, Snapper Creek, and Coral Gables Canals.

Stations 21, 22, 23

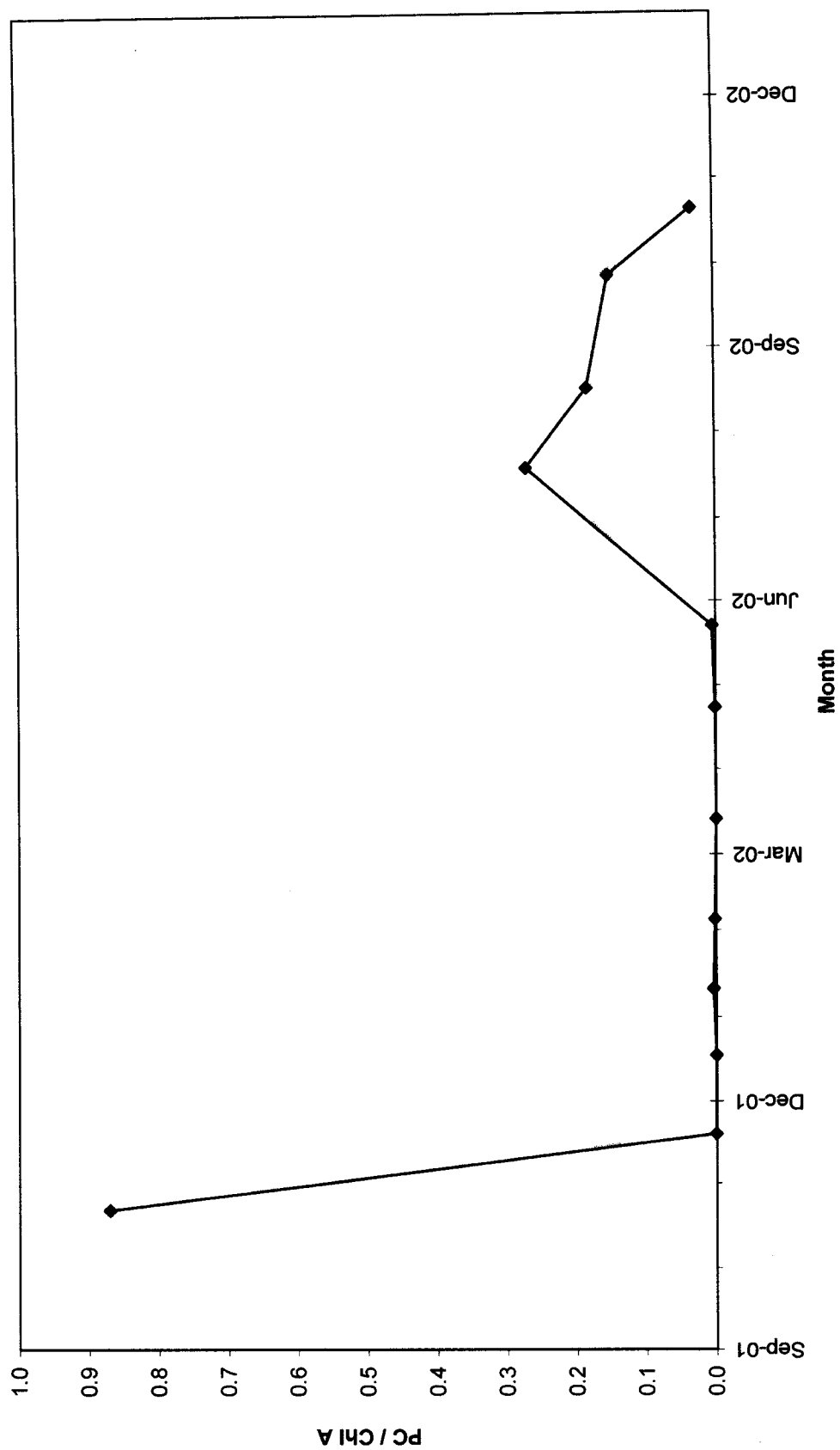


Figure 45. Time course of phycocyanin/ chlorophyll a ratio at station 24 near Key Biscayne.

Stations 24

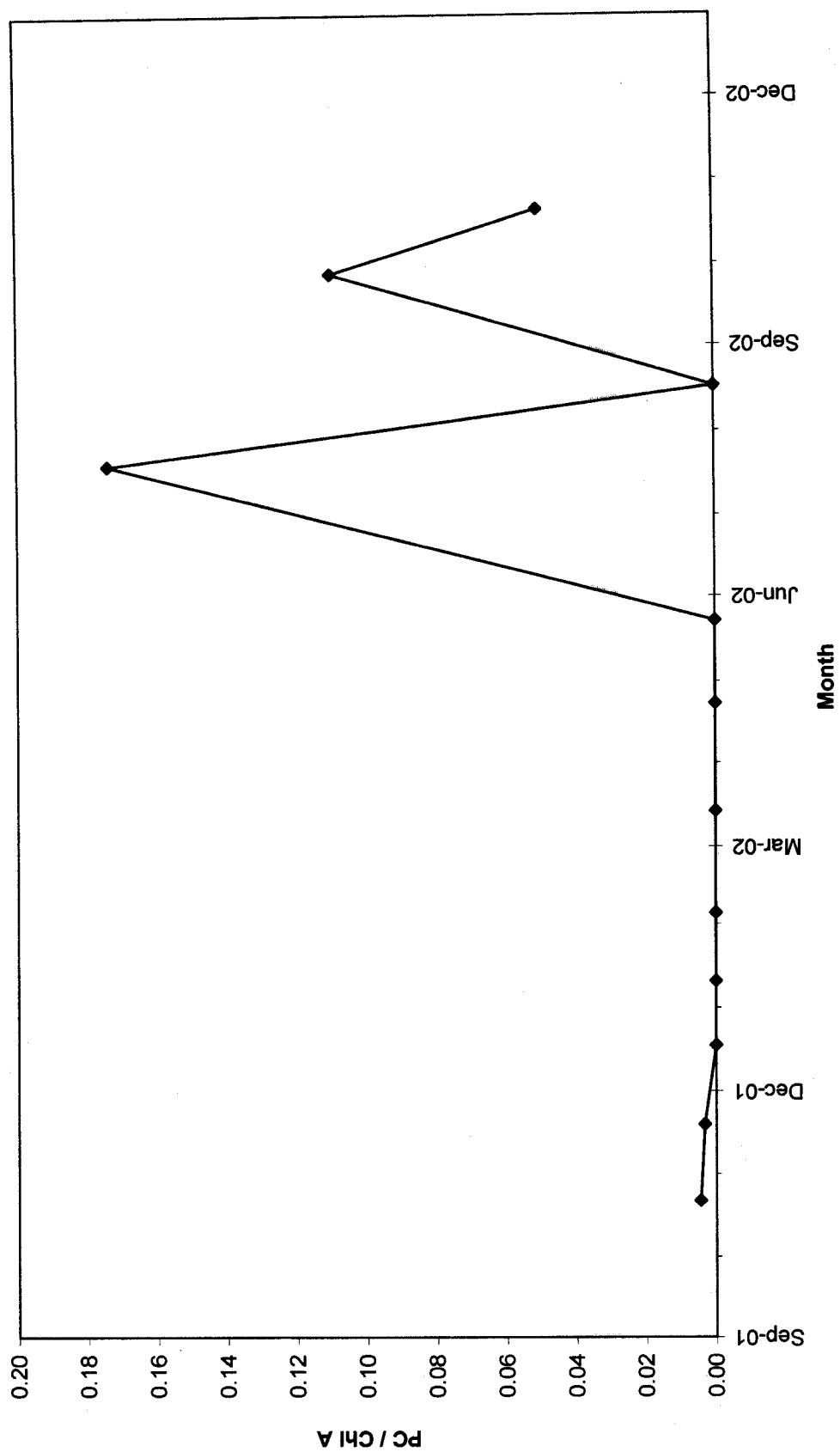


Figure 46. Time course of average phycocyanin/ chlorophyll a ratio at stations 25, 26, and 27 in central south Biscayne Bay.

Stations 25, 26, 27

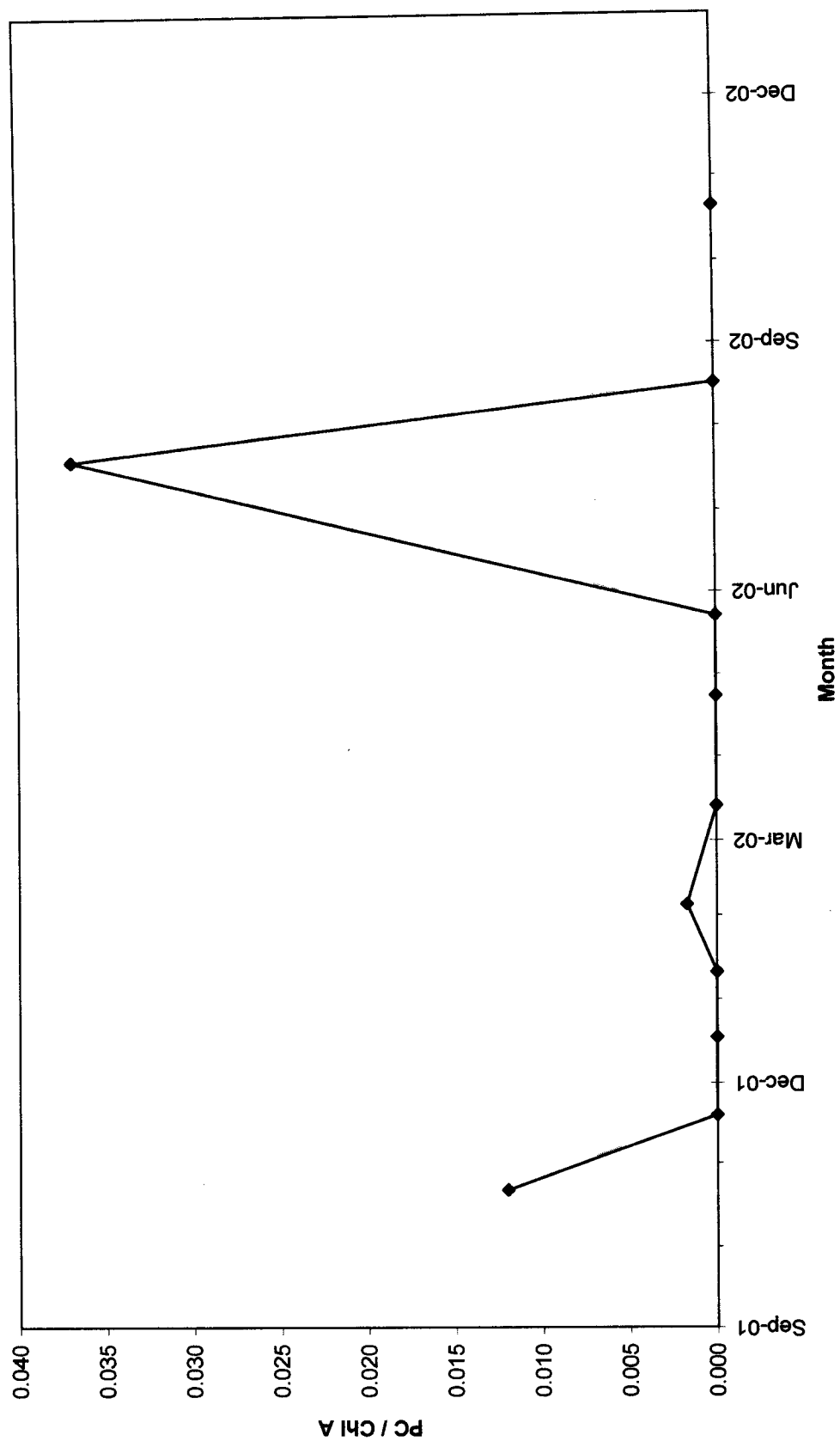


Figure 1

Figure 47. Time course of average phycocyanin/ chlorophyll a ratio at stations 5, 6, and 8 offshore east of Elliot Key and Key Largo.

Stations 5, 6, 8

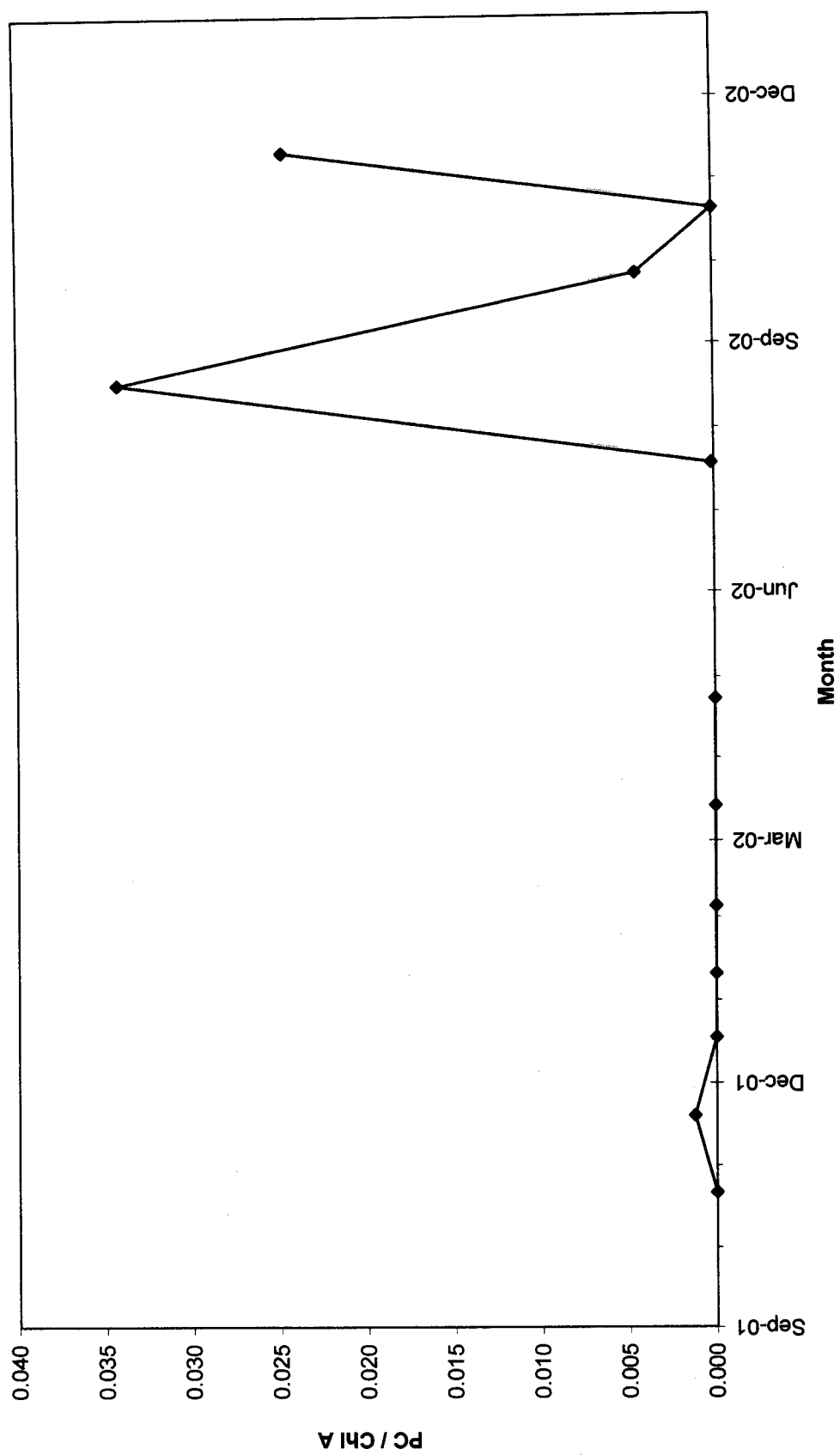


Figure 48. Average phycoerythrin/ chlorophyll a ratio in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002).

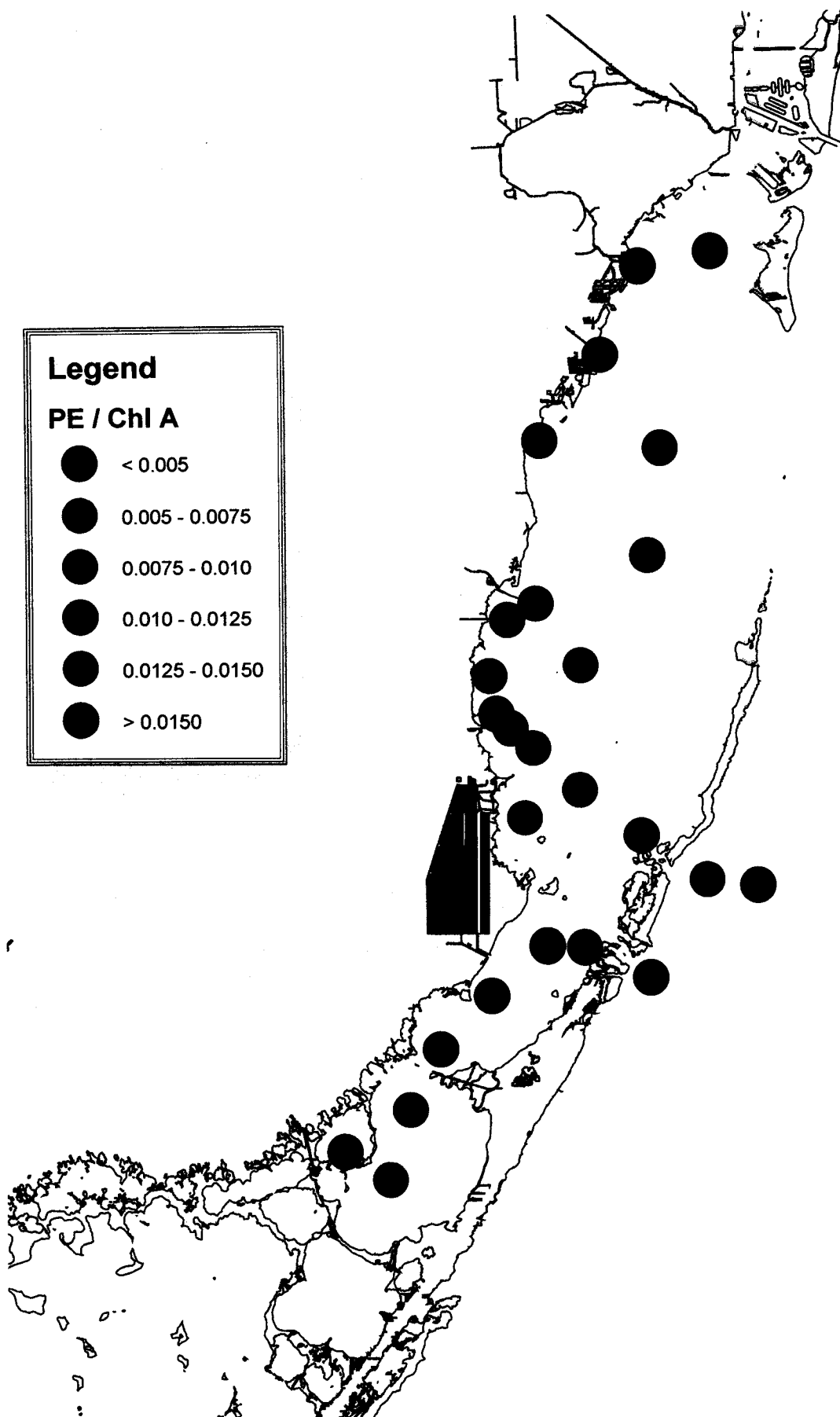


Figure 49. Overall relationship between phycoerythrin/ chlorophyll a ratio and phytoplankton abundance (as chlorophyll a) in south Biscayne Bay.

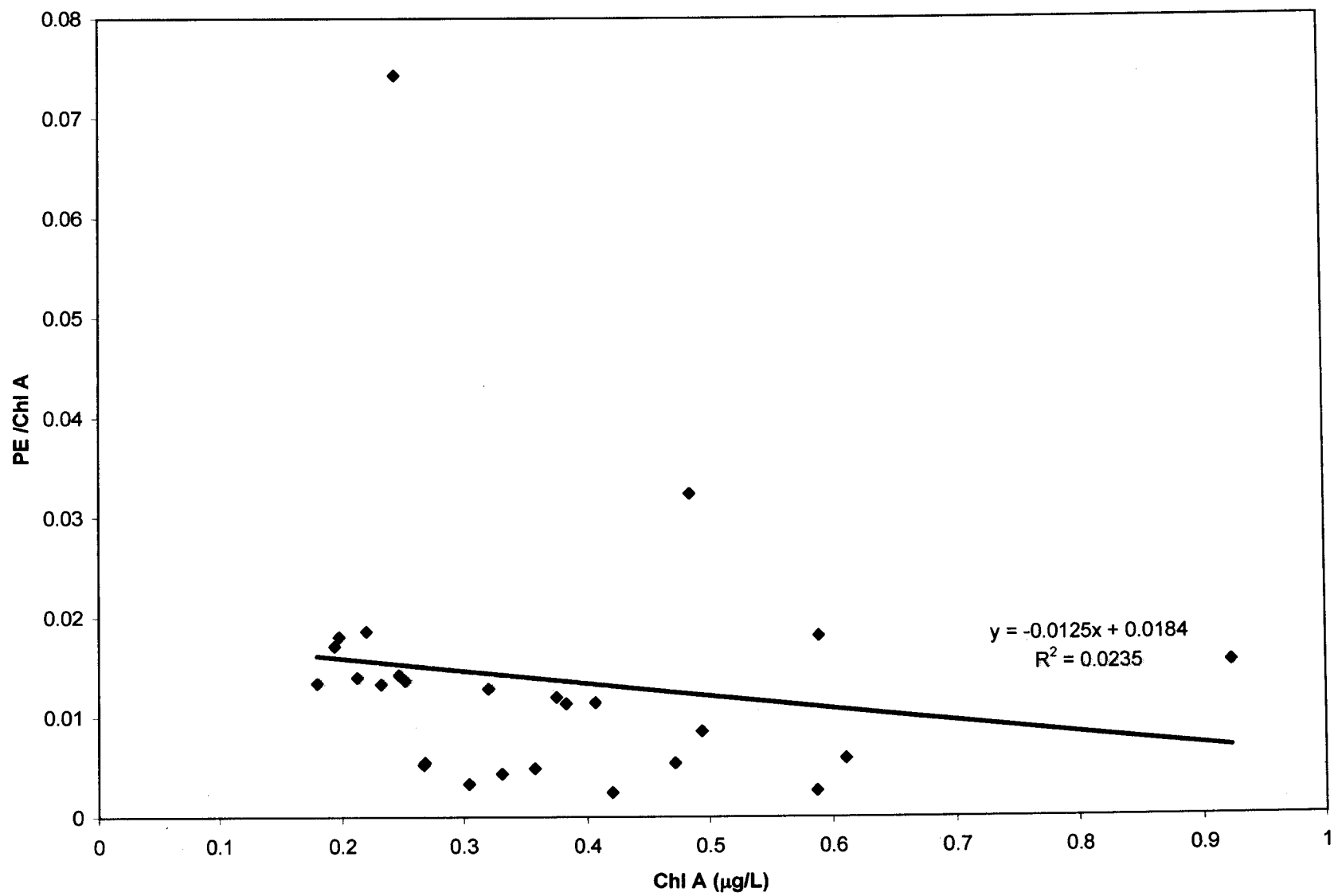


Figure 50. Overall relationship between phycoerythrin/ chlorophyll a ratio and salinity in south Biscayne Bay.

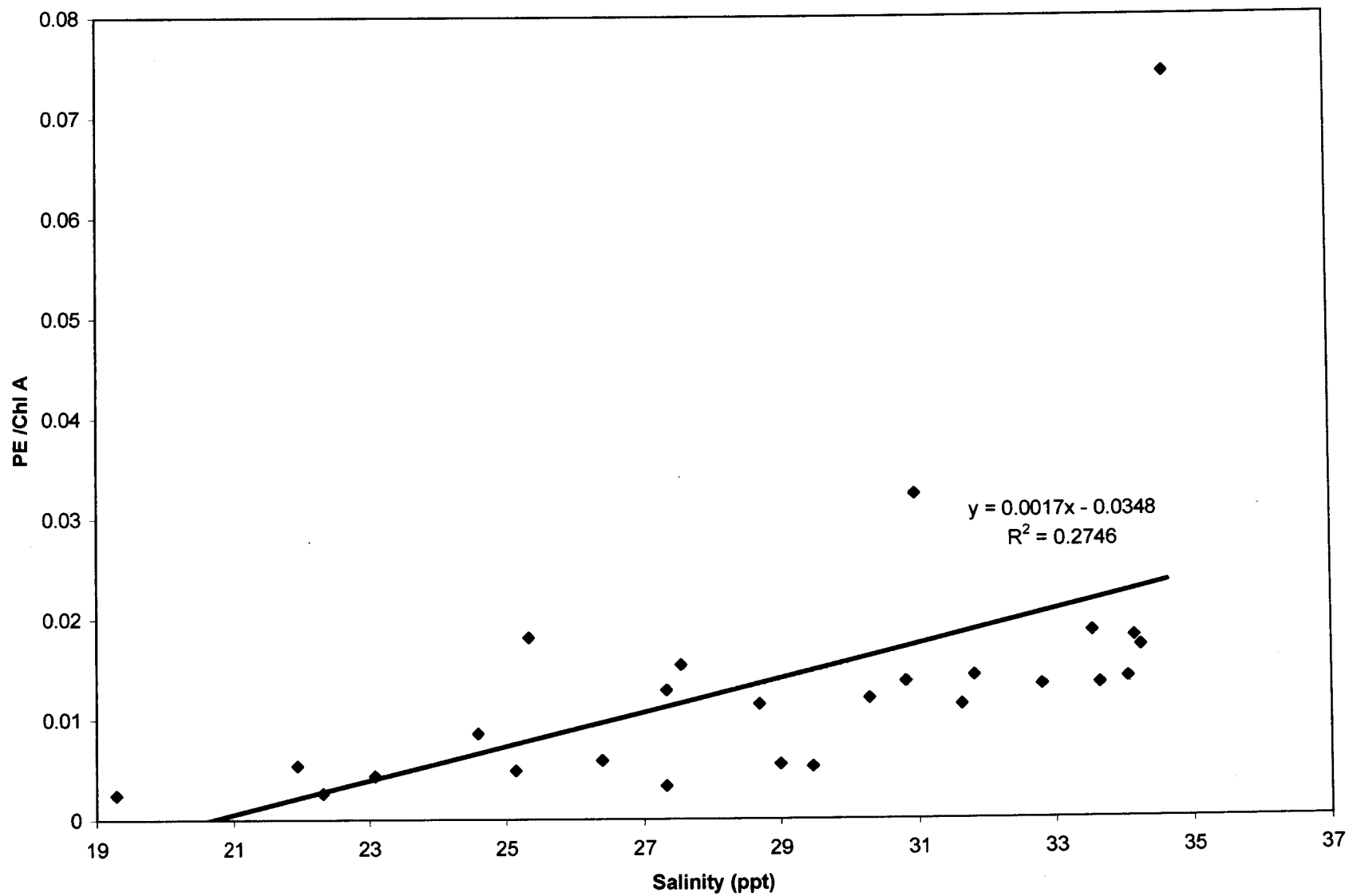


Figure 51. Time course of phycoerythrin/ chlorophyll a ratio at station 15 near mouth of Aerojet Canal.

Station 15

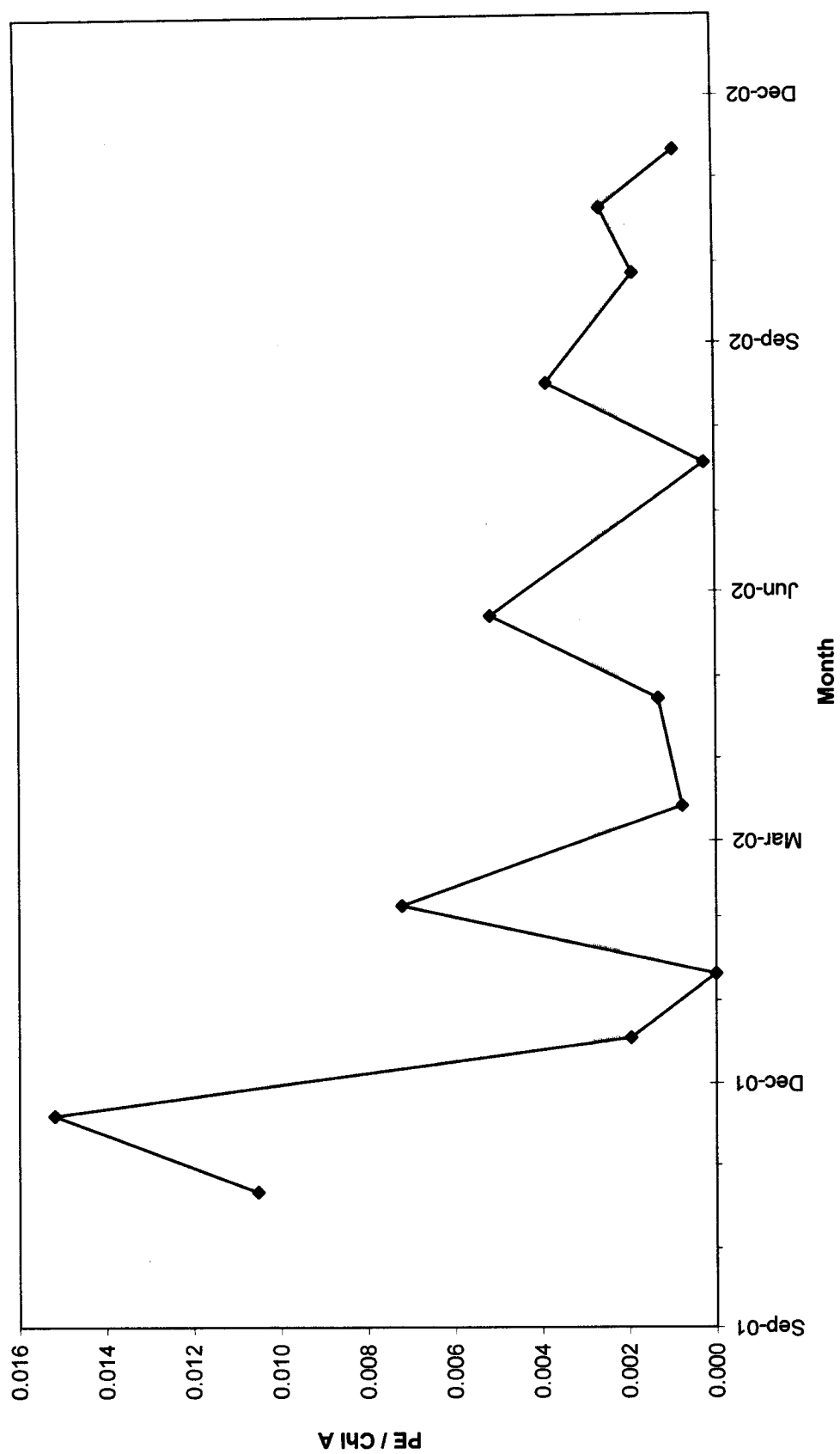


Figure 52. Time course of average phycoerythrin/ chlorophyll a ratio at stations 13 and 14 in Barnes Sound.

Stations 13, 14

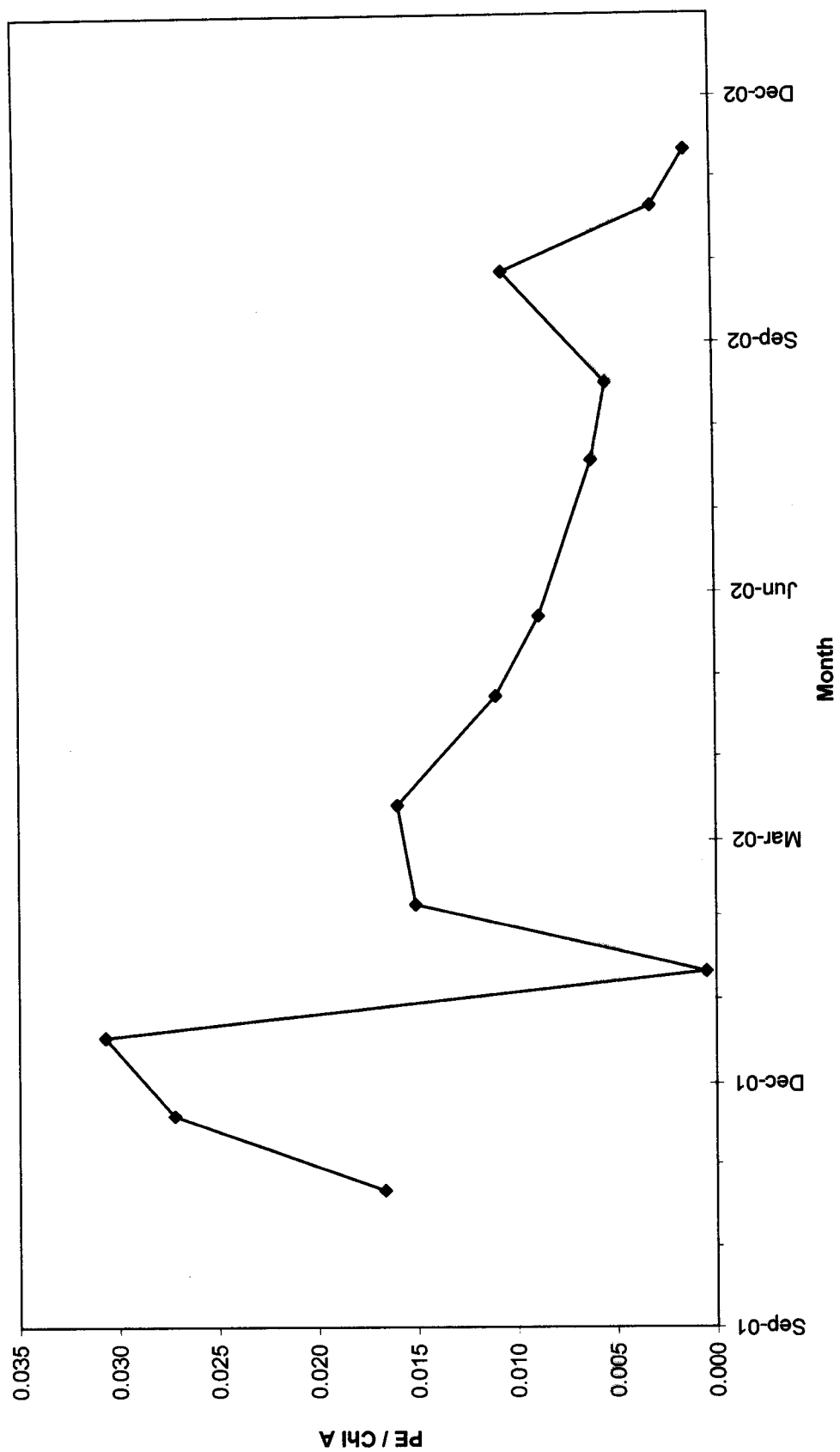


Figure 53. Time course of average phycoerythrin/ chlorophyll a ratio at stations 10, 11, and 12 in Card Sound.

Stations 10, 11, 12

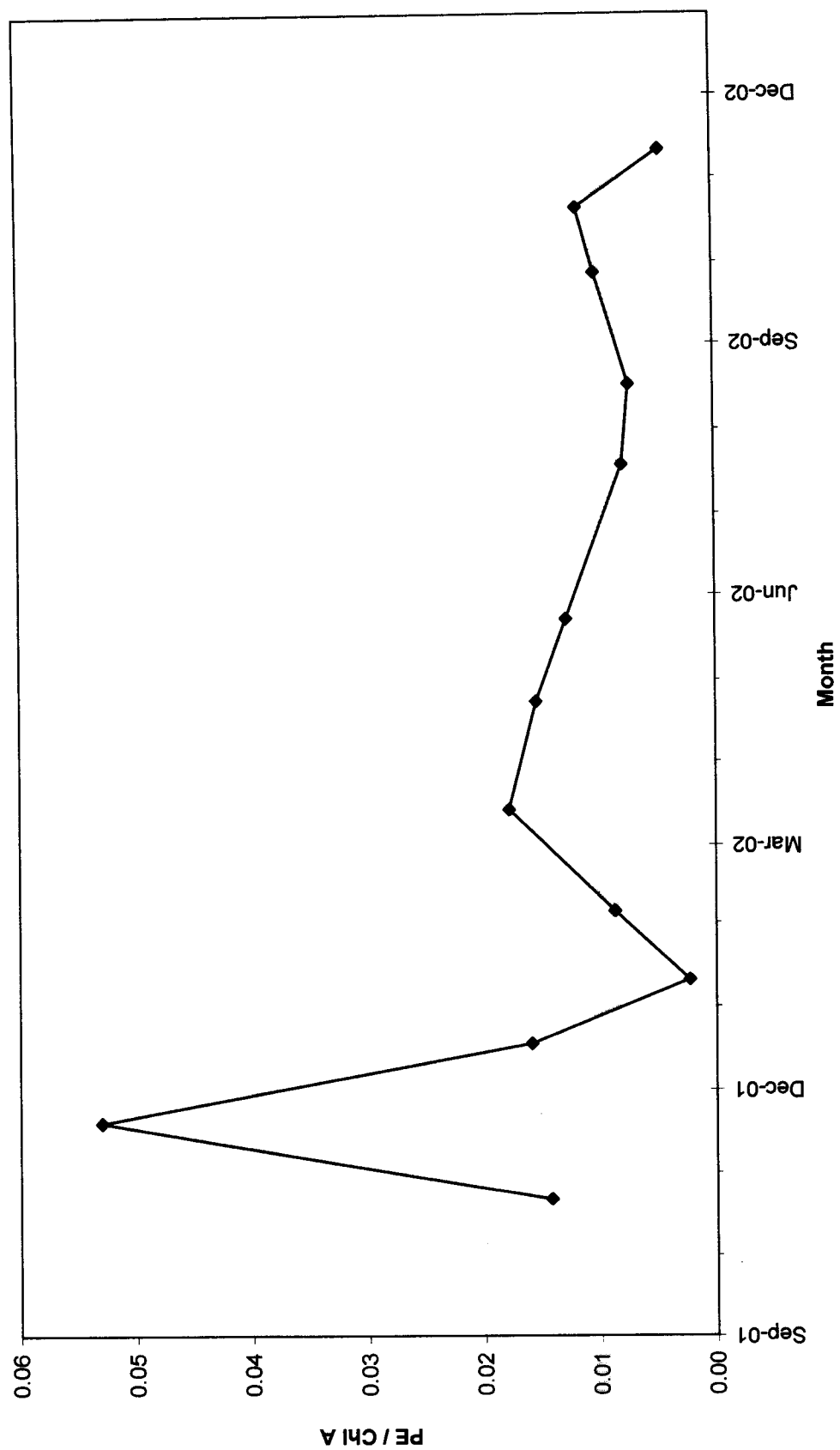


Figure 54. Time course of average phycoerythrin/ chlorophyll a ratio at stations 17, 18, 19, and 20 near the mouths of Mowry, Military, Princeton and Black Creek Canals.

Stations 17, 18, 19, 20

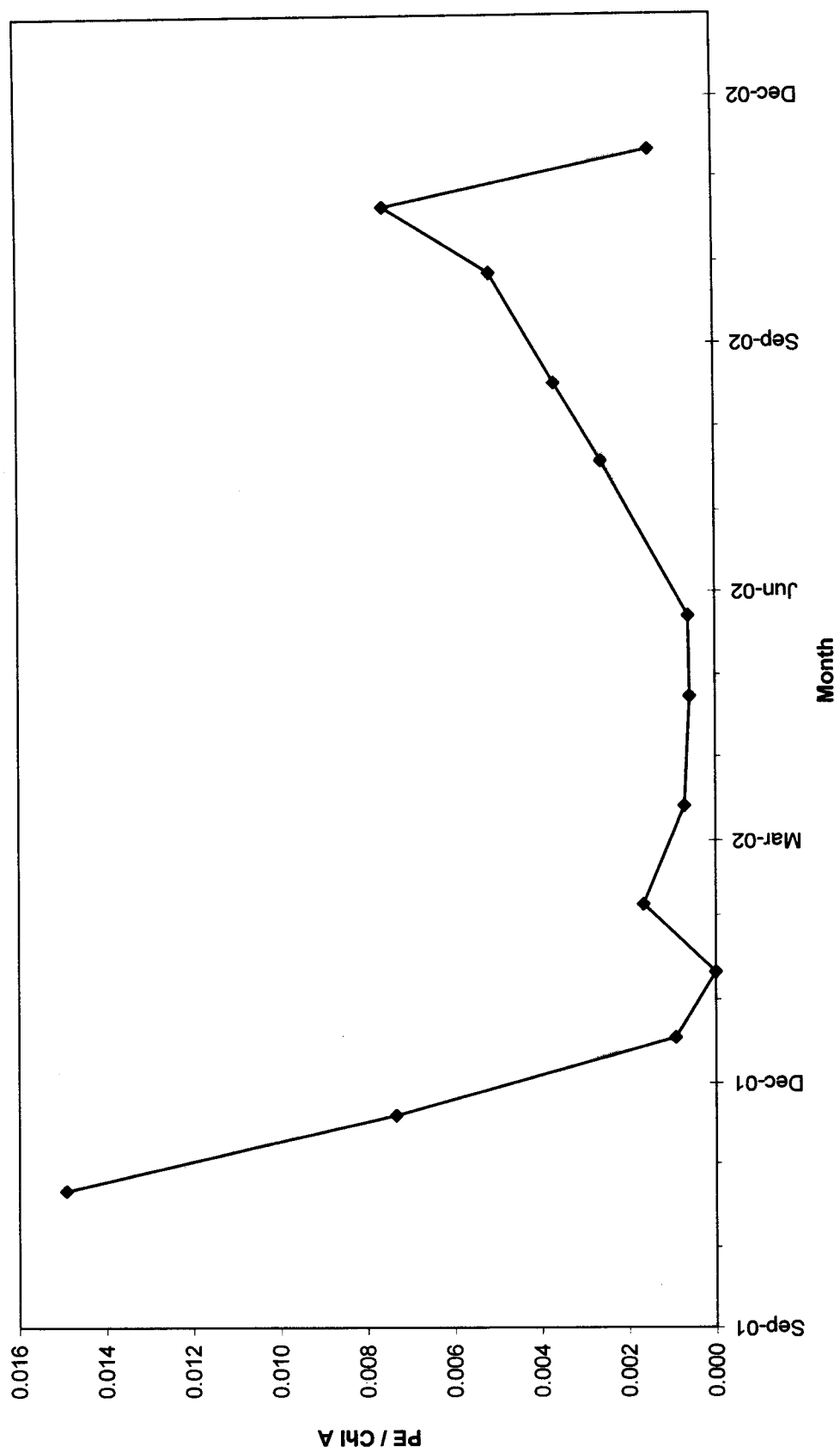


Figure 55. Time course of average phycoerythrin/ chlorophyll a ratio at stations 21, 22, and 23 near the mouths of Cutler, Snapper Creek, and Coral Gables Canals.

Stations 21, 22, 23

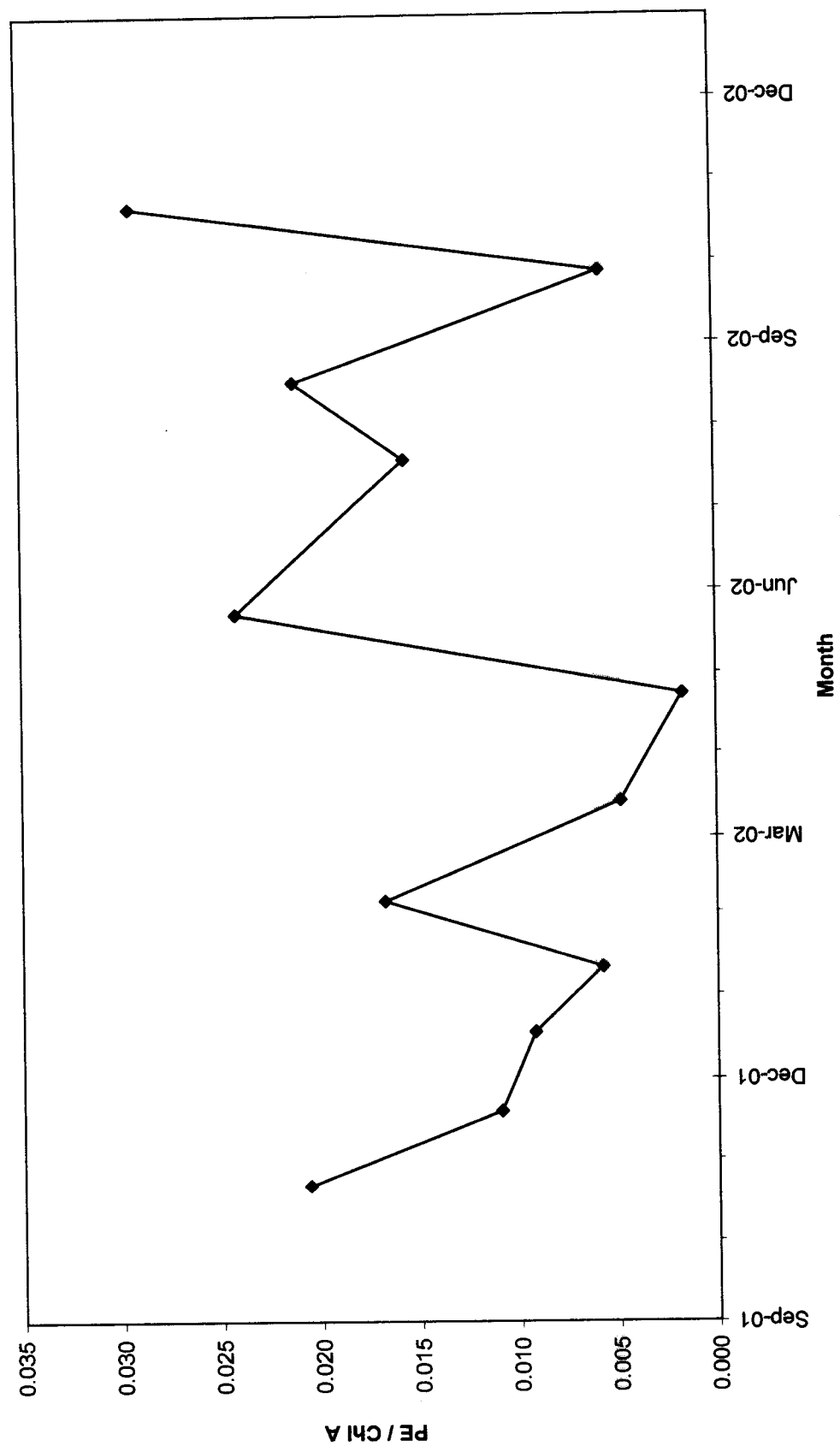


Figure 56. Time course of phycoerythrin/ chlorophyll a ratio at station 24 near Key Biscayne.

Stations 24

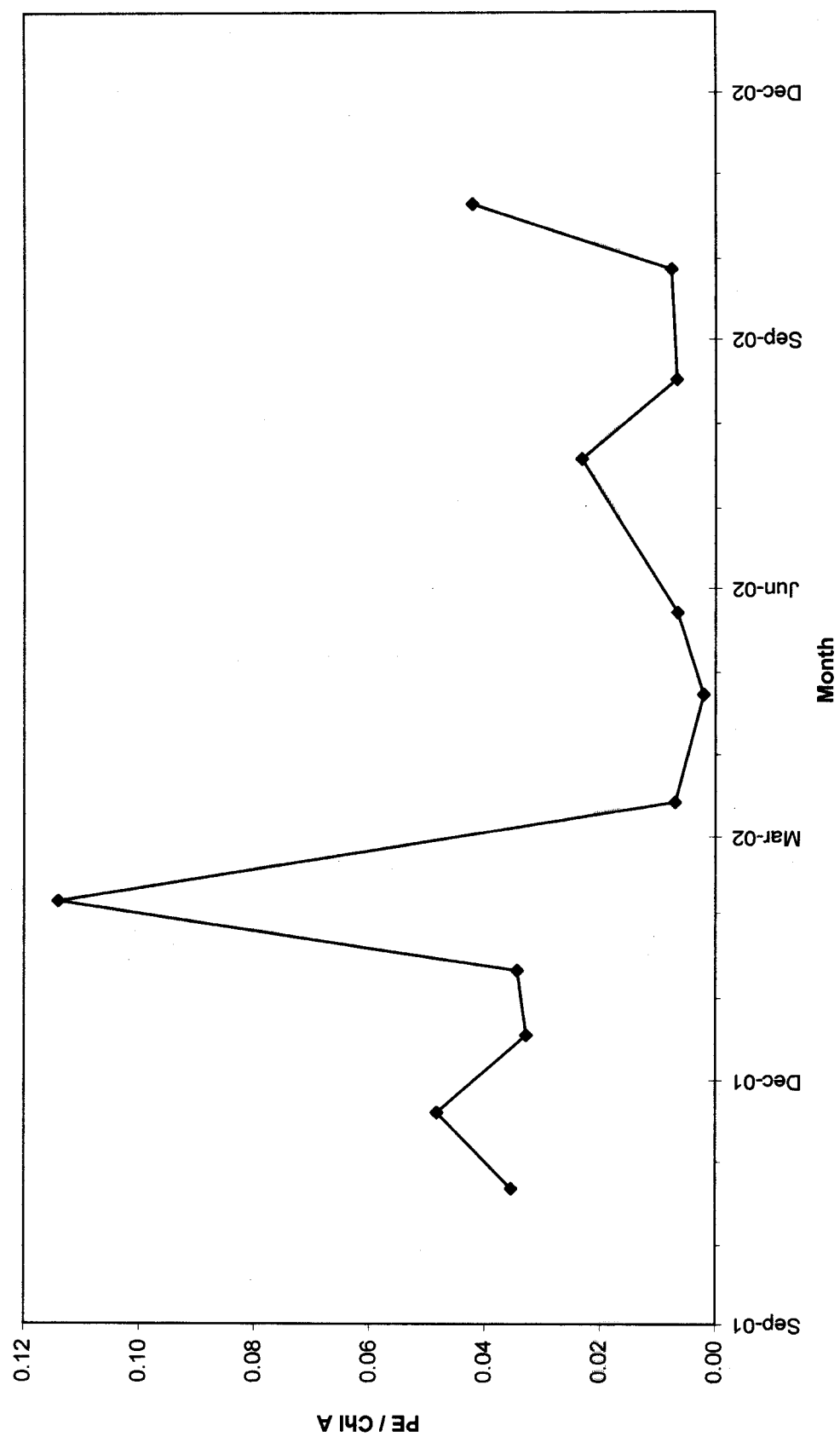


Figure 57. Time course of average phycoerythrin/ chlorophyll a ratio at stations 25, 26, and 27 in central south Biscayne Bay.

Stations 25, 26, 27

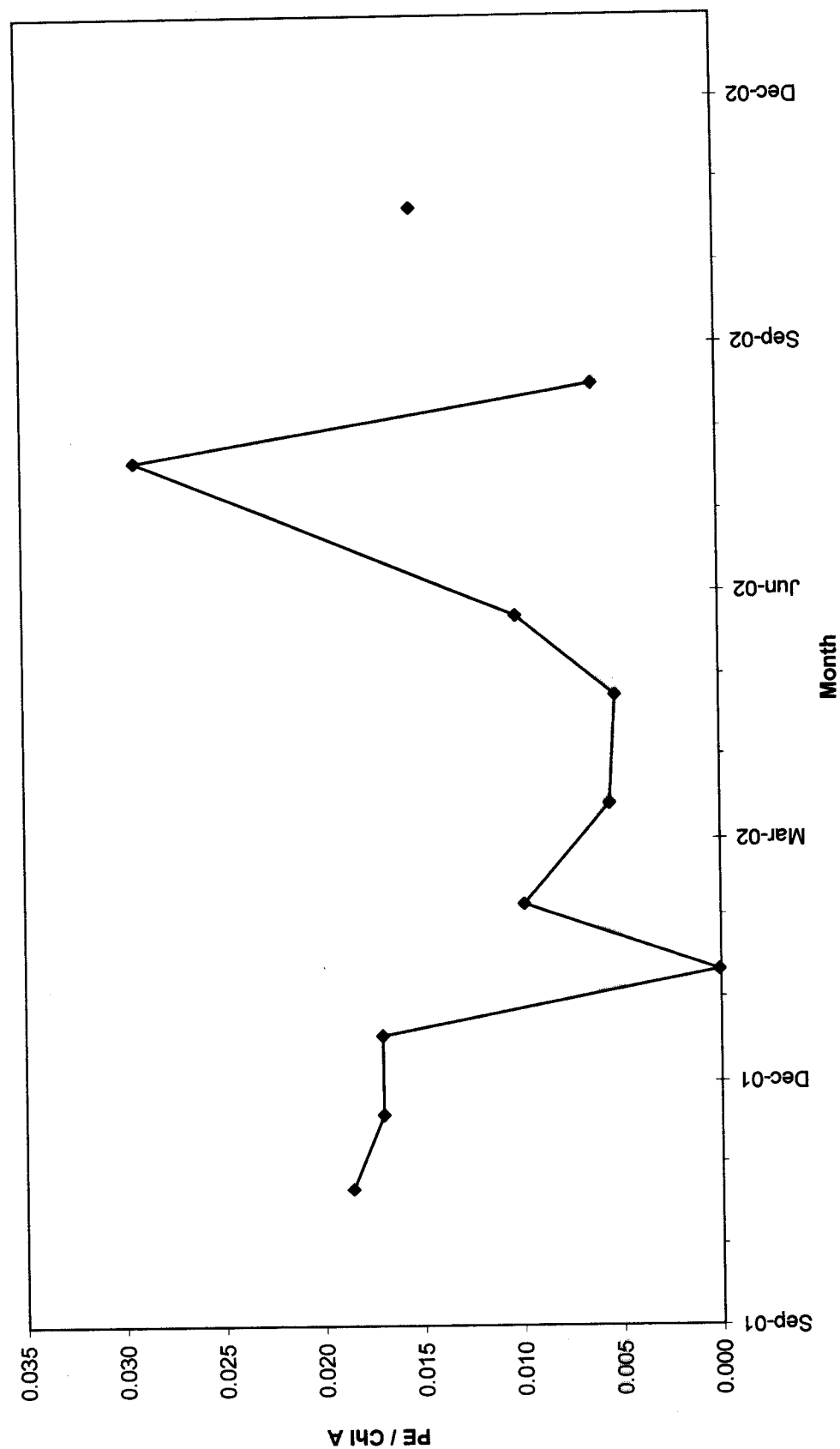


Figure 58. Time course of average phycoerythrin/ chlorophyll a ratio at stations 5, 6, and 8 offshore east of Elliot Key and Key Largo.

Stations 5, 6, 8

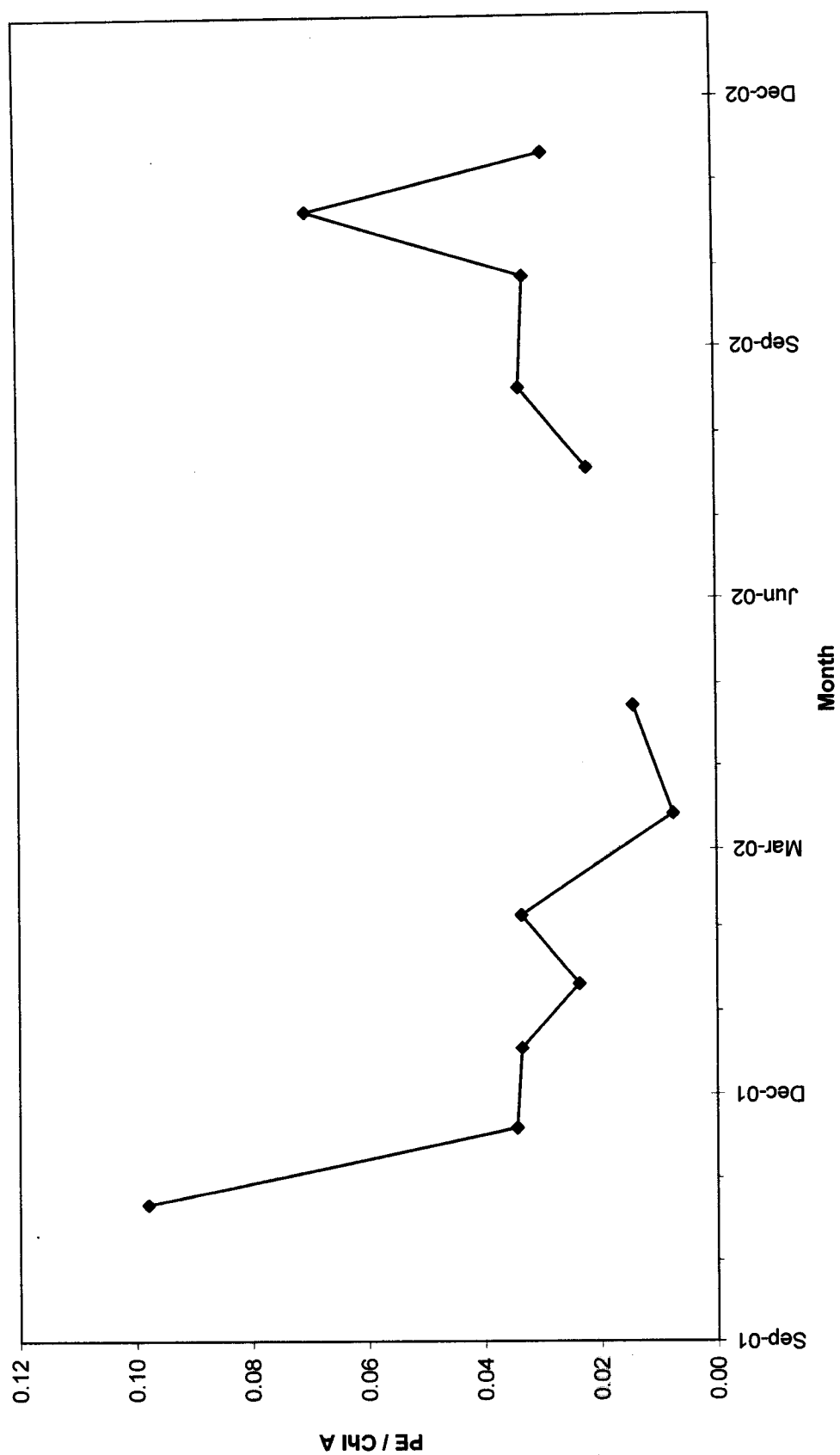


Figure 59. Index of nutrient bioassays in south Biscayne Bay (averaged over entire sampling period, October 2001-November 2002). A positive index (red) indicates nitrogen limitation and a negative index (blue) indicates phosphorus limitation.

Legend

$(FLN-FLP)/(FLN+FLP)$

- -1.00 - -0.50 P Limited
- -0.50 - -0.25
- -0.25 - 0
- 0 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00 N Limited

