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Freshwater Leakage Around Coastal Water Control Structures, and Salinities in Biscayne Bay, Biscayne National Park



United States Department of the Interior

**National Park Service
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**FRESHWATER LEAKAGE AROUND COASTAL
WATER CONTROL STRUCTURES, AND SALINITIES IN
BISCAYNE BAY, BISCAYNE NATIONAL PARK**

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NATIONAL PARK SERVICE - Southeast Region
Research/Resources Management Report SER-90/02

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ABSTRACT

A high correlation exists between canal discharge and bay salinities in the vicinity of Mowry Canal (C-103). It is shown that leakage around or through the control structure (S-204) at Mowry Canal is not significant. There is evidence to suggest that discreet patches of less saline waters occur in and drift within the Bay. The present operating rules for the structure gates result in highly intermittent canal discharges which are seen as salinity dips lasting for periods of 1 to 3 hours. These dips of up to 15 ppt are more pronounced near canal outlets and become less severe eastward of the canals in Biscayne Bay. The possibility of these strong, intermittent pulses affecting the marine flora and fauna in the area exists. Consideration should be given to modifying the gate operation rules to provide a more constant discharge with less severe extremes.

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INTRODUCTION

Biscayne National Park (Fig. 1) encompasses 70,850 hectares (175,000 acres) of a mainland mangrove shoreline, a warm shallow bay, many small barrier islands, and living coral reefs. The Park was established as a National Monument in 1968 to preserve and protect the northern-most example of living coral reefs in the Northern Hemisphere. In 1980, the Monument was enlarged by Congress to National Park status. The Park is bordered on the west by Miami, the largest and most rapidly developing urban area in Florida. The principal sources of freshwater to the Park are six canals (Figs. 1 and 2) which drain agricultural land, a military complex, and Metropolitan Dade County. Surface run-off, ground water intrusion, and precipitation are minor sources of freshwater.

In 1983, scientists at Biscayne National Park initiated a series of studies to determine (1) whether there had been a shift in floral composition of the grassbed communities within the Black Creek vicinity of the Park, and if so, (2) what might be the factors responsible for the change in floral composition. Specifically, there was concern by Park resource managers that Thalassia was being replaced by Halodule in certain affected areas. Studies to document benthic community structure, to determine if groundwater upwelling might be a source of nutrients and chlorinated pesticides, and to identify possible effects of canal discharges were carried out by Szmant (1987), Corcoran, et al. (1987), and Chin Fatt and Wang (1986). Additionally, Nnaji

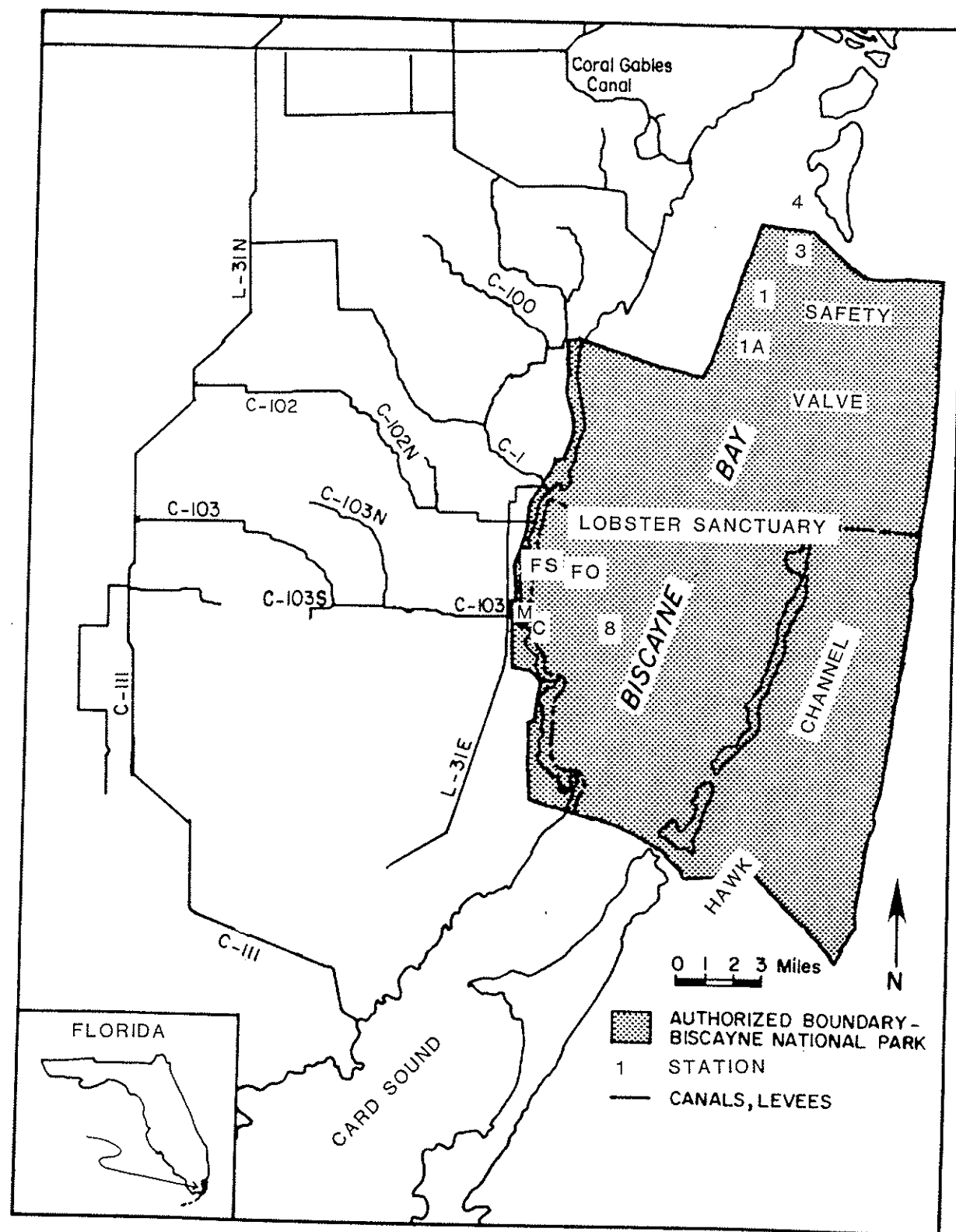


Figure 1. Location map showing study area, major canal systems, and data sampling site locations

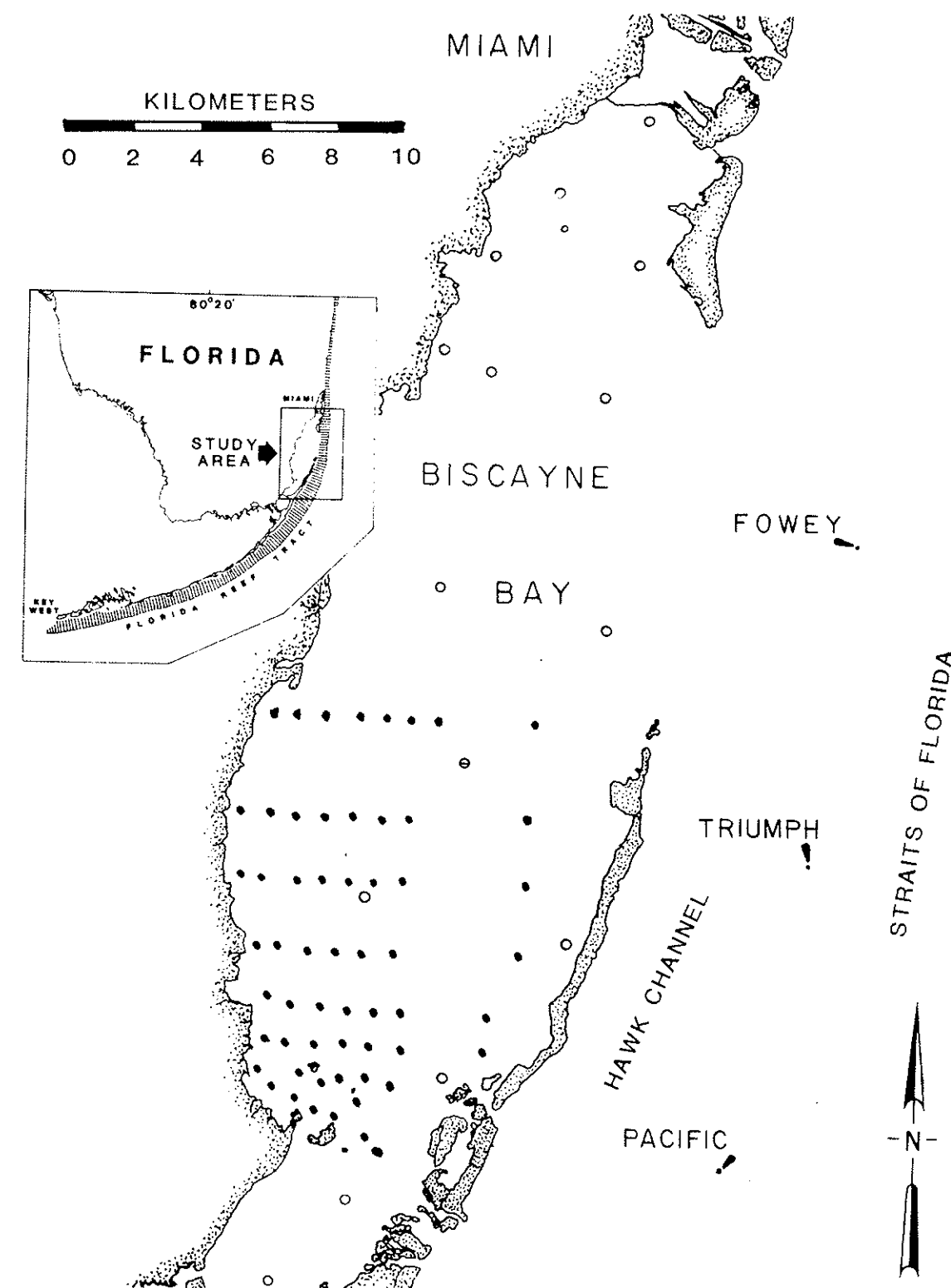


Figure 2. National Park Service, Biscayne National Park water quality sampling stations (●), 1971 - 1984 and Dade County DERM water quality monitoring stations (○), 1979 - 1985

(1987) evaluated a twelve year water quality record for Biscayne Bay. Szmant (1987, p. 14) suggested that, among other possible causes, the observed differences in the grassbed communities are "likely caused by increased color, lower salinity, and higher nutrients in the water column that were in turn caused by increased discharges from the canals." Corcoran, et al. (1987) suggested that the detection of insecticides and phthalic acid esters in the sediments of the Black Creek area (both north and south of the study area) was anticipated because of the extensive use of the Black Creek drainage basin for agricultural purposes. What is noteworthy, however, is that the compounds were detected in the pore waters of the sediments indicating that they could become mobile and be introduced into the water column. This could occur by resuspension of the sediments (e.g. from high velocity canal discharges, storm events, and prop-wash from boats) or the upwelling of groundwater through the sediments. Because of the shallow water depths (1.5 m [5 ft.] MLW) in the study area the resuspension of sediments due to canal discharges, storm events, and to a lesser degree prop-wash would appear to be viable pathways for insecticides to enter the water column, be transported to other areas of the bay, and introduced into the Bay food chain.

Brook (1982) found that canal discharges after lengthy periods of drought carried fertilizers, pesticides, herbicides, and other pollutants into the Bay. The water quality of canal discharge was modeled by Wang, et al. (1978) to determine the spreading rates of pollutants and fresh water, and zones of influence around the

canal openings. Scheidt and Flora (1983) evaluated Mowry Canal water quality and discharge patterns for the period 1974-1981. Numerous studies have evaluated the flow fields, physical properties and characteristics of water transport and circulation in Biscayne Bay (Johnson and Lee, 1977; Lee, 1975; Lee and Rooth, 1976; Swakon and Wang, 1977; Wang and Connor, 1975; Wang, et al., 1988). More recently, Chin Fatt and Wang (1986) and Cofer-Shabica and Wang (1989) examined the relationship between canal discharge volumes and salinity distributions in the Bay. These studies showed that observed salinities at canal openings did not always correlate well with assumed discharges. To explain the lack of correlation it was hypothesized that leakage around the gate structures, or ground water intrusion through the Bay bottom could be important. The following study was undertaken to evaluate this hypothesis. In addition, seasonal statistics of salinity and temperature of the study area are provided to allow future comparisons with a Bay base-line.

METHODS

Measurements of conductivity and temperature were made during 1985-86 at several locations in Biscayne Bay with continuously recording salinometers (Hydrolab Datasonde, Model 2070-DS). The instruments were routinely cross-calibrated with Wormely Water prior to and after deployment. Table 1 lists locations (see Fig. 1) of the instruments, deployment dates, sampling time interval, and total number of samples taken. Conductivity and temperature

<u>Date</u>	<u>LAT</u> 25°N	<u>LON</u> 80°W	<u>STATION</u> <u>NAME</u>	<u>TIME</u> <u>INTERVAL</u>	<u>NUMBER</u>
1985					
09/30-10/04	37.01' X	11.53'	Marker 1A	15'	NA
10/07-10/11	38.59' X	11.50'	Marker 1	15'	NA
10/28-11/07			Marker 1	60'	260
10/28-11/07			Marker 1A	60'	260
1986					
02/11-03/22	39.80' X	11.05'	Marker 3	30'	1853
02/11-03/22	41.10' X	11.03'	Marker 4	30'	1853
05/02-05/08	28.21' X	20.25'	Mowry, mid-water	5'	1853
05/02-05/08			Mowry, surface	5'	1853
05/21-05/22			Mowry, surface	5'	224
05/22-05/28			Mowry, mid-water	5'	1748
05/28-06/03			Mowry, mid-water	5'	1766
06/03-06/24			Mowry, mid-water	20'	1491
06/04-06/24	27.78' X	19.18'	Convoy Point	20'	1422
06/24-07/17			Mowry, mid-water	20'	1717
06/24-07/17			Convoy Point	20'	1717
08/05-08/20	30.27' X	20.11'	Fender Pt., inshore	20'	1084
08/05-08/20	30.17' X	19.81'	Fender Pt., off	20'	1084
08/21-09/15			Fender Pt., inshore	20'	1791
08/21-09/15			Fender Pt., off	20'	1806
10/28-12/22			Mowry, mid-water	60'	1322
10/28-11/22	27.55' X	17.91'	Turkey Point #8	60'	621

Table 1. Hydrolab Datasonde deployments during 1985-1986

readings obtained from the Datasondes were converted to salinity using the empirical formulation of Weyl (1964). For the same periods, records of canal (Mowry, Military, Moody/Princeton, Black Creek, and Snapper Creek Canals) discharges, rainfall (Homestead Air Force Base and Miami International Airport), and ground water levels for the Biscayne Bay watershed were obtained from the South Florida Water Management District, West Palm Beach (SFWMD) and the United States Geological Survey, Water Resources Division, Miami (USGS). These data were processed according to the techniques outlined in Chin Fatt and Wang (1986, pp 6-9).

From 1971 through 1984, the resource managers at Biscayne National Park collected water quality data, including temperature and salinity, from an initial network of 60 stations. Over time, the number of stations changed and in 1984 consisted of 31 (Fig. 2) at which approximately 15 variables were monitored. The sampling was not continuous and the number of sampling periods varied from 3 to 8 months in any given year. Similar temperature and salinity data have been collected monthly, beginning in 1979, by Dade County Department of Environmental Resource Management at their water quality monitoring stations throughout the Bay.

RESULTS AND DISCUSSION

SALINITY

Time series plots of the NPS salinity data are presented in

Figures 3 - 13. The salinity data at Markers 1 and 1A bayside of the Safety Valve (Fig. 1) varies between 34 and 36 ppt with daily variations more typically only 0.5 ppt (Fig. 3). The pattern is similar at Markers 3 and 4 just southwest of Key Biscayne (Fig. 4). These four stations represent ocean boundary conditions for the study. There are occasional dips in salinity of 2-3 ppt supported by a single value, and also some longer and larger drops especially at Marker 3. The cause of these localized drops, often appearing at only one instrument, may be due to rainfall and is examined in more detail later.

On 2 May 1986, two instruments were deployed at the outlet of Mowry Canal, one near the surface (0.0m MLW) and one at -0.6m (2 ft.) MLW to determine instrument reliability (Fig. 5). The large drops in salinity recorded by the surface unit are probably due to the sensor being out of the water due to wave action or tide height. The reliability of the data appears to be good as the instruments consistently calibrated to the Standard.

Prior to 29 May 1986, there were no recorded releases of water from Mowry Canal (SFWMD data) and the salinity remained relatively constant around 30-32 ppt. The record from 22 - 29 May (Fig. 6) shows sharp drops and recoveries in salinity. These may represent instrument errors because they are supported by only one data point. The changes in salinity supported by multiple values are probably real. These are typically 1-2 ppt, and may be due to leakage around the control structure gates. More leakage would occur at low tide when the head-pressure differential is greater. Because the volume of freshwater responsible for these

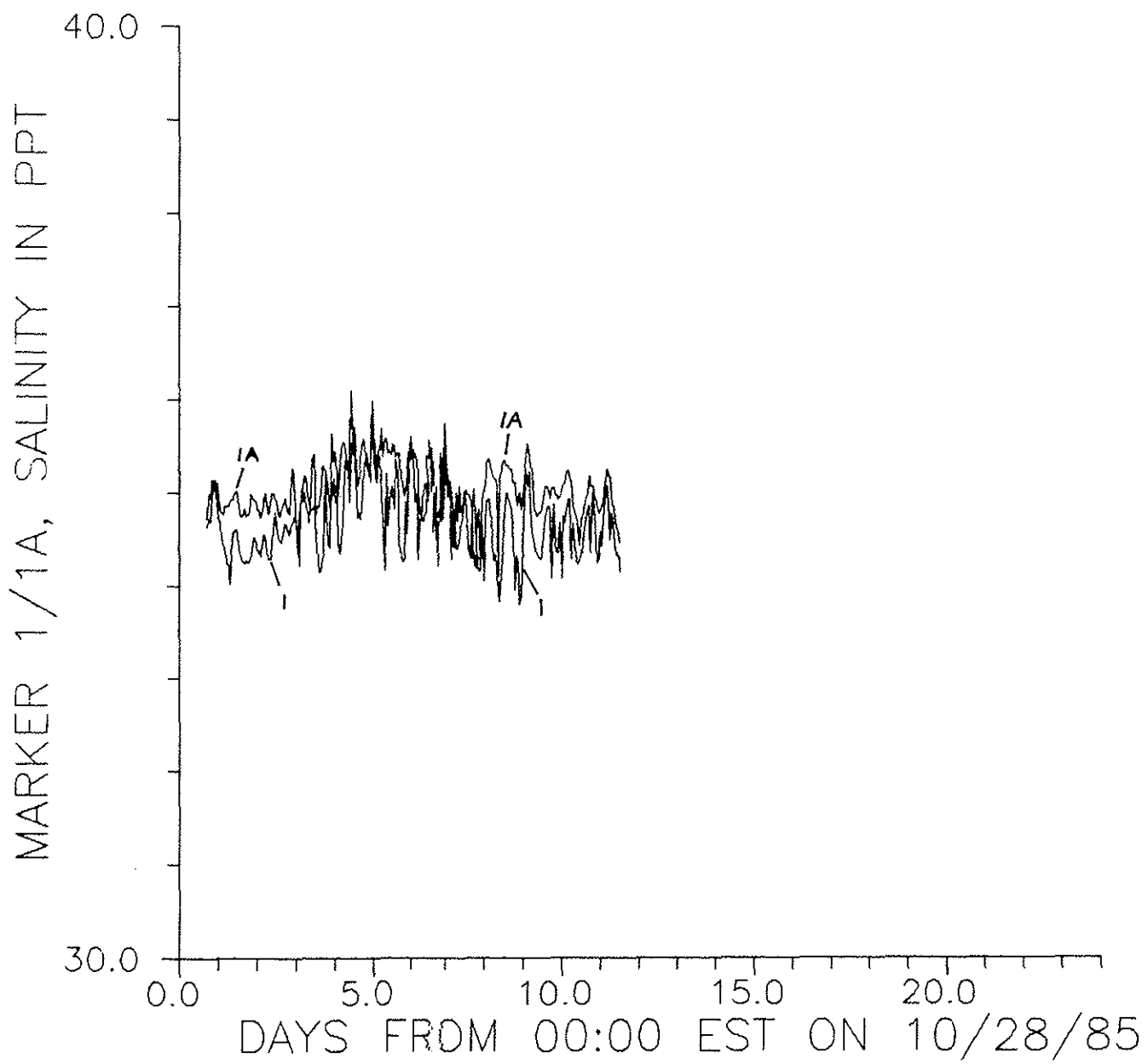


Figure 3. Salinity at Markers 1/1A, October-November 1985

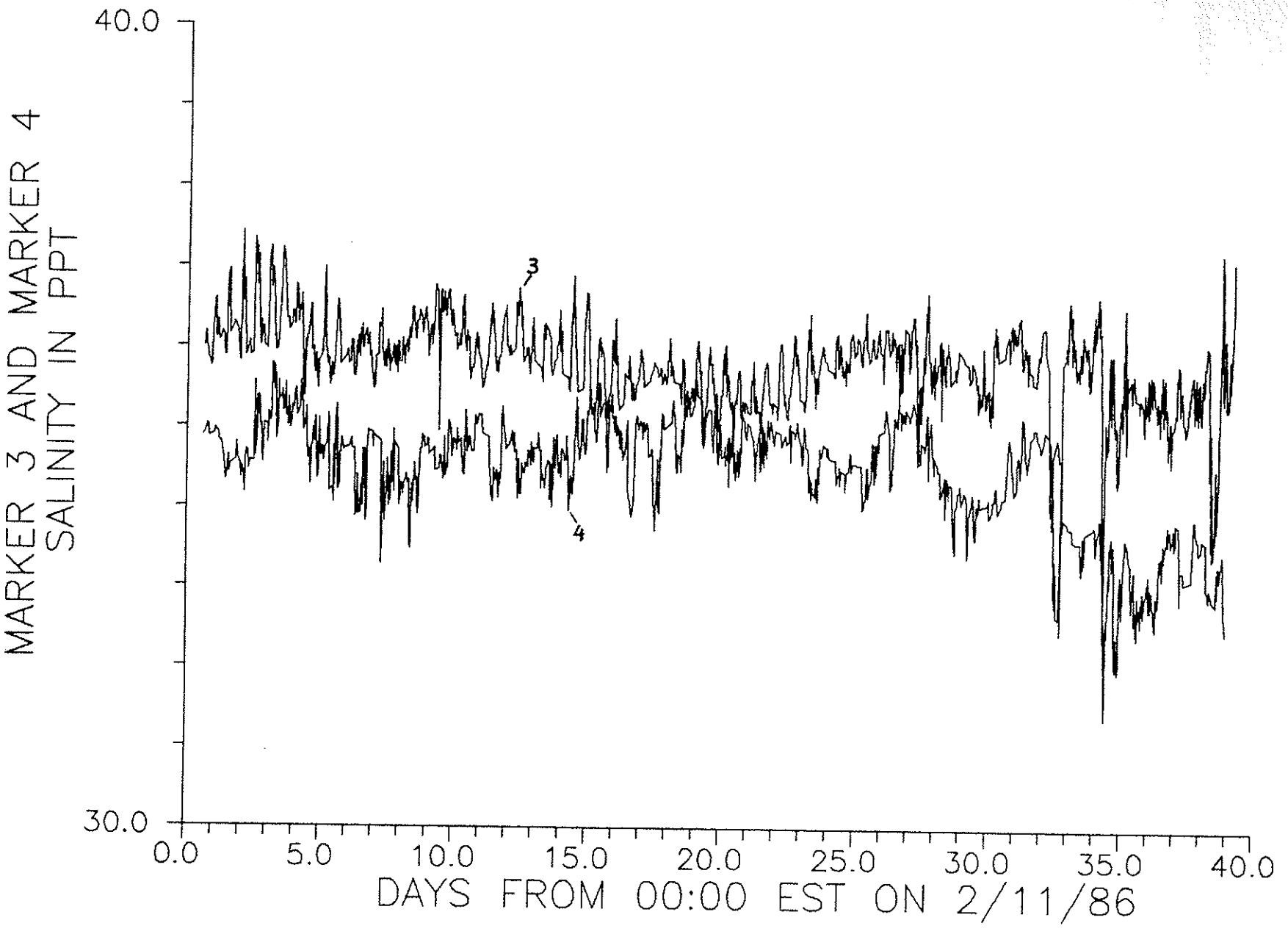


Figure 4. Salinity at Markers 3 and 4, February-March 1986

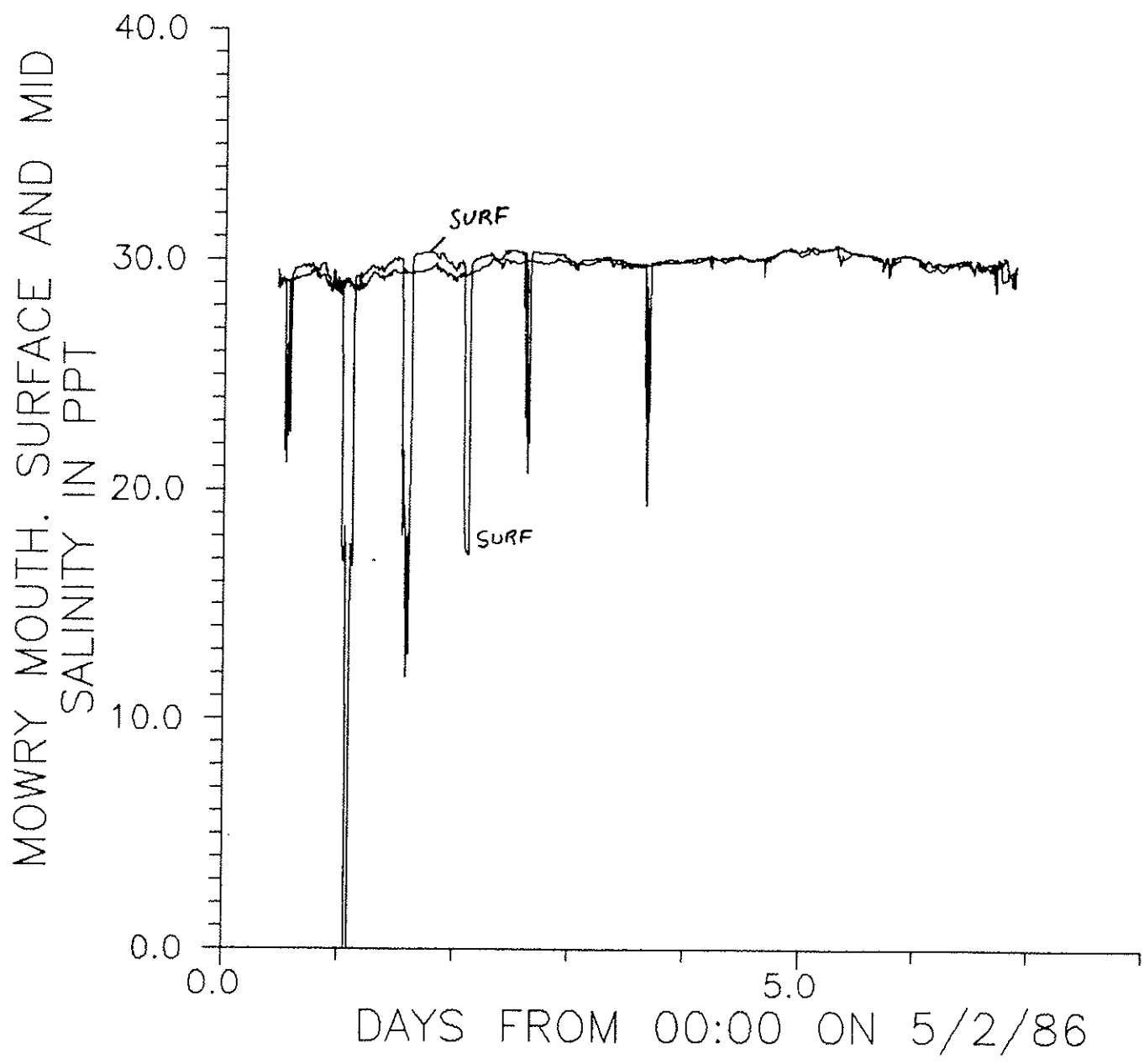


Figure 5. Salinity at Mowry Canal outlet, May 1986

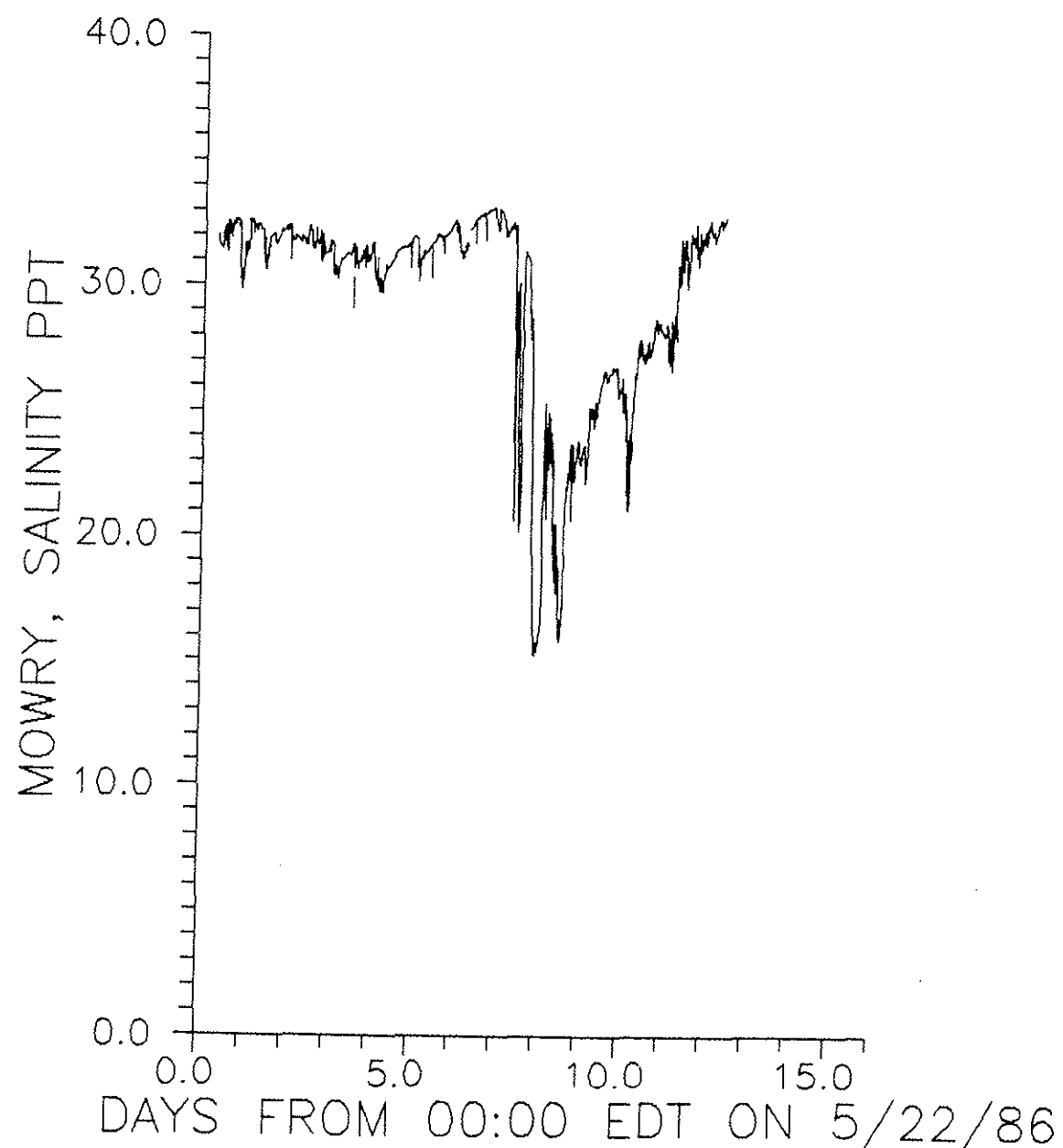


Figure 6. Salinity at Mowry Canal outlet, May-June 1986

drops is very small and difficulties in obtaining ground water levels, no attempts were made to correlate salinity with water levels behind the structure. From this record it may be concluded that seepage whether around the gates or through the ground is not an important contributor of freshwater to the Bay, at least at Mowry Canal.

The effect of actual gate opening beginning on 29 May is evident in the salinity record (Fig. 6). Drops of about 10 ppt occur very rapidly, followed by recovery to levels somewhat smaller than before the drops. After 30 May, the gates remained closed and the salinity slowly increased to about 32 ppt in 4 - 5 days. There were then no recorded canal discharges until 7 June, although the salinity dropped to 25 ppt during 4 - 6 June (Figs. 7 and 8). Canal discharge may actually have taken place, but was not recorded because of instrument error. The salinity at Mowry Canal oscillates vigorously, fluctuating 10-15 ppt, over short periods of 1-3 hours. Assuming negligible leakage, the lack of correlation observed by Chin Fatt and Wang (1986) can be explained entirely by these rapid oscillations. The synoptic salinity surveys reported in their report involved only one instantaneous sampling at each station. With the extreme variations in salinity expected at the canal outlets that can be considered as random noise around a mean signal, it is evident that any attempt to correlate salinity with canal discharge will fail. These large and rapid oscillations in salinity are present even at some distance to the south of the canal as seen for example in the Convoy Point records (Figs. 9 and 10).

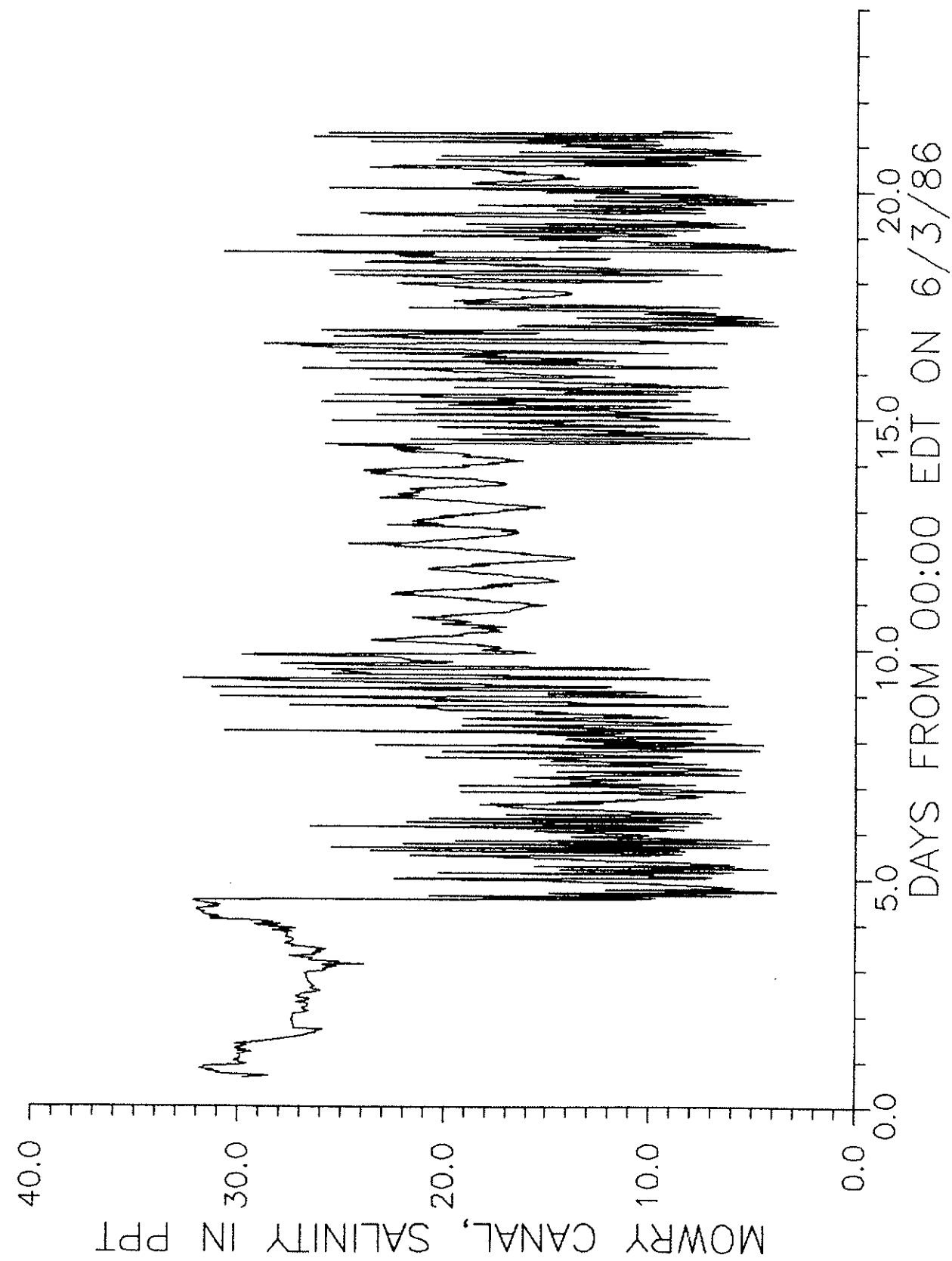


Figure 7. Salinity at Mowry Canal outlet, June 1986

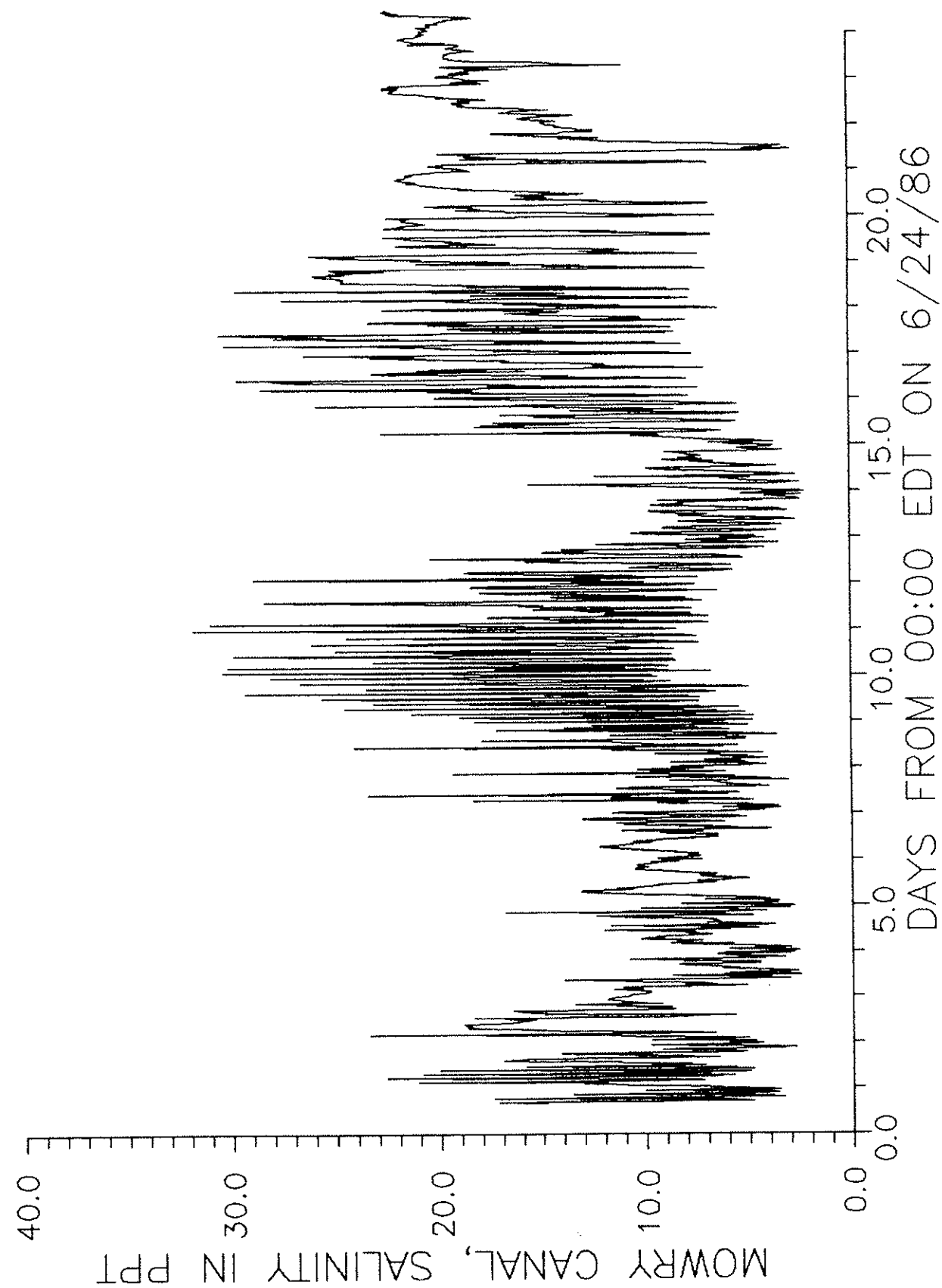


Figure 8. Salinity at Mowry Canal outlet, June-July 1986

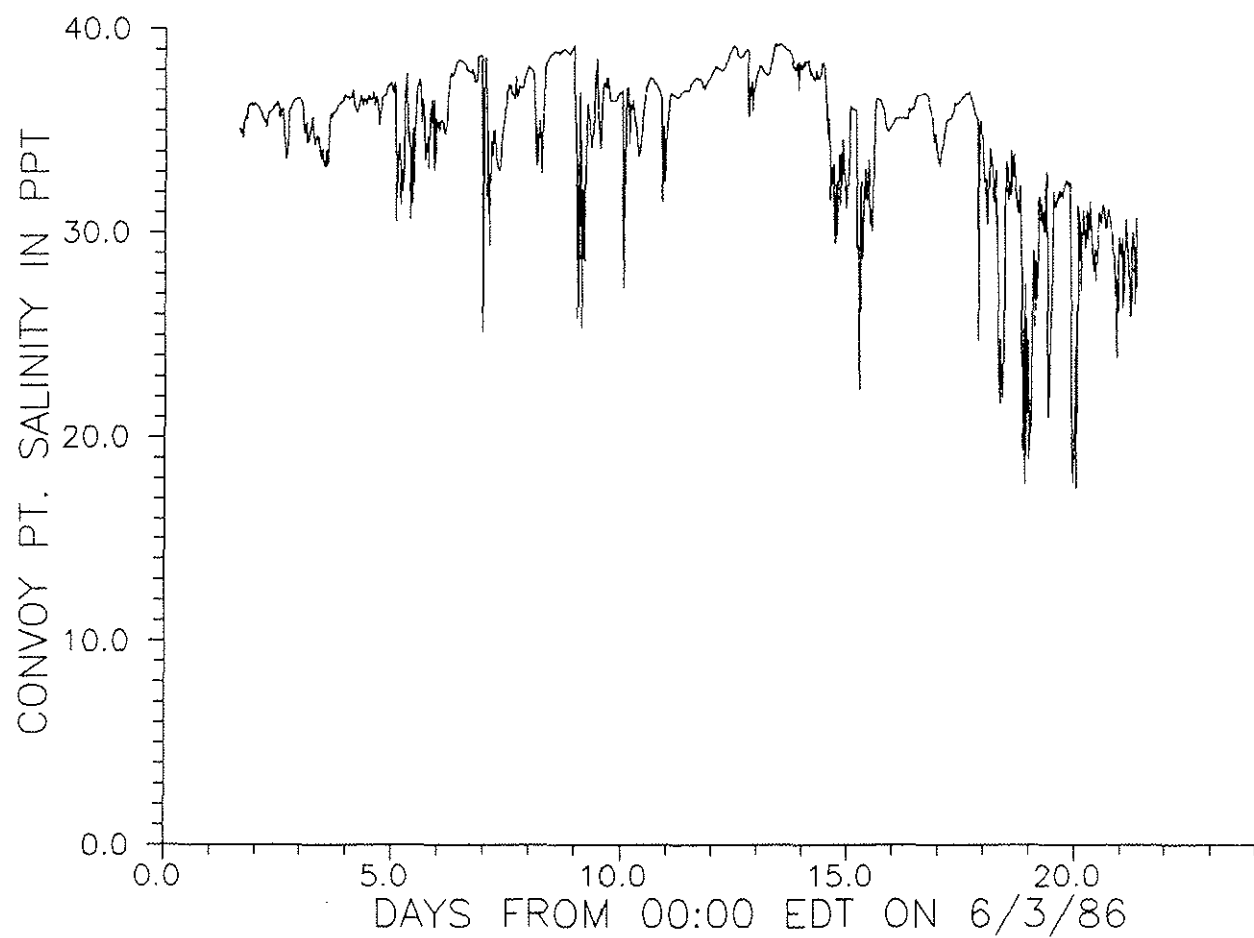
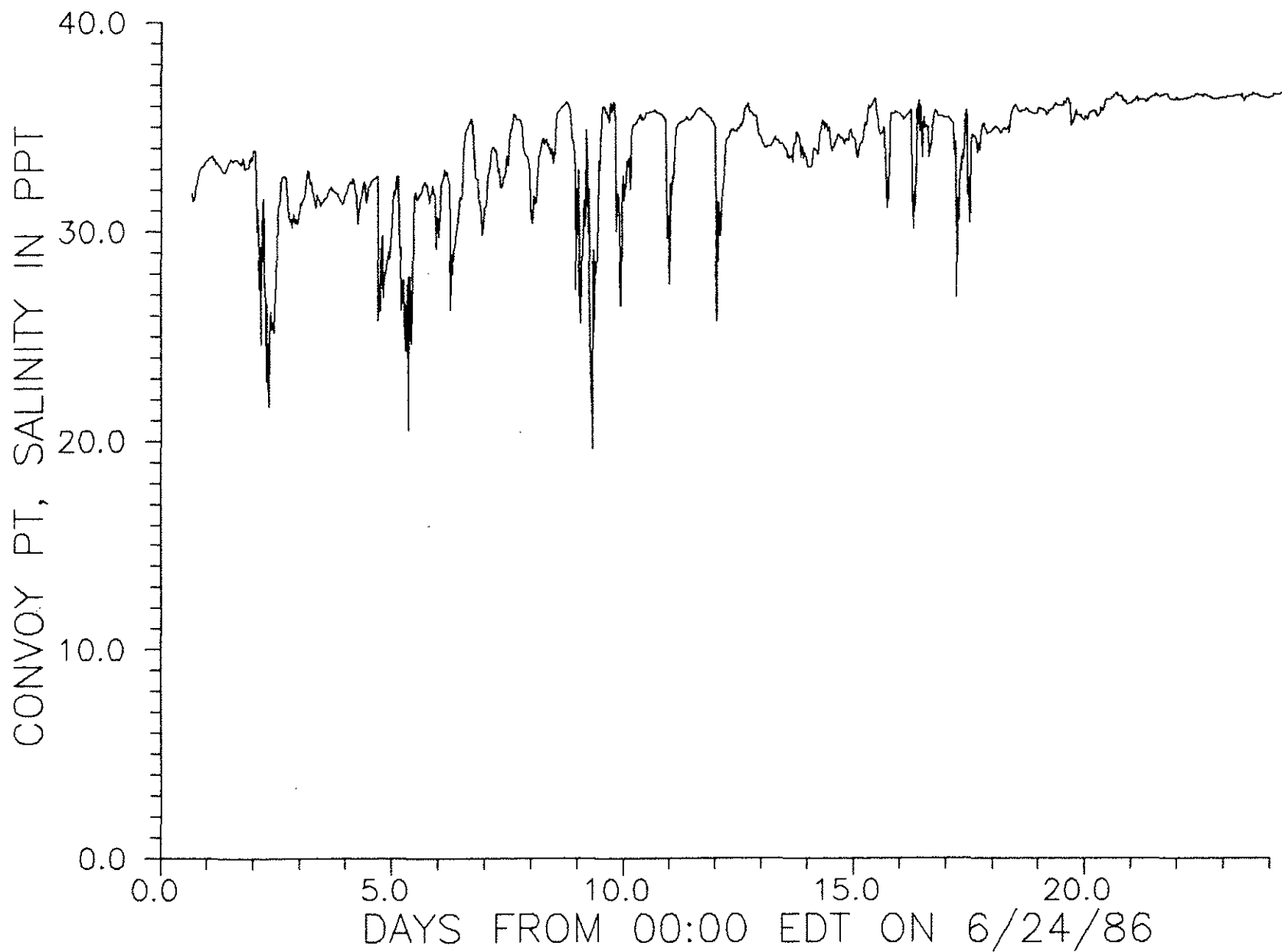


Figure 9. Salinity at Convoy Point, June 1986

Figure 10. Salinity at Convo Point, June-July 1986



Oscillations of 10 ppt over a few hours duration are frequent. The trends at Convoy Point (the instrument was located approximately 1000 m [1100 yds] NE of the Point) and Mowry Canal appear similar with some smoothing occurring at Convoy Point, as expected, due to advective and convective mixing. The record shown in Figure 9 suggests that the Bay is actually becoming saltier until 16 June. This may be due to more saline waters being transported into the Mowry Canal vicinity from adjacent areas or perhaps evaporation is having a significant local effect. After 16 June, salinities drop at both the Mowry Canal and Convoy Point stations.

Salinities at Fender Point (inside) and at the Turkey Point Channel Marker 8 station (outside) are compared in Figure 11. The fluctuations at Marker 8, which is located southeast of Mowry, are much reduced with the largest excursions of about 7 ppt. In addition, the trends at the two stations are dissimilar. A plausible explanation for these trends may be that the water at Marker 8 is more influenced by waters in the eastern part of the Bay or even by the proximity of the inlets (e.g. Caesar's Creek) to waters of the Straits of Florida, indicating a northward circulation.

Salinities measured inshore (Fig. 12) and 455 m (1500 ft.) offshore (Fig. 13) of Fender Point show frequently divergent trends. This is noteworthy and gives a strong indication that freshwater is trapped in a band near the shore and that cross-shore mixing is slow.

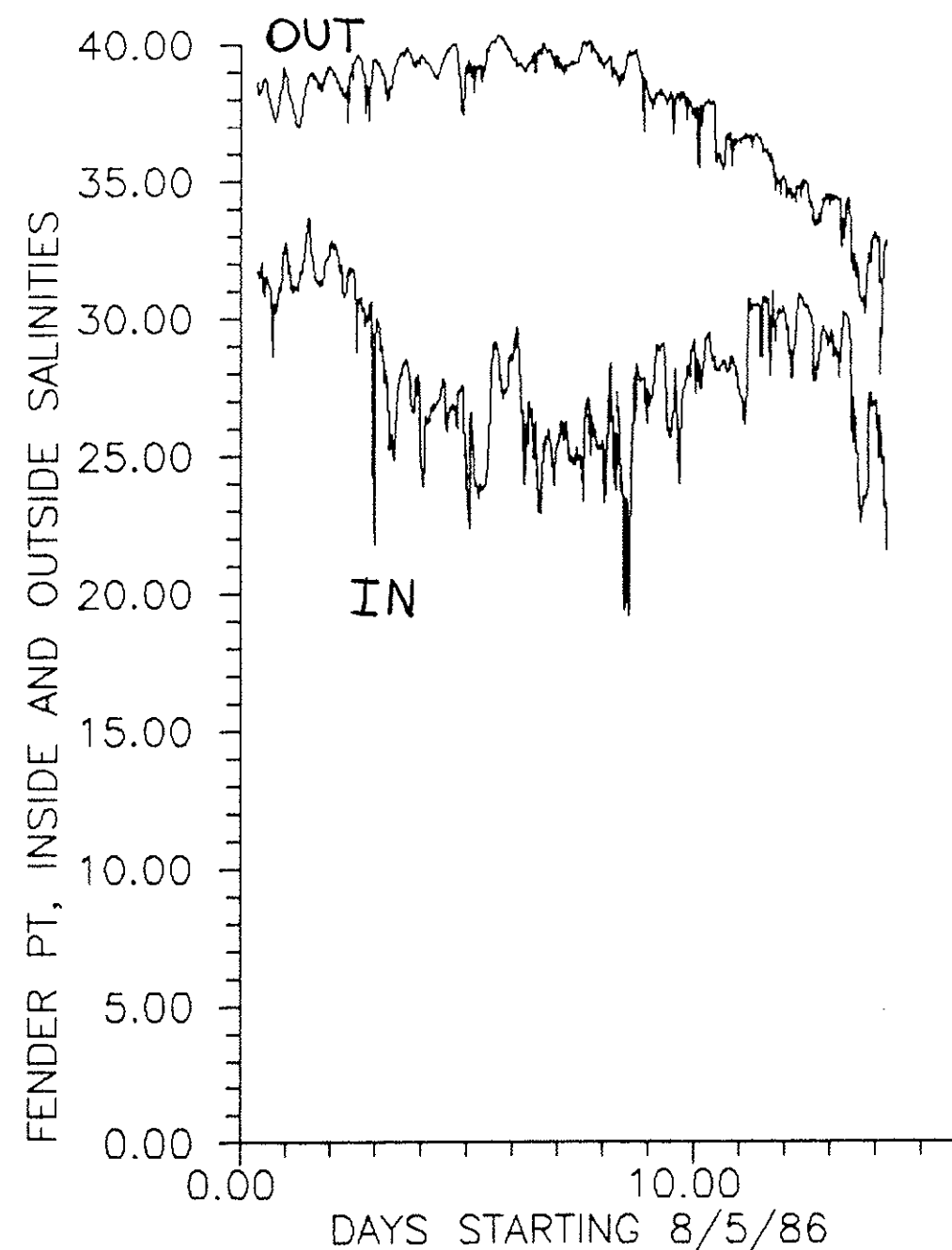


Figure 11. Salinity at Fender Point near coast (inside) and 455 m (1500 ft.) into the Bay (outside), August 1986

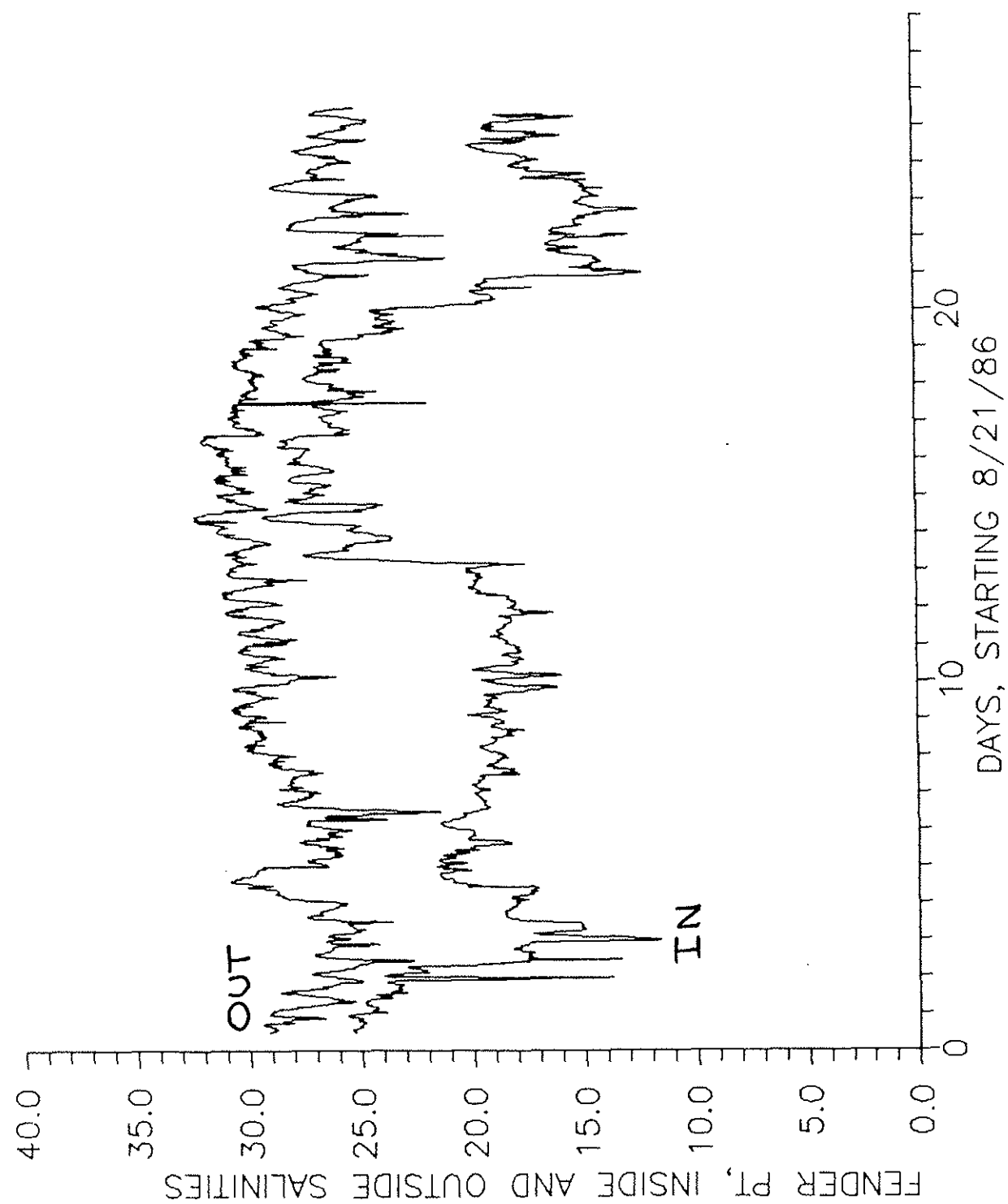


Figure 12. Salinity at Fender Point, August-September 1986

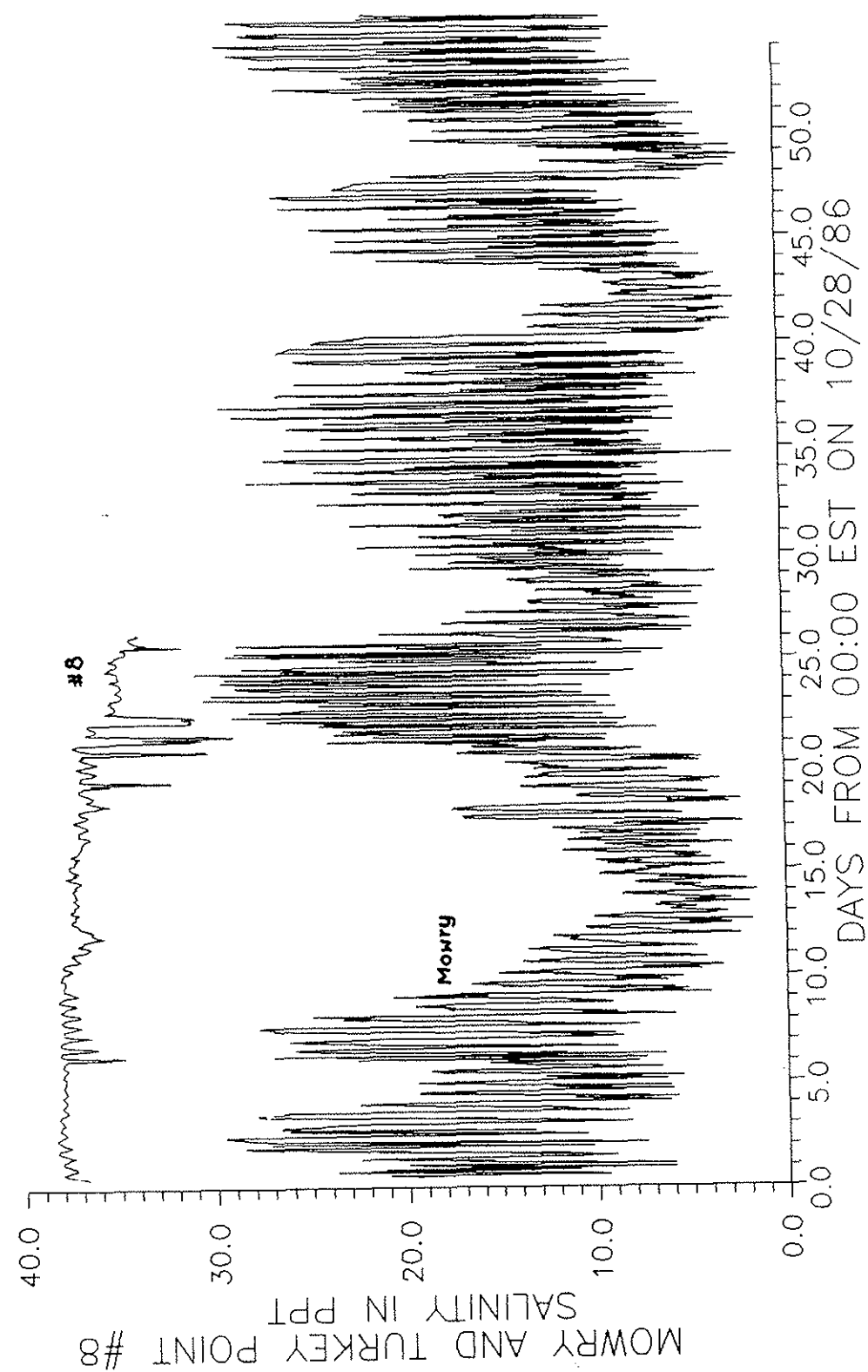


Figure 13. Salinity at Mowry Canal outlet and buoy #8 of the Turkey Point Channel, October-December 1986

CANAL DISCHARGE

The relationship between canal discharge and salinity in Mowry Canal is shown in the expanded plots in Figures 14 and 15. The discharge records are lacking or in error starting about 8 June to noon on 11 June. However, from then until 28 June, there is an obvious correlation between canal discharge and salinity drops. The canal discharges are implemented by an automatic control procedure which opens and closes the gates according to the difference between the up- and downstream stages.

Because of the astronomical tides in the Bay, dominated by the Principal Lunar semi-diurnal harmonic M_2 , it is expected that discharges will also exhibit M_2 periodicity. However, from the record it appears that periods of 3 to 5 hours are also involved (Figs. 14 and 15). In order to investigate whether other periods are prevalent, a fast Fourier transform of the Mowry Canal salinity data, beginning 3 June 1986 was calculated. A total of 1491 values at 20 minute intervals were used. The result is shown in Figure 16. The M_2 component, approximately 12.4 hours, is clearly evident. Other minor peaks are found at about 2, 4, and 6 hours. Thus, any secondary periodicity does not appear to be important.

Our data suggest that the lack of correlation found by Chin Fatt and Wang (1986) may be simply due to the high intermittency of canal discharge and salinity sampling variability inherent in the synoptic measurements. In fact, there appears to be quite good correlation between discharge and salinity at the opening of

MOWRY DISCHARGE IN CFS

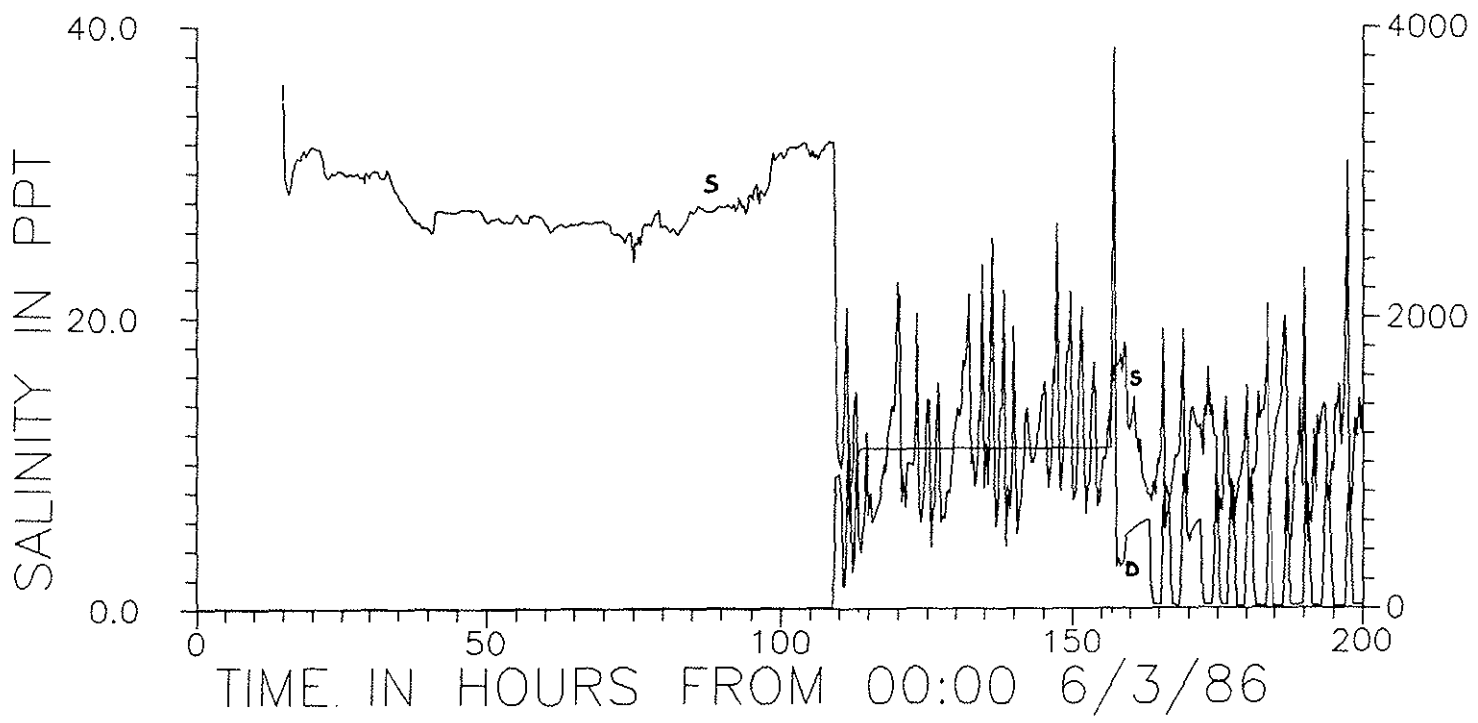


Figure 14. Expanded plot of Mowry Canal outlet salinity and discharge, June 1986

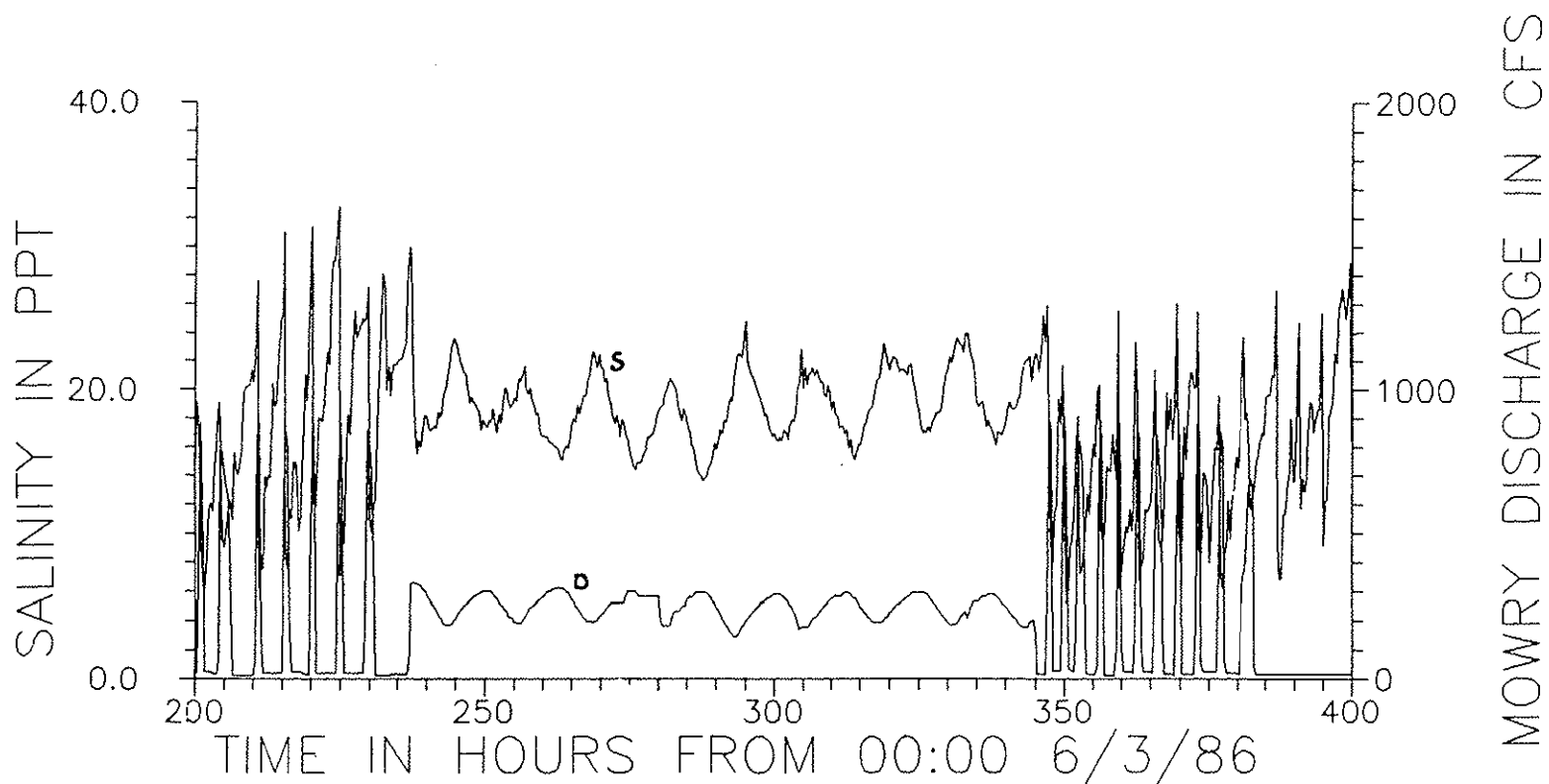
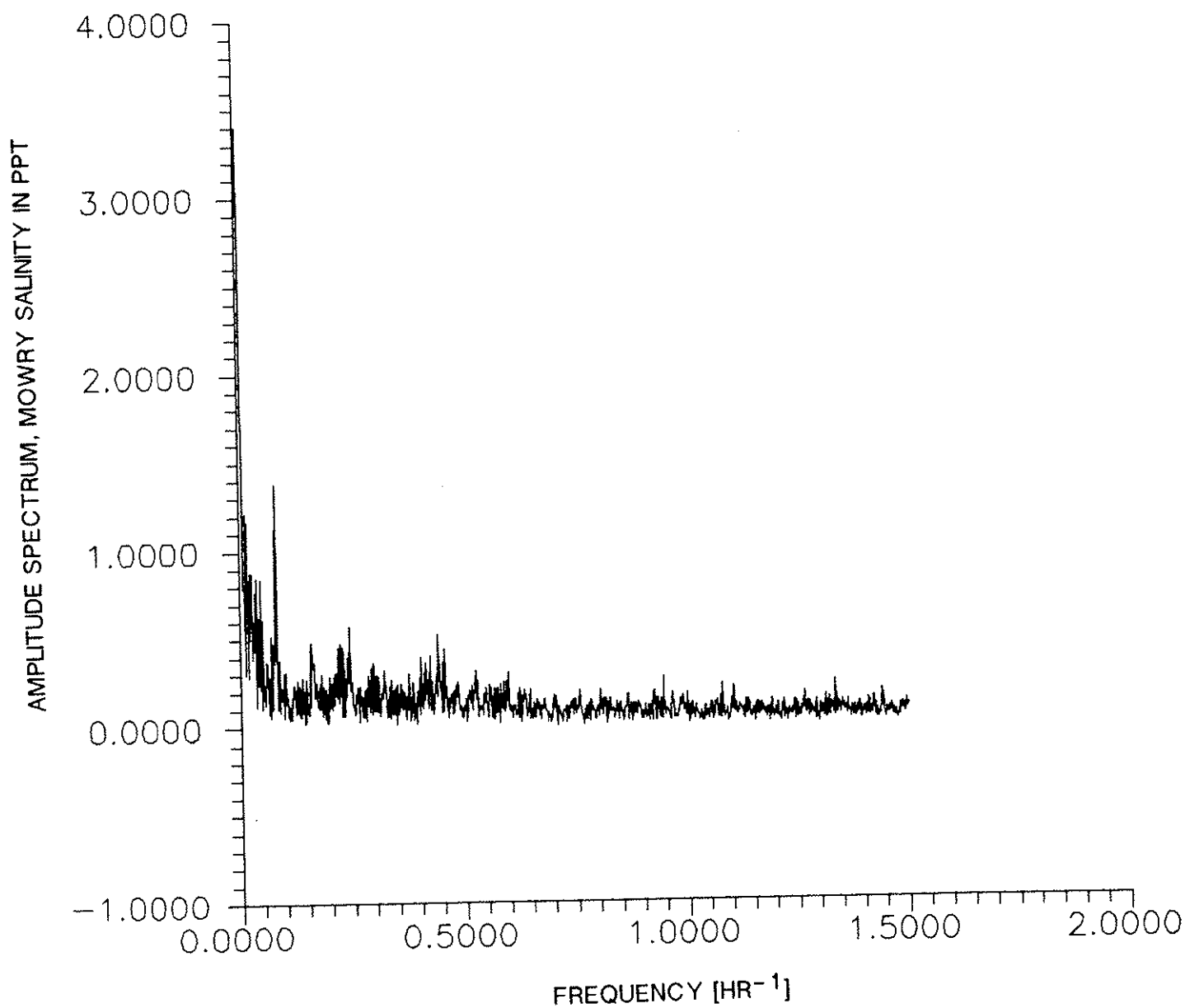


Figure 15. Expanded plot of Mowry Canal outlet salinity and discharge, June 1986

Figure 16. Amplitude spectrum of Mowry Canal salinity, June 1986



Mowry Canal. An example of this intermittency is provided by the record for Mowry Canal in November 1986 (Fig. 17) where the daily average values are shown for comparison.

The salinity at the opening of Mowry Canal drops precipitously when discharges begin on 7 June. It then takes the form of a downward concave curve which corresponds to the upward concave mean discharge record (Fig. 18). The discharge record is most likely in error for 8, 19, and 20 June (Chin Fatt and Wang, 1986). For the period of 24 June to 16 July, the trends in discharge (decreasing, Fig. 19) and salinity at Convoy Point (increasing, Fig. 10) are in agreement. Since there are a number of other canals in the vicinity of Mowry, it is useful to compare their discharges (Figs. 20-23). For further comparison, the daily average discharges for Snapper Creek (S-22) are shown in Figure 24, and for Cutler Drain (S-123) in Figure 25. The record from Cutler Drain has some highly questionable and large values at Julian days 161 and 189. Combined total discharges for north and south of Black Point and for the entire Bay are shown in Figure 26. Note that 1 June 1986 corresponds to Julian day 152. The decline in salinity observed at Convoy Point beginning 16 June (Julian day 167) is now clearly seen as a result of increased canal discharges, mainly in south Bay, and starting as much as 8 days earlier.

The daily average discharge in November, 1986 for all canals south of Black Point is shown in Figure 27. The relative distribution between canals is shown in Figures 28 and 29. The very large contribution from Military Canal is noteworthy and

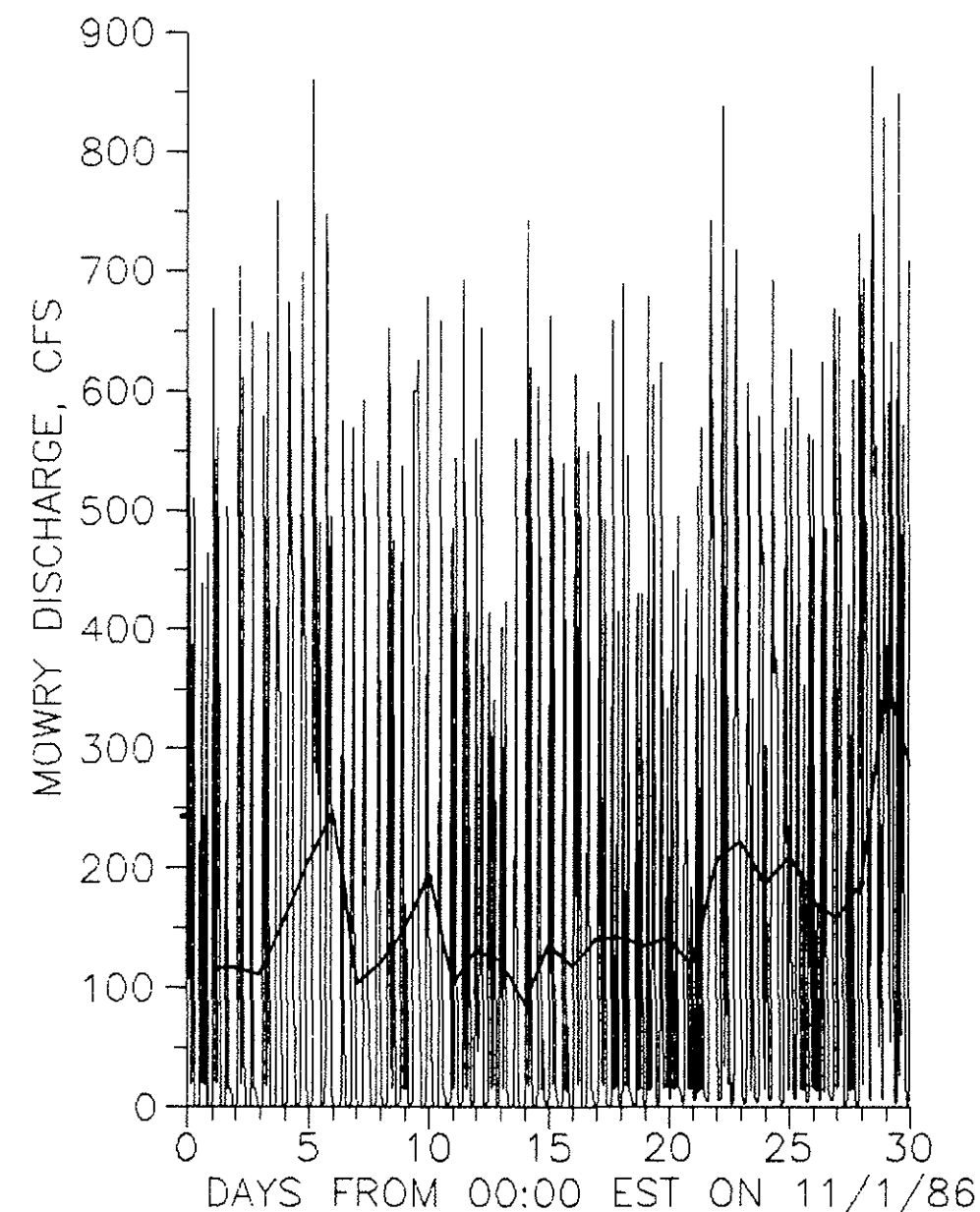


Figure 17. Mowry Canal discharge, instantaneous and daily average, November 1986

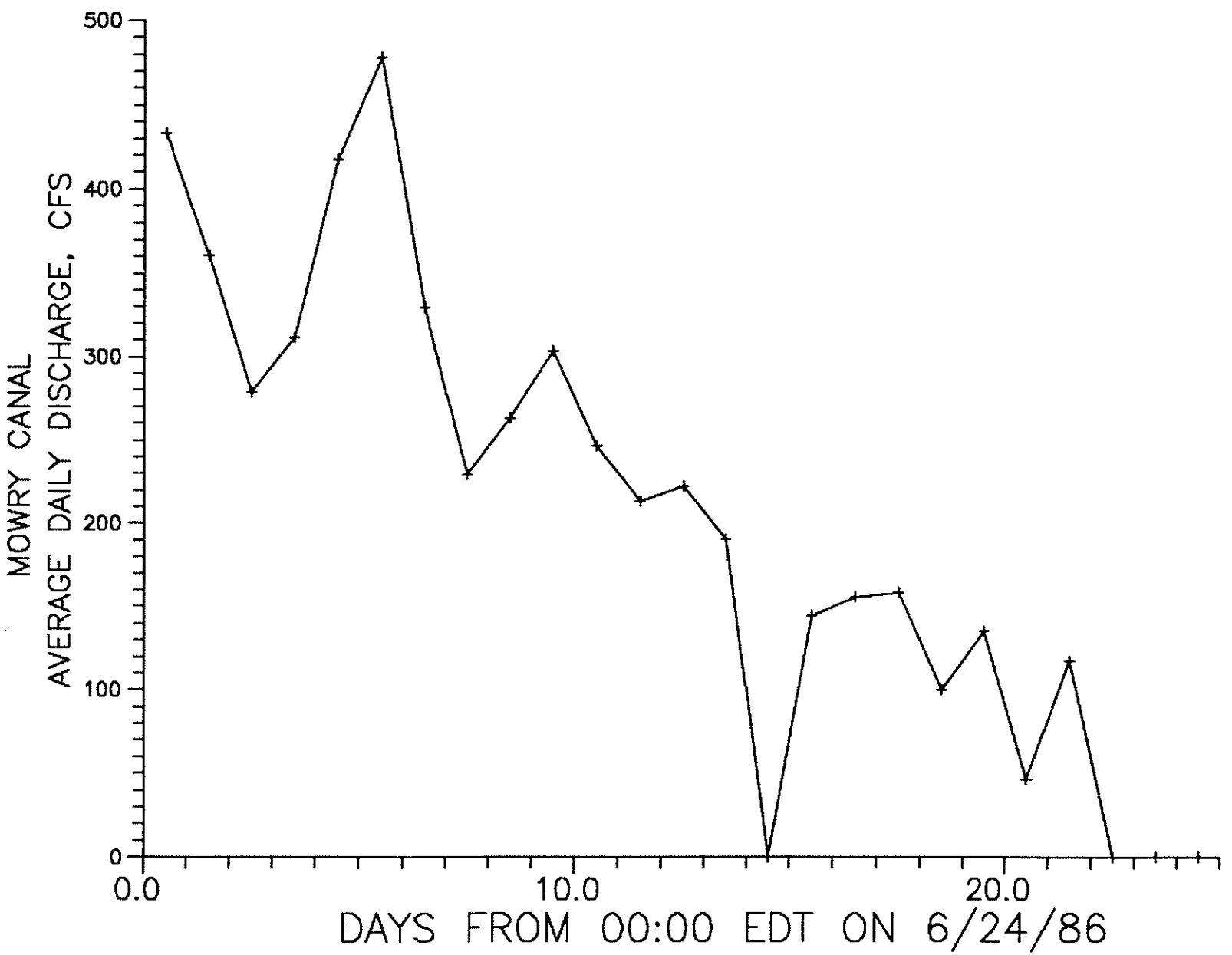
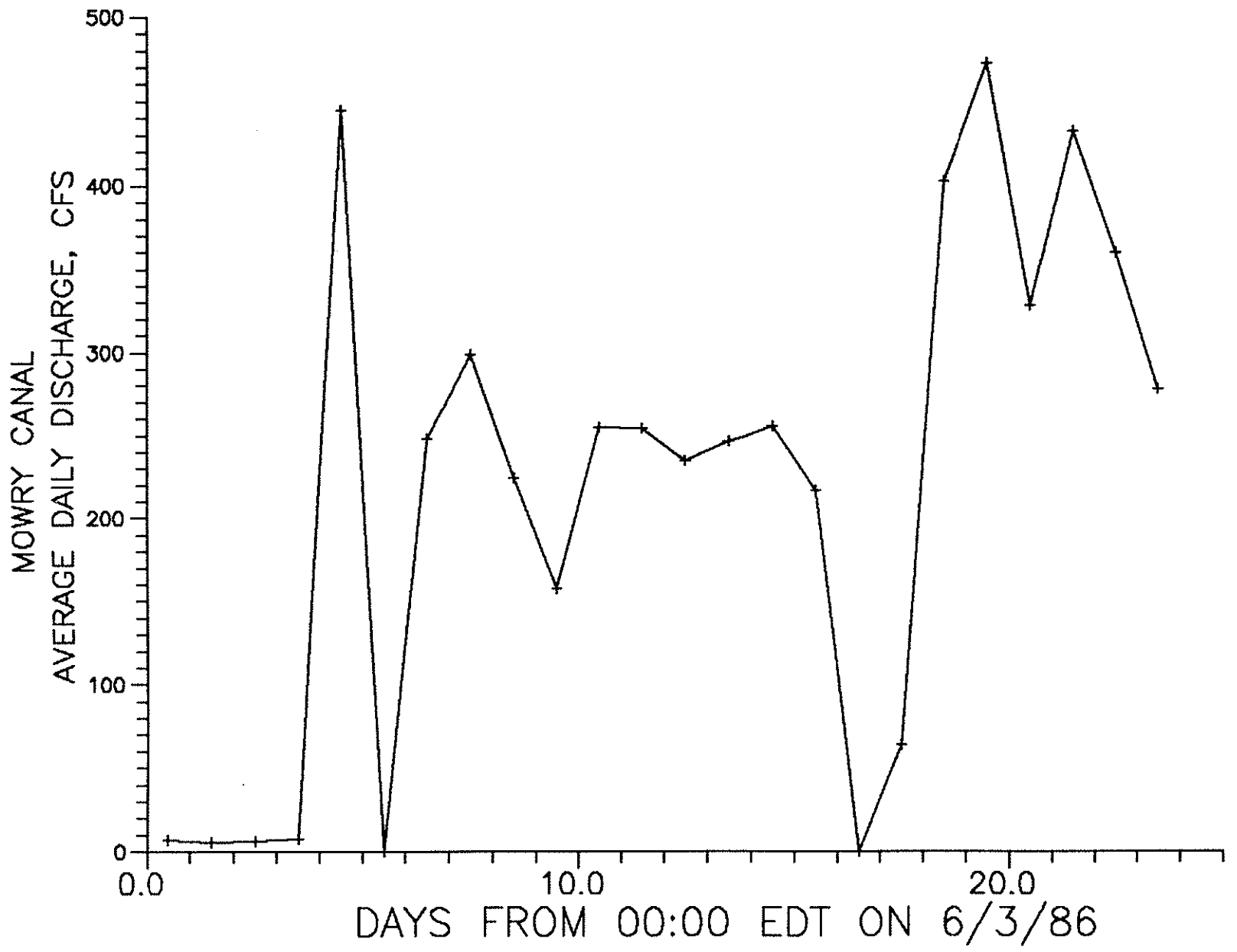


Figure 18. Mowry Canal, average daily discharge, June 1986

Figure 19. Mowry Canal, average daily discharge, June-July 1986

Figure 20. Mowry Canal, S-20F, daily discharge

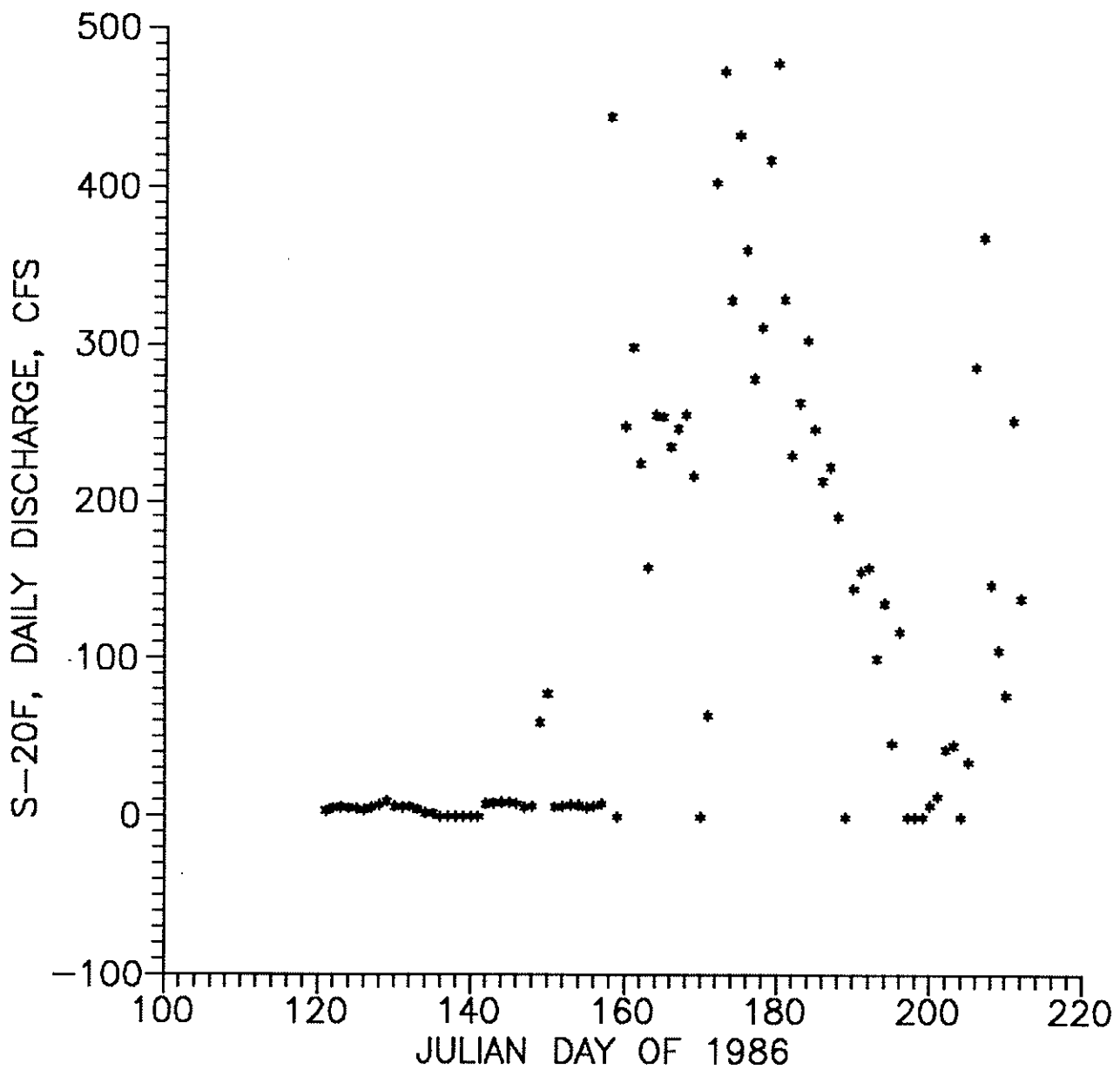


Figure 21. Black Creek, S-21 daily discharge

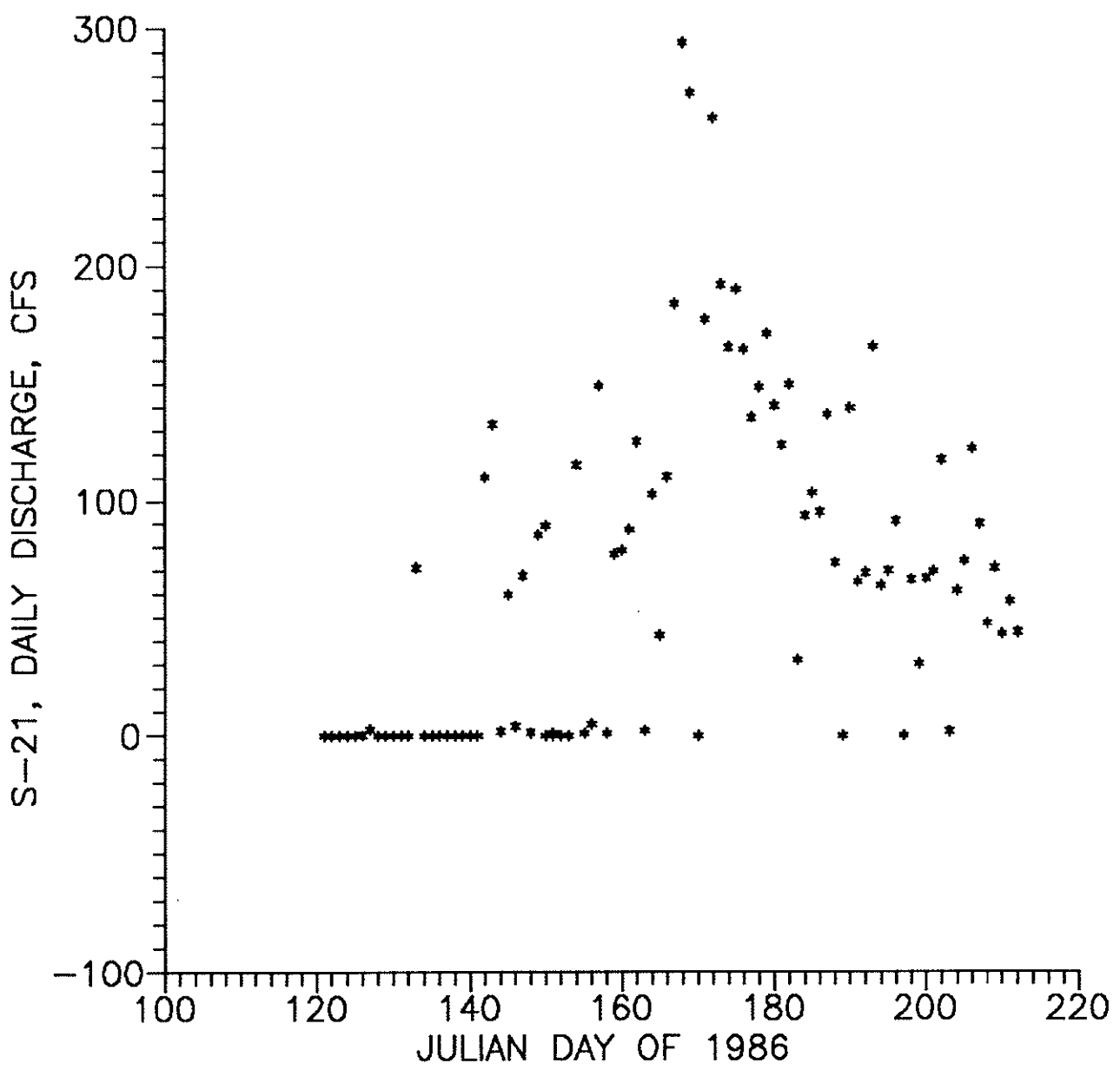


Figure 22. Moody Canal, S-20G, daily discharge

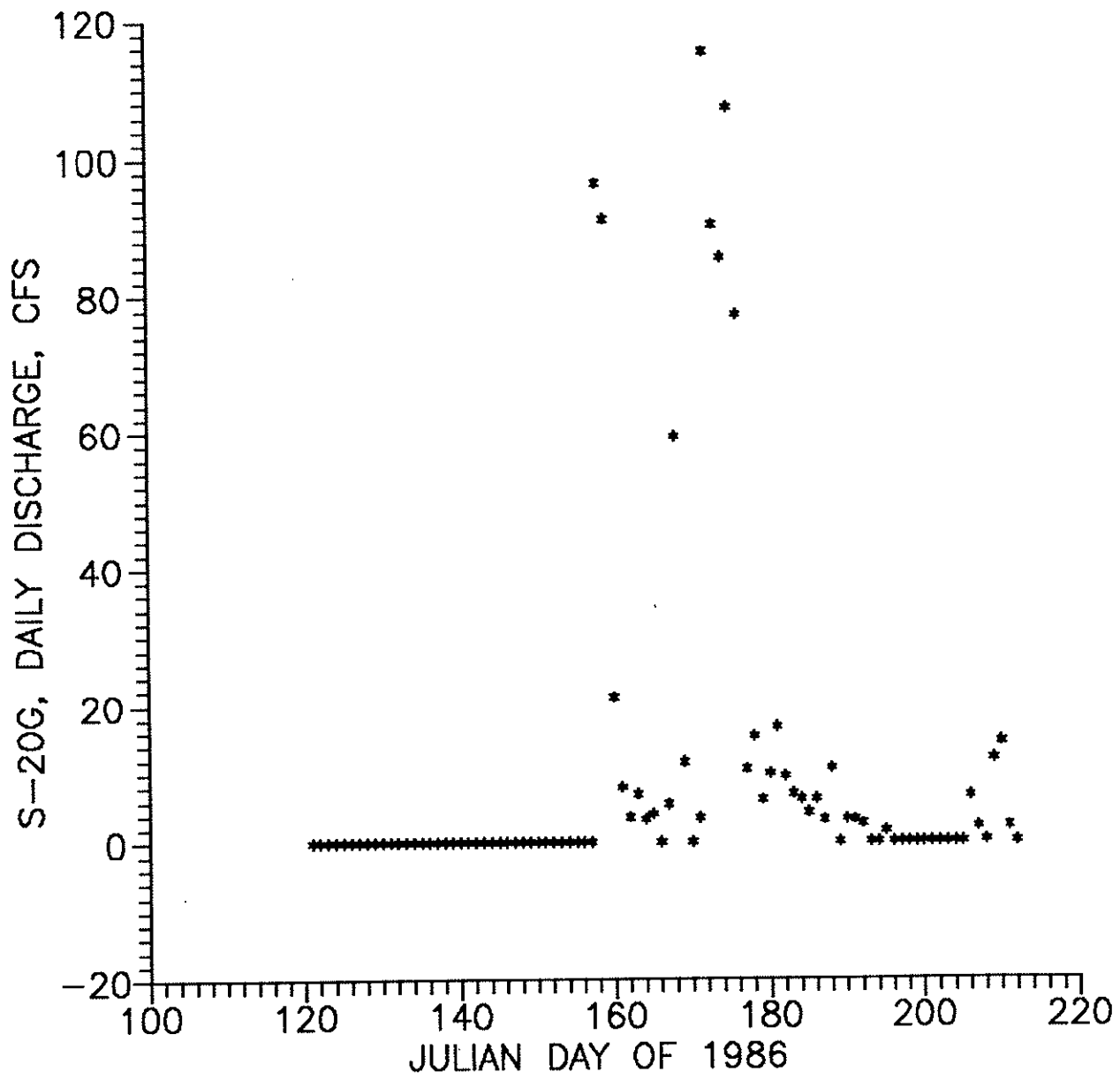


Figure 23. Military Canal, S-21A, daily discharge

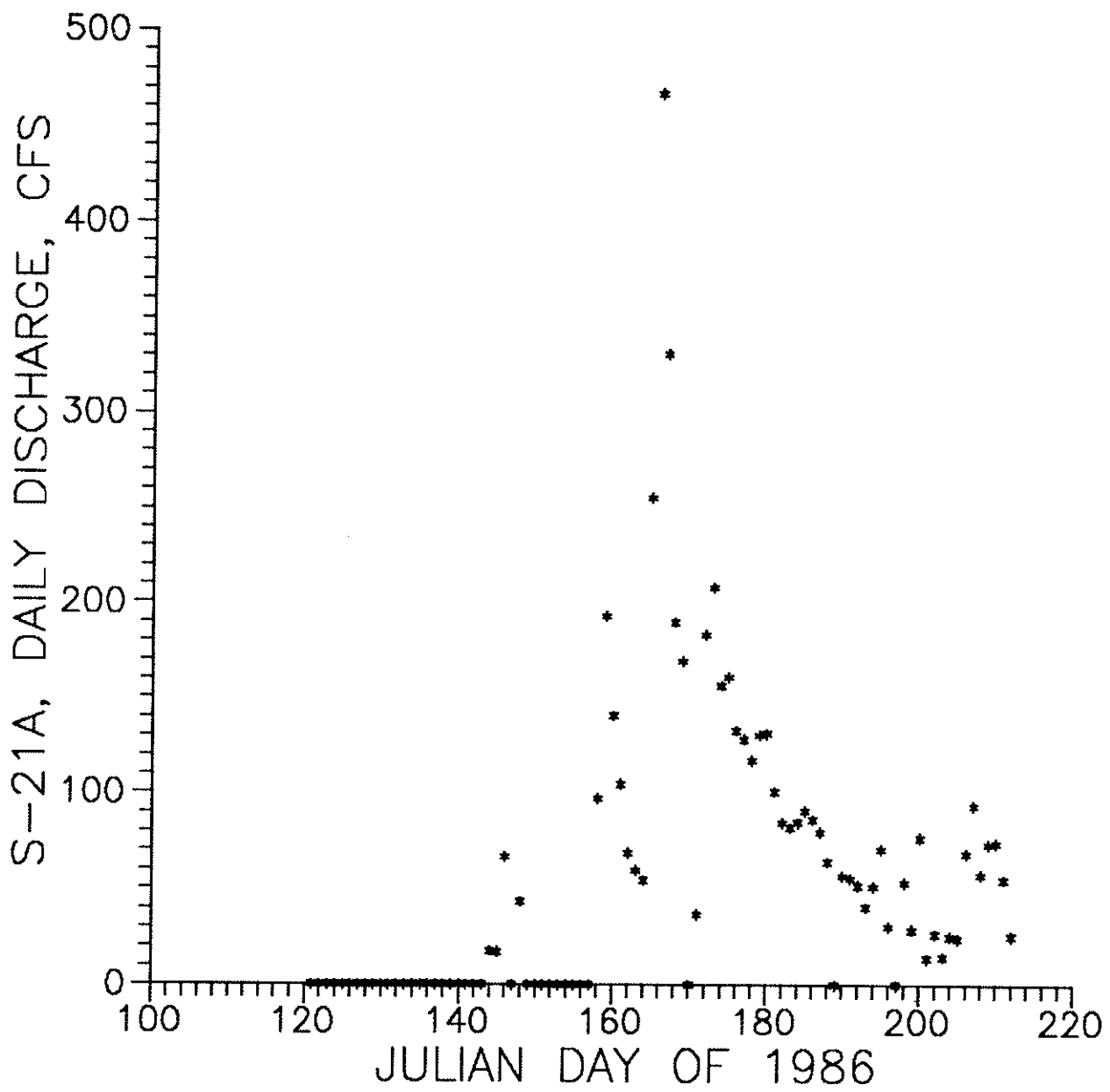


Figure 24. Snapper Creek, S-22, daily discharge

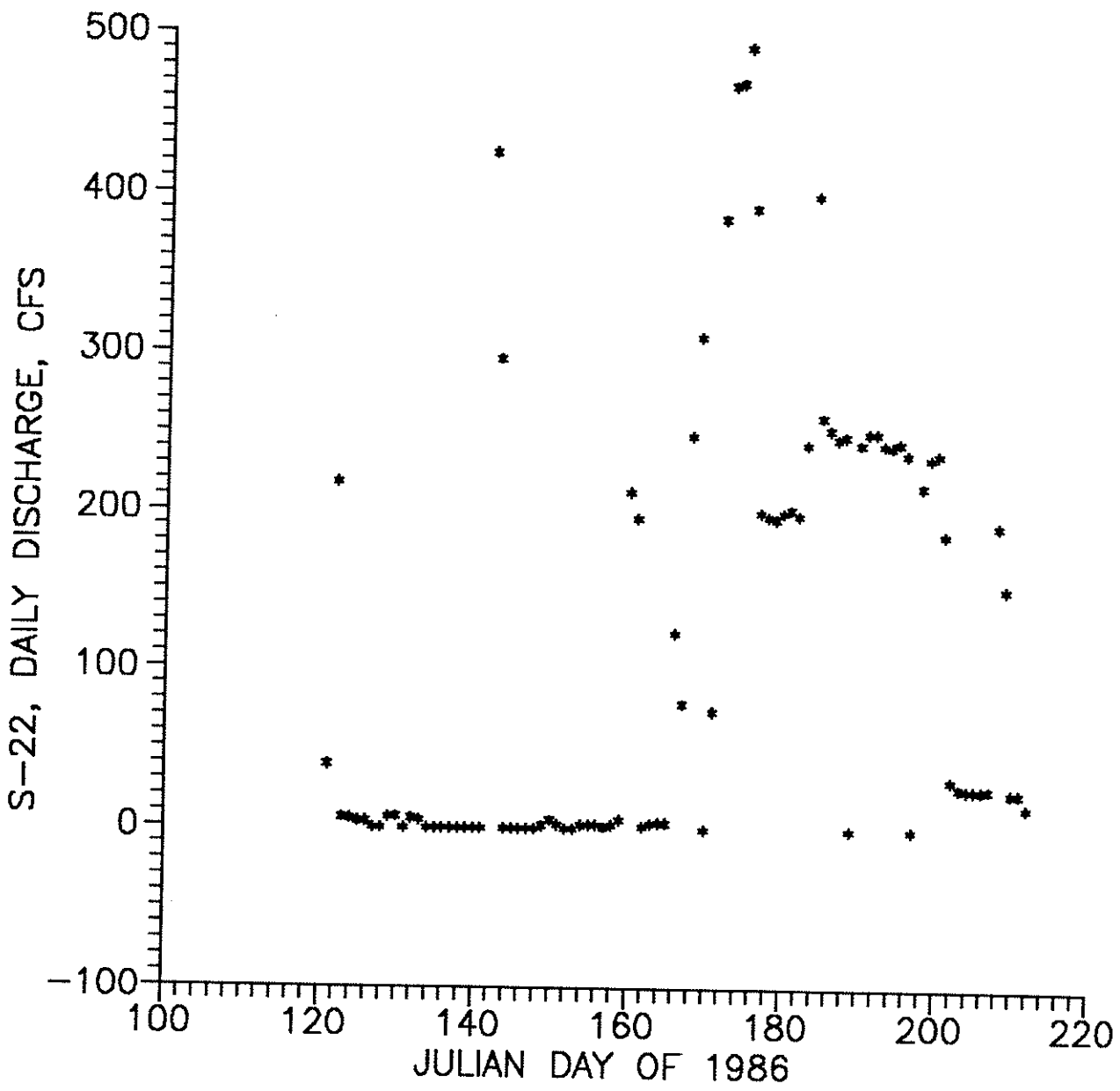


Figure 25. Cutler Drain, S-123, daily discharge

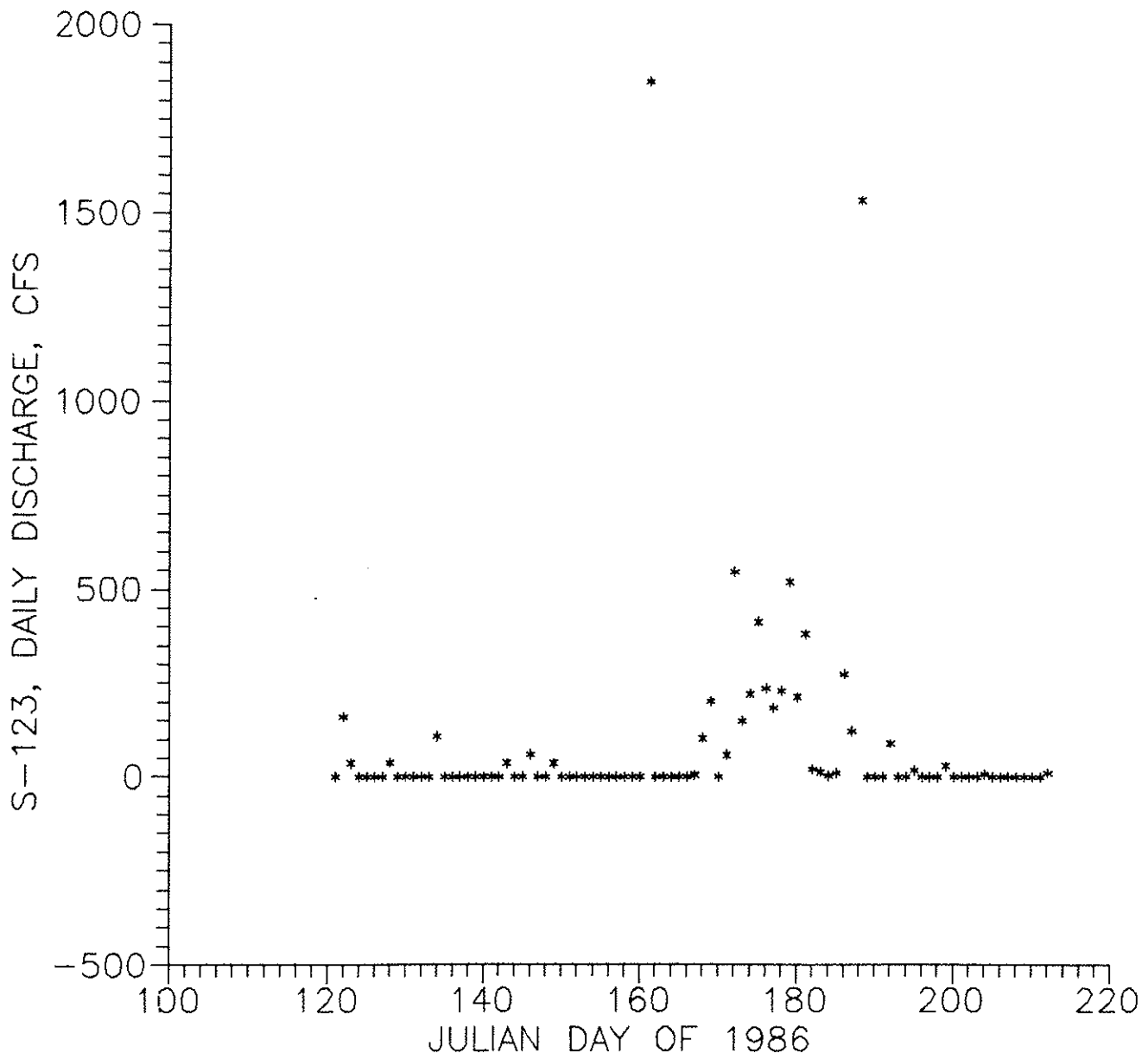
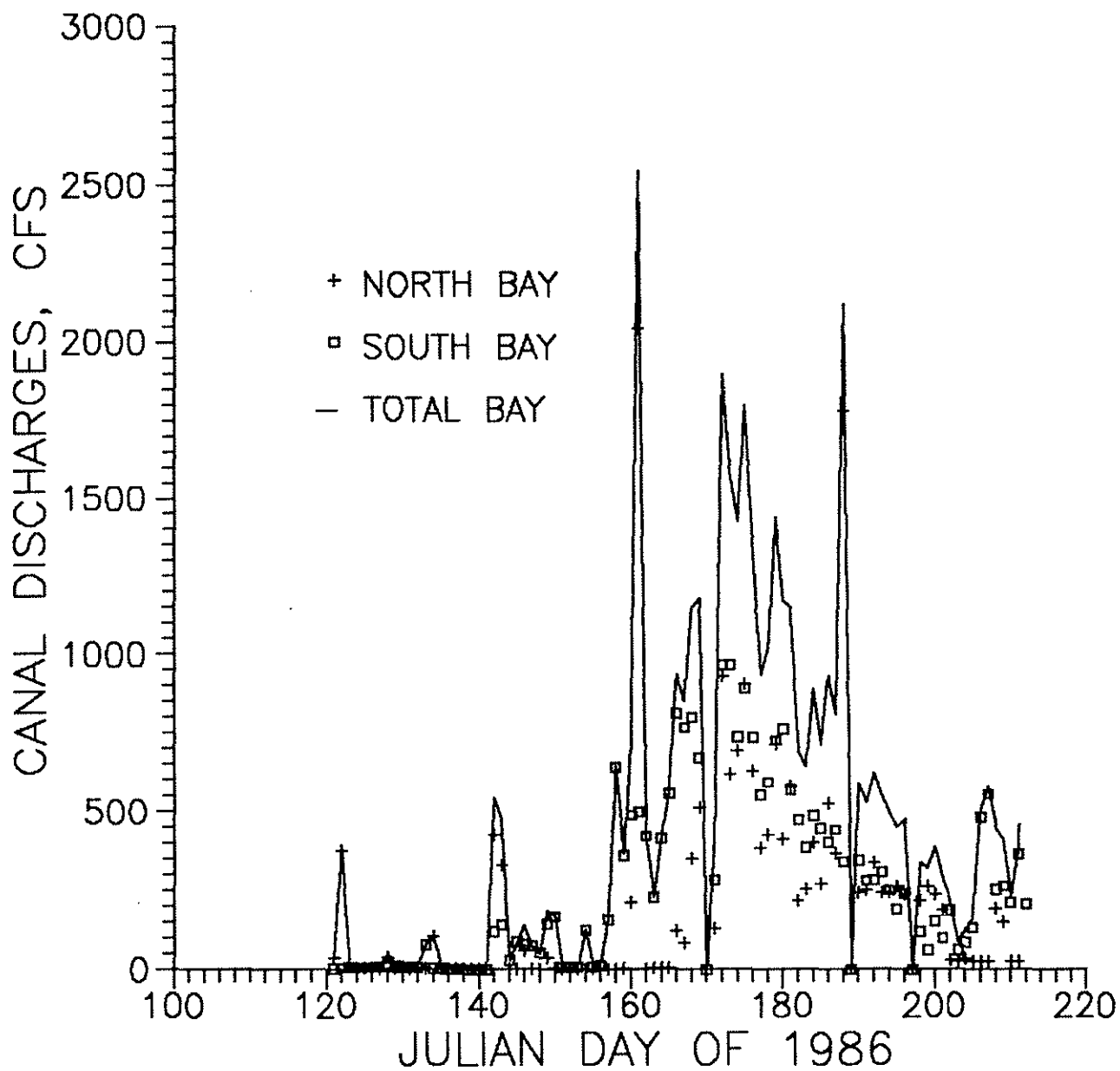


Figure 26. Daily discharge sums, North and South Bays, and total discharges



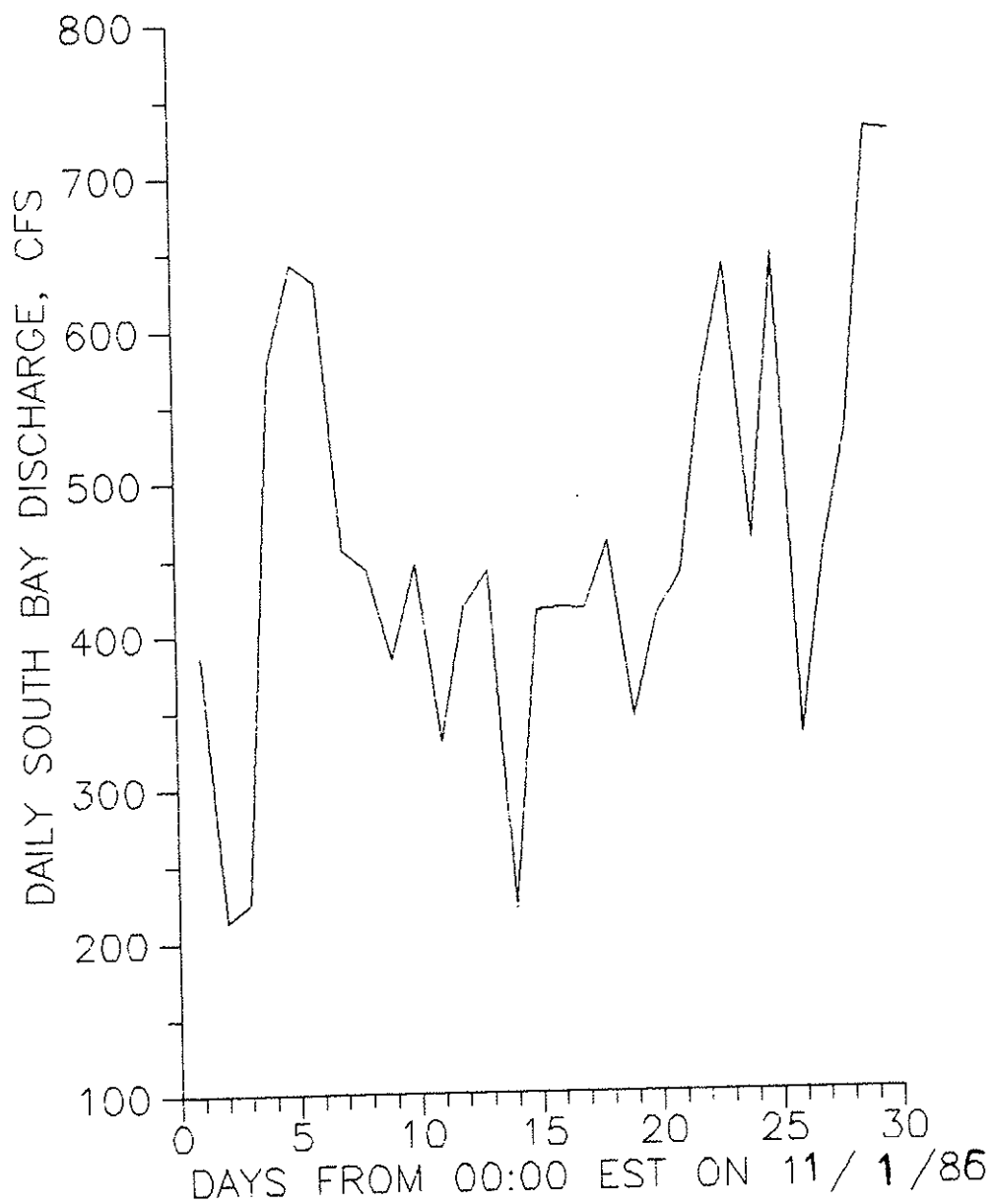


Figure 27. Daily total South Bay discharge, November 1986

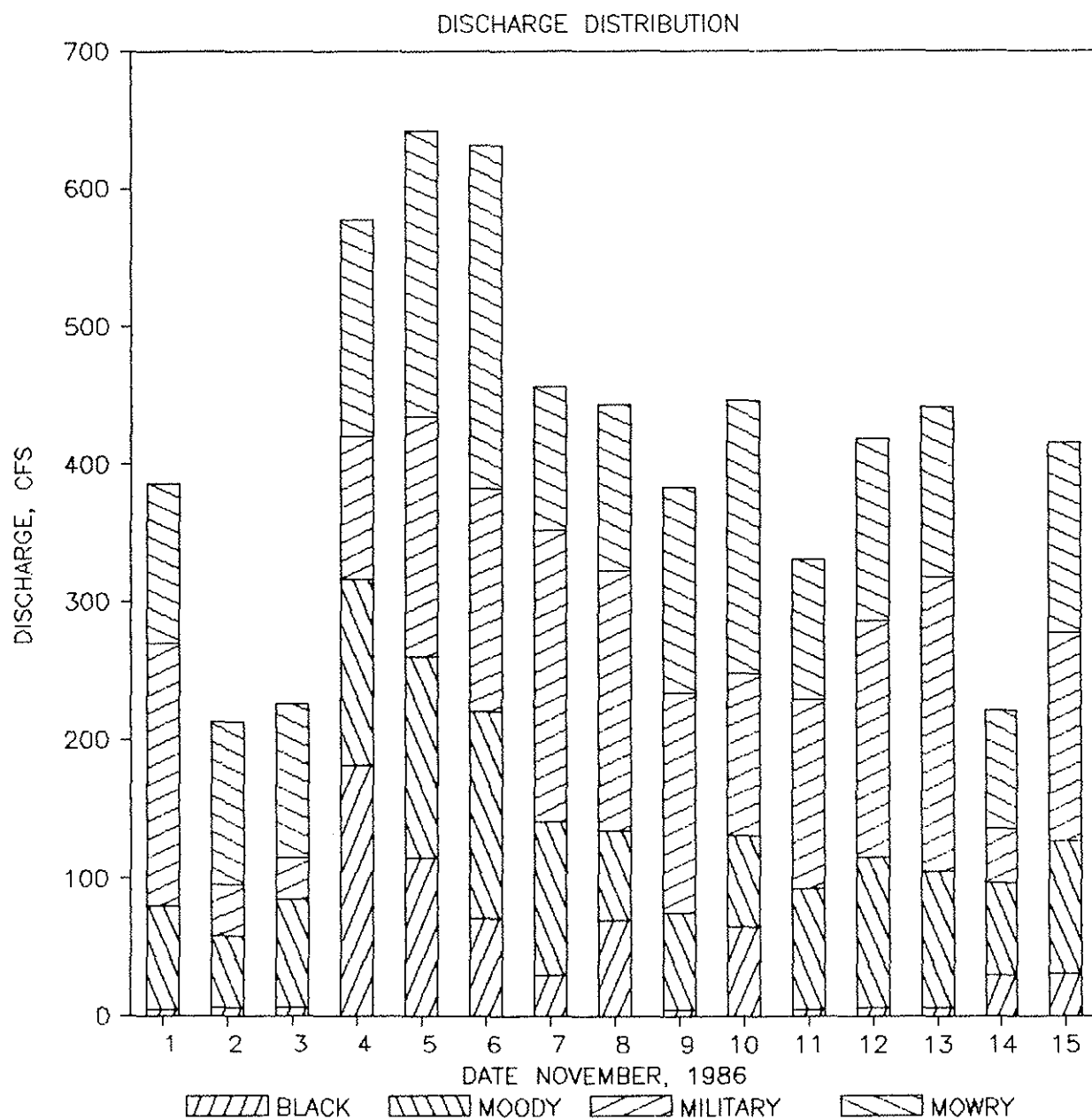


Figure 28. Relative discharge distribution between south Bay canals, 1 - 15 November 1986

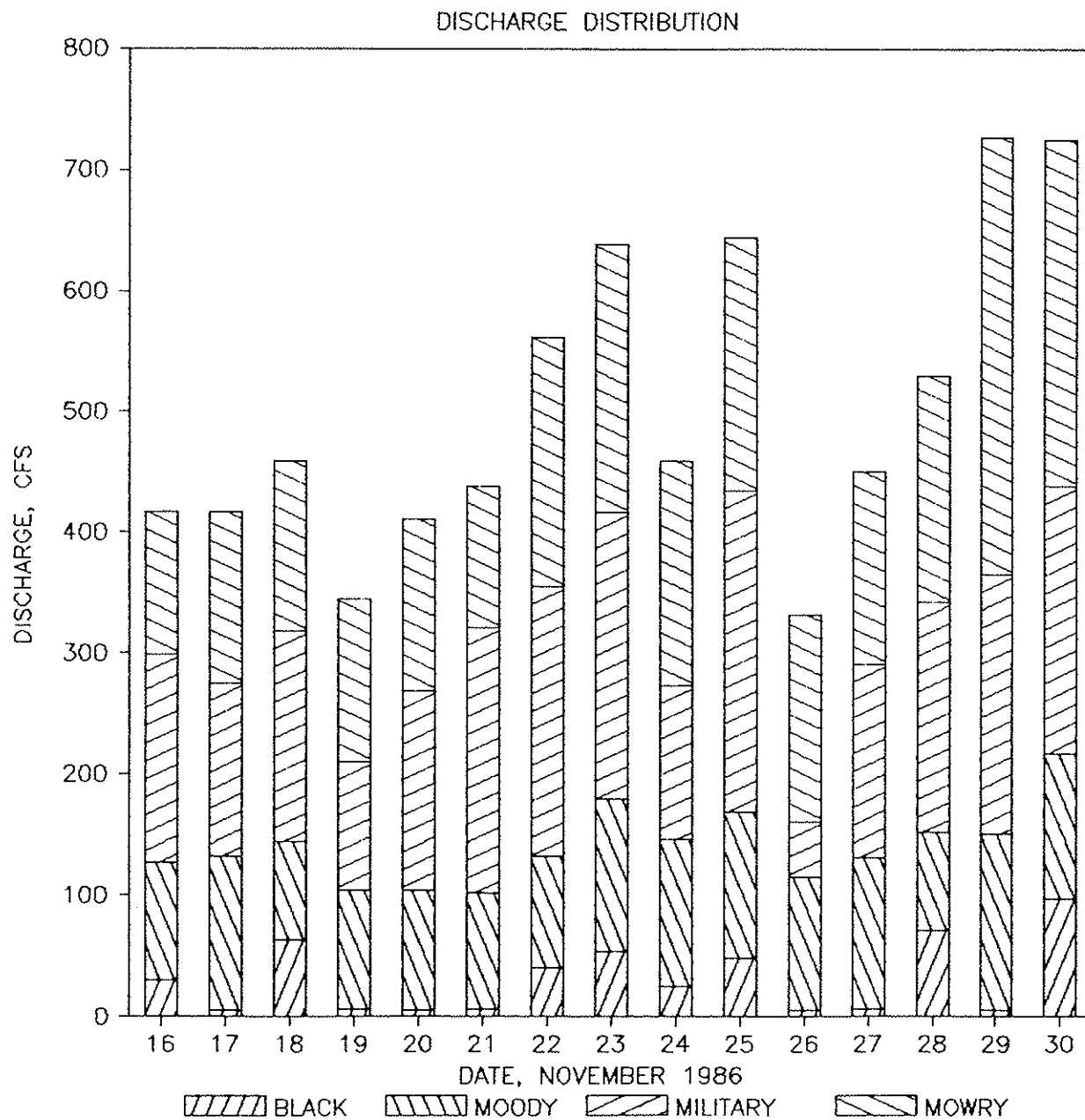


Figure 29. Relative discharge distribution between south Bay canals, 16 - 30 November 1986

appears to be a recent phenomenon. The large salinity fluctuations at both Mowry Canal and Convoy Point have not been observed at Markers 1, 1A, 3, and 4. It therefore appears that mixing processes taking place within the Bay are sufficiently strong to smooth out these sharp gradients.

PRECIPITATION

Large freshets (declines in salinity of 5-10 ppt with subsequent recovery within a few hours) are sometimes observed at one or a pair of Datasonde stations away from canal outlets. These include observations at Convoy Point (Figs. 9 and 10), Turkey Point Marker 8 (Fig. 13), Markers 3 and 4 (Fig. 4), and at Fender Point (Figs. 11 and 12). These data may indicate that patches of fresher water are formed by the canal discharges and transported, as discreet units, for some distances, or they may be due to local rainfall.

Using rainfall data obtained from SFWMD (Tables 2-15, Appendix 1) an attempt was made to identify relationships between the freshets and rainfall. No correlations were found and we attributed this to the patchiness of precipitation patterns. For example, a drop of 5 ppt occurred at the outside Fender Point station on 27 August 1986. No rain was recorded at the SFWMD rainfall gage stations in the immediate vicinity. Note that the large spike on 7 September is probably due to instrument error because it involved only a single 20 minute value. Areawide rainfall of about 2.5 cm (1 in.) on 17 August did not result in any particular drops in salinity at Fender Point. The larger

drops in salinity at Turkey Point Marker 8 from 17 to 22 November do not appear to be correlated with rainfall. However, the patchiness and sporadic nature of rainfall is illustrated by the records for November (Table 2). There was insignificant rainfall at all stations during the period of 17 to 22 November. The Homestead Field Station measured 3.6 cm (1.42 in.) of rainfall on 24 November. On 22 November, 7.0 cm (2.77 in.) of rainfall was recorded at S-20 (approximately 12 km south of Mowry Canal). Yet, on both of these days little or no rainfall was observed at the other watershed stations. Several centimeters of apparently areawide rainfall around 7 June did not result in any observable freshets at Convoy Point or Mowry Canal until canal discharge began. At Markers 3 and 4 freshets of only 2-3 ppt (due to proximity to the Straits of Florida) occurred on 20 February, 16 and 22 March 1986. Heavy and patchy rainfall did occur around these dates, but direct correlation could not be established.

A rough estimate of the order of magnitude change in salinity expected from rainfall can be made, assuming complete mixing in the top 33 cm (1 ft.) surface layer. Using characteristic values (English System of units) of rainfall, $R = 2$ in; salinity, $s = 30$ ppt; and depth, $d = 1$ ft., gives:

$$(d + R) s(\text{new}) = d s(\text{old})$$

OR

$$(1 + 0.167) s(\text{new}) = 1 (30)$$

the resulting salinity $s(\text{new}) = 25.7$ ppt, and the salinity drop

is 4.3 ppt.

The freshwater will tend to stay on top of the saltwater and spread horizontally. Wind and waves promote turbulent mixing reducing the vertical salinity gradient. Usually vertical turbulent mixing and tidal flushing will eliminate gradients in a short time.

Measurements rarely show sustained variations of salinity except in the immediate vicinity of the canals. It appears that heavy rainfall could cause local drops in salinity of as much as 5-10 ppt, however, the patchiness and the intensity of such event make it difficult to verify such drops. In order to confirm this hypothesis, a time based, simultaneous record of rainfall and salinity should be made.

SEASONAL STATISTICS AND MAPPING

Management of Biscayne Bay aquatic resources requires the formulation and application of water quality models to assess actual and potential adverse impacts on the resources. One step toward this goal was the salinity model described in Chin Fatt and Wang (1986). Baseline data are an important component of the development and use of these models and are also critical to any long-term monitoring of the waters of Biscayne Bay and Biscayne National Park.

Generally, the salinity distribution within the Bay varies

considerably during the wet and dry seasons and is dependent on freshwater inflow, evaporation, and advective transport and mixing. Salinity and temperature are important parameters for many biological and chemical processes in estuarine waters. A quantitative knowledge of seasonal and shorter term variations in these parameters can improve the accuracy of predicting such processes and assist in evaluating the impacts of future developments on Biscayne Bay and its resources.

The large historic data set of salinity and temperature collected by the National Park Service (Nnaji, 1987) from 1971 to 1984 and by Dade County (Department of Environmental Resources Management) from 1979 to 1985 was statistically analyzed to provide a summary of expected ranges, minimum, and maximum values. Dade County station locations are not coincident with National Park Service stations, but use the same station numbering scheme. This conflict was resolved in the present work by adding 100 to the Dade County station numbers. In our analysis, the data were divided into four seasons: January - March, April - June, July - September, and October - December. Statistics consisting of minimum, maximum, mean, standard deviation, and number of observations were then compiled.

SALINITY

Statistics for salinity are presented in Table 16. The National Park database contained several points where the temperature and conductivity exceeded the high range of the instrumentation. For these samples, a salinity of 42 ppt was assigned.

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
2	1	1.20	30.20	18.59	8.69	21.00
2	2	.30	39.00	15.40	12.16	31.00
2	3	.30	37.30	9.50	10.94	27.00
2	4	.20	22.60	7.62	7.52	24.00
4	1	4.30	34.00	20.34	7.71	24.00
4	2	.90	34.70	19.15	10.34	28.00
4	3	1.20	36.30	16.08	10.16	26.00
4	4	1.30	21.70	11.60	7.32	24.00
6	1	2.10	36.70	22.59	9.12	31.00
6	2	1.80	40.00	25.99	10.94	28.00
6	3	3.90	39.30	24.30	9.88	27.00
6	4	1.20	26.60	12.22	8.41	24.00
7	1	21.90	36.70	28.47	3.78	22.00
7	2	19.90	39.00	32.86	4.35	23.00
7	3	17.50	40.60	29.27	7.17	17.00
7	4	12.70	29.10	21.66	4.61	17.00
8	1	19.90	36.40	28.14	3.79	23.00
8	2	19.70	38.00	31.54	5.26	28.00
8	3	10.10	39.90	26.93	7.74	24.00
8	4	13.60	30.10	22.19	4.27	21.00
10	1	26.50	37.60	34.60	4.20	5.00
10	2	35.60	35.60	35.60	35.60	1.00
10	3	50.00	.00	.00	.00	.00
10	4	50.00	.00	.00	.00	.00
11	1	18.00	38.70	27.21	5.02	37.00
11	2	15.20	42.00	28.92	7.02	44.00
11	3	5.20	38.10	21.67	7.59	37.00
11	4	5.00	31.30	20.80	5.44	35.00
12	1	29.40	33.70	31.29	1.25	7.00
12	2	22.30	39.00	30.90	5.64	9.00
12	3	17.10	31.90	26.77	4.42	9.00
12	4	25.00	30.70	27.93	2.04	7.00
13	1	31.00	34.30	32.67	1.20	6.00
13	2	26.20	39.20	33.19	4.46	9.00
13	3	22.70	32.00	29.37	2.88	7.00
13	4	28.30	30.60	29.52	.81	5.00
14	1	33.50	38.40	34.90	1.40	10.00
14	2	32.00	39.40	35.58	2.39	12.00
14	3	31.60	34.80	33.60	1.02	7.00
14	4	32.20	33.80	32.86	.66	5.00
15	1	30.00	37.70	33.56	2.28	37.00
15	2	19.50	40.00	36.16	3.61	43.00
15	3	20.40	39.60	33.34	4.55	35.00
15	4	25.50	36.70	31.65	2.79	35.00
16	1	50.00	.00	.00	.00	.00
16	2	35.20	37.50	36.35	1.15	2.00
16	3	50.00	.00	.00	.00	.00
16	4	50.00	.00	.00	.00	.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
18	1	33.30	37.50	35.67	1.04	27.00
18	2	34.00	39.60	36.95	1.14	32.00
18	3	20.40	39.00	34.57	4.14	29.00
18	4	29.40	37.30	34.24	1.71	30.00
19	1	34.20	37.10	35.96	.75	23.00
19	2	35.30	42.00	36.92	1.29	27.00
19	3	19.60	38.30	34.67	4.61	23.00
19	4	31.10	42.00	34.91	2.12	22.00
20	1	24.20	24.20	24.20	24.20	1.00
20	2	50.00	.00	.00	.00	.00
20	3	50.00	.00	.00	.00	.00
20	4	50.00	.00	.00	.00	.00
21	1	19.60	37.70	28.69	4.60	37.00
21	2	16.80	42.00	31.58	6.24	40.00
21	3	10.80	40.40	26.29	7.39	37.00
21	4	8.40	26.80	22.16	4.40	35.00
22	1	30.90	35.10	32.88	1.59	6.00
22	2	23.90	39.10	33.20	4.40	9.00
22	3	27.50	34.00	31.11	2.23	7.00
22	4	24.00	29.90	27.86	2.06	5.00
23	1	32.60	35.80	34.47	1.25	6.00
23	2	33.00	39.30	35.33	2.27	7.00
23	3	31.70	34.50	33.39	1.05	7.00
23	4	24.30	31.90	30.06	2.91	5.00
24	1	33.20	38.50	35.85	1.33	10.00
24	2	34.50	39.40	36.46	1.53	9.00
24	3	33.30	36.10	34.67	1.05	7.00
24	4	32.50	35.50	33.68	1.01	5.00
25	1	30.60	39.20	33.97	2.15	33.00
25	2	31.30	40.00	36.60	2.11	35.00
25	3	2.80	39.10	32.68	6.68	36.00
25	4	22.80	37.00	31.52	3.23	34.00
26	1	34.50	37.30	36.35	.89	6.00
26	2	34.80	39.60	37.17	1.45	6.00
26	3	34.90	36.70	35.74	.56	7.00
26	4	34.40	35.60	35.16	.40	5.00
27	1	32.30	37.80	35.23	2.10	4.00
27	2	36.30	36.30	36.30	36.30	1.00
27	3	50.00	.00	.00	.00	.00
27	4	50.00	.00	.00	.00	.00
28	1	33.40	37.70	35.74	1.17	31.00
28	2	34.20	40.10	37.34	1.36	31.00
28	3	20.60	39.00	34.85	4.27	28.00
28	4	31.00	37.40	34.15	1.71	30.00
29	1	33.60	37.20	35.93	1.02	26.00
29	2	34.40	40.10	36.80	1.17	27.00
29	3	20.10	38.70	34.86	4.60	23.00
29	4	30.80	36.90	34.47	1.60	26.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
30	1	28.40	28.40	28.40	28.40	1.00
30	2	50.00	.00	.00	.00	.00
30	3	50.00	.00	.00	.00	.00
30	4	50.00	.00	.00	.00	.00
31	1	19.30	37.00	29.55	4.21	39.00
31	2	14.40	42.00	32.31	7.07	41.00
31	3	16.30	40.00	29.24	6.67	36.00
31	4	6.30	32.00	21.76	6.39	35.00
32	1	31.60	36.00	33.53	1.43	6.00
32	2	32.80	39.30	35.96	1.90	8.00
32	3	29.40	35.40	32.94	1.88	7.00
32	4	26.50	33.30	30.46	2.25	5.00
33	1	32.50	36.30	34.63	1.23	6.00
33	2	34.10	39.50	36.74	1.53	8.00
33	3	32.00	36.20	34.04	1.26	7.00
33	4	32.20	34.00	32.88	.65	5.00
34	1	33.50	38.70	35.86	1.33	10.00
34	2	33.90	39.50	36.67	1.49	9.00
34	3	34.10	36.20	34.81	.73	7.00
34	4	33.50	34.60	34.12	.41	5.00
35	1	31.90	37.70	34.29	1.66	33.00
35	2	32.30	39.60	36.79	1.99	37.00
35	3	19.90	39.00	34.05	4.14	35.00
35	4	22.80	35.70	31.69	3.20	35.00
36	1	34.80	37.20	36.06	.72	8.00
36	2	34.30	39.60	37.00	1.46	9.00
36	3	34.80	37.10	35.64	.78	7.00
36	4	35.00	36.10	35.56	.36	5.00
37	1	36.90	38.30	37.60	.70	2.00
37	2	50.00	.00	.00	.00	.00
37	3	50.00	.00	.00	.00	.00
37	4	50.00	.00	.00	.00	.00
38	1	33.60	38.30	35.66	1.16	31.00
38	2	34.50	40.20	37.54	1.38	31.00
38	3	20.10	39.50	34.47	4.89	29.00
38	4	28.50	37.00	34.10	2.12	30.00
39	1	33.20	37.30	35.93	1.07	26.00
39	2	35.00	40.40	37.35	1.18	28.00
39	3	20.90	39.70	35.18	4.79	22.00
39	4	32.80	37.30	34.94	1.22	26.00
50	1	29.20	35.70	32.67	2.71	6.00
50	2	36.90	39.20	38.05	1.15	2.00
50	3	50.00	.00	.00	.00	.00
50	4	26.40	30.80	29.30	1.71	4.00
51	1	23.10	38.40	31.17	3.87	39.00
51	2	27.80	42.00	35.74	3.29	39.00
51	3	14.10	40.40	32.30	5.56	35.00
51	4	12.50	35.80	24.90	5.41	35.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
52	1	31.20	36.70	33.95	1.71	6.00
52	2	33.60	39.30	36.44	1.66	7.00
52	3	30.40	35.30	33.40	1.40	7.00
52	4	27.20	33.50	31.48	2.39	5.00
53	1	33.80	36.80	34.88	1.03	6.00
53	2	33.70	39.30	36.45	1.71	6.00
53	3	33.10	35.70	34.64	.90	7.00
53	4	31.20	34.70	33.44	1.19	5.00
54	1	34.50	38.40	36.09	1.17	10.00
54	2	34.00	39.60	36.64	1.60	7.00
54	3	33.90	35.80	35.08	.75	8.00
54	4	33.20	35.40	34.16	.71	5.00
55	1	28.40	37.40	34.16	2.01	33.00
55	2	31.00	39.70	36.75	1.92	35.00
55	3	19.40	38.80	34.48	4.14	35.00
55	4	22.90	35.80	31.45	3.52	36.00
57	1	35.20	38.70	36.95	1.30	4.00
57	2	37.20	37.20	37.20	37.20	1.00
57	3	50.00	.00	.00	.00	.00
57	4	50.00	.00	.00	.00	.00
58	1	33.60	38.50	35.72	1.20	31.00
58	2	35.00	40.00	37.70	1.24	31.00
58	3	19.70	38.90	34.66	4.38	29.00
58	4	26.40	37.50	33.90	2.70	29.00
60	1	50.00	.00	.00	.00	.00
60	2	50.00	.00	.00	.00	.00
60	3	50.00	.00	.00	.00	.00
60	4	28.00	28.00	28.00	28.00	1.00
61	1	24.70	37.20	31.73	3.28	33.00
61	2	27.40	42.00	36.07	3.04	38.00
61	3	20.90	40.00	32.66	4.81	36.00
61	4	14.10	36.90	26.17	5.12	35.00
62	1	32.30	36.00	34.20	1.15	6.00
62	2	32.90	39.70	36.23	1.98	7.00
62	3	31.60	35.30	33.63	1.30	7.00
62	4	27.90	33.70	31.78	2.02	5.00
63	1	32.80	36.80	35.02	1.21	6.00
63	2	33.30	39.50	36.35	1.92	6.00
63	3	31.70	35.40	34.26	1.32	7.00
63	4	30.00	34.60	33.18	1.67	5.00
64	1	35.00	37.30	35.88	.83	6.00
64	2	33.80	39.70	36.55	1.85	6.00
64	3	31.50	36.00	34.73	1.48	7.00
64	4	32.50	35.10	33.68	.94	5.00
65	1	27.20	37.40	34.29	2.05	33.00
65	2	31.00	40.60	36.83	1.86	37.00
65	3	2.60	38.60	33.35	6.68	35.00
65	4	23.10	36.50	31.66	3.37	35.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
68	1	32.20	37.50	35.50	1.31	27.00
68	2	34.80	40.10	37.55	1.32	30.00
68	3	19.80	38.70	34.62	4.42	28.00
68	4	26.30	37.10	33.46	2.96	30.00
70	1	30.80	35.90	33.45	1.72	6.00
70	2	37.30	39.20	38.25	.95	2.00
70	3	23.50	35.00	30.46	3.84	5.00
70	4	24.40	33.00	29.70	3.14	5.00
71	1	24.20	38.50	32.73	3.09	37.00
71	2	30.80	42.00	36.37	2.55	38.00
71	3	20.40	39.70	33.19	4.66	35.00
71	4	15.50	36.60	26.92	4.82	35.00
72	1	33.10	36.00	34.17	.94	6.00
72	2	32.50	39.70	36.19	2.08	7.00
72	3	32.20	34.80	33.80	.87	7.00
72	4	28.20	33.50	30.96	1.98	5.00
73	1	34.30	35.80	35.02	.49	6.00
73	2	34.00	39.50	36.30	1.82	6.00
73	3	33.70	35.30	34.56	.58	7.00
73	4	29.80	34.20	32.54	1.52	5.00
74	1	34.60	38.60	35.85	1.10	10.00
74	2	34.20	39.60	36.36	1.66	7.00
74	3	33.30	36.00	34.83	.81	7.00
74	4	31.30	35.40	33.20	1.34	5.00
75	1	26.10	39.00	34.25	2.33	37.00
75	2	32.00	40.70	36.86	1.77	36.00
75	3	19.70	38.50	34.10	4.06	34.00
75	4	23.20	37.30	31.65	3.32	35.00
78	1	33.60	38.40	35.67	1.22	31.00
78	2	34.30	40.50	37.17	1.47	28.00
78	3	19.80	38.50	34.47	4.31	28.00
78	4	26.80	37.00	33.79	2.65	30.00
80	1	31.70	36.00	33.90	1.38	6.00
80	2	37.00	39.60	38.30	1.30	2.00
80	3	50.00	.00	.00	.00	.00
80	4	25.00	33.60	30.35	3.22	4.00
81	1	25.20	37.20	32.67	2.72	33.00
81	2	32.20	42.00	36.51	2.07	37.00
81	3	20.20	39.50	33.60	4.51	35.00
81	4	18.40	36.20	27.81	4.16	35.00
82	1	33.70	36.00	34.63	.76	6.00
82	2	32.60	39.70	35.63	2.27	6.00
82	3	33.50	34.90	34.03	.54	7.00
82	4	28.80	34.10	31.98	1.79	5.00
83	1	34.20	35.90	34.65	.64	6.00
83	2	33.40	39.60	36.10	2.01	6.00
83	3	33.40	35.30	34.46	.64	7.00
83	4	30.80	34.70	32.66	1.28	5.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
84	1	26.30	37.10	34.36	3.24	8.00
84	2	33.50	39.50	36.37	1.83	7.00
84	3	33.30	35.90	34.74	.90	7.00
84	4	31.70	34.60	32.82	.98	5.00
85	1	29.60	37.10	34.28	1.91	33.00
85	2	32.00	42.00	36.69	1.78	34.00
85	3	20.10	38.40	34.29	4.09	34.00
85	4	21.60	37.40	31.37	3.73	35.00
87	1	50.00	.00	.00	.00	.00
87	2	23.80	30.10	26.95	3.15	2.00
87	3	50.00	.00	.00	.00	.00
87	4	50.00	.00	.00	.00	.00
88	1	32.00	37.50	35.24	1.22	24.00
88	2	34.10	39.80	37.42	1.23	26.00
88	3	19.80	38.10	34.71	4.13	29.00
88	4	28.10	36.80	33.86	2.38	29.00
89	1	50.00	.00	.00	.00	.00
89	2	35.40	35.80	35.60	.20	2.00
89	3	50.00	.00	.00	.00	.00
89	4	50.00	.00	.00	.00	.00
91	1	33.60	36.00	34.47	.74	6.00
91	2	32.30	39.60	35.91	1.99	8.00
91	3	26.80	35.70	32.54	2.59	7.00
91	4	25.30	34.40	30.26	2.92	5.00
92	1	26.70	37.40	33.17	2.47	32.00
92	2	32.60	42.00	36.57	2.00	32.00
92	3	20.90	39.50	34.13	4.31	31.00
92	4	18.40	35.90	28.36	4.10	33.00
93	1	34.00	36.00	34.63	.70	6.00
93	2	32.70	39.60	35.80	2.16	7.00
93	3	30.50	35.50	33.73	1.49	7.00
93	4	27.60	35.20	32.02	2.48	5.00
94	1	33.60	36.30	34.55	.86	6.00
94	2	32.60	39.40	35.65	2.26	6.00
94	3	33.40	35.50	34.24	.78	7.00
94	4	30.80	34.00	32.42	1.08	5.00
95	1	32.50	38.30	35.30	1.49	10.00
95	2	34.00	39.00	36.26	1.54	8.00
95	3	33.60	36.00	34.66	.99	7.00
95	4	31.70	33.60	32.26	.73	5.00
96	1	29.20	37.00	34.12	1.91	33.00
96	2	32.00	42.00	36.59	1.91	33.00
96	3	19.60	38.10	34.11	3.97	36.00
96	4	23.20	37.20	32.58	3.09	35.00
97	1	34.50	38.50	36.65	1.45	4.00
97	2	35.90	35.90	35.90	35.90	1.00
97	3	50.00	.00	.00	.00	.00
97	4	50.00	.00	.00	.00	.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
127	1	23.40	38.00	31.58	3.55	16.00
127	2	23.60	39.00	33.35	4.18	20.00
127	3	25.20	38.50	32.69	3.64	19.00
127	4	26.80	35.60	31.31	2.58	20.00
128	1	24.30	38.50	32.62	3.42	16.00
128	2	28.00	39.10	34.02	3.19	20.00
128	3	24.90	37.90	33.47	3.18	19.00
128	4	28.80	36.20	32.84	1.84	20.00
129	1	21.90	38.10	31.54	3.86	16.00
129	2	26.40	39.80	33.87	3.84	19.00
129	3	25.10	38.90	32.29	3.91	19.00
129	4	25.60	35.90	30.66	2.94	20.00
130	1	19.90	36.60	29.93	3.84	16.00
130	2	24.40	39.10	32.14	4.00	20.00
130	3	22.40	38.40	29.91	4.68	19.00
130	4	23.00	33.30	28.57	2.70	20.00
131	1	20.40	38.30	31.54	4.04	16.00
131	2	26.70	39.90	34.11	3.76	20.00
131	3	25.60	40.00	32.62	4.26	18.00
131	4	27.60	36.30	30.73	2.68	20.00
132	1	23.20	38.30	32.96	3.94	14.00
132	2	29.00	39.20	34.27	2.94	14.00
132	3	26.00	39.90	33.61	4.54	15.00
132	4	17.80	36.00	30.30	3.89	17.00
133	1	16.20	35.60	29.03	4.72	16.00
133	2	13.20	38.20	28.46	6.61	19.00
133	3	1.40	37.10	26.06	9.91	19.00
133	4	7.30	33.00	25.15	6.14	20.00
134	1	17.20	38.10	30.79	4.56	16.00
134	2	24.30	39.20	33.20	4.35	19.00
134	3	24.50	40.00	31.94	4.87	19.00
134	4	24.40	36.50	29.54	2.91	20.00
135	1	25.30	38.40	33.21	3.41	15.00
135	2	29.10	39.00	34.96	2.68	16.00
135	3	25.90	38.90	34.63	3.26	15.00
135	4	27.70	36.70	32.04	2.40	19.00
136	1	25.50	38.50	33.25	3.49	16.00
136	2	30.40	39.20	35.18	2.74	19.00
136	3	25.60	40.00	35.48	3.17	19.00
136	4	28.50	37.30	32.03	2.43	20.00
137	1	28.00	38.80	34.19	3.22	15.00
137	2	28.10	38.90	34.91	2.65	16.00
137	3	25.10	38.90	35.01	3.19	15.00
137	4	30.10	35.80	32.64	1.80	18.00
138	1	24.90	38.40	33.49	3.51	15.00
138	2	29.50	38.80	35.08	2.84	17.00
138	3	24.90	39.70	35.57	3.02	18.00
138	4	29.90	37.10	32.78	1.79	20.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
139	1	16.10	31.40	23.32	4.58	15.00
139	2	4.90	38.80	26.07	9.42	19.00
139	3	3.30	35.10	19.87	8.50	18.00
139	4	4.20	27.40	18.44	6.26	20.00
140	1	14.70	34.90	24.65	5.51	15.00
140	2	7.20	38.50	28.46	8.74	18.00
140	3	10.70	39.90	26.38	8.41	17.00
140	4	3.30	32.10	17.44	7.91	19.00
141	1	23.00	39.80	32.55	4.41	14.00
141	2	24.50	41.30	35.06	4.45	18.00
141	3	23.90	40.00	34.89	3.92	16.00
141	4	24.10	37.60	30.89	3.32	19.00
142	1	25.70	39.50	34.30	3.79	14.00
142	2	29.90	39.90	35.70	3.00	16.00
142	3	24.60	40.00	35.58	3.82	16.00
142	4	24.20	37.10	33.01	2.76	16.00
143	1	27.10	38.70	33.90	3.20	14.00
143	2	29.60	40.00	35.48	3.00	17.00
143	3	25.00	38.40	35.44	3.11	16.00
143	4	7.10	36.60	30.81	7.61	17.00
144	1	27.10	38.70	33.67	3.51	14.00
144	2	28.50	46.20	35.86	4.01	17.00
144	3	25.00	38.90	35.24	3.31	15.00
144	4	12.30	37.10	31.79	5.39	18.00
145	1	24.90	39.00	32.75	4.09	14.00
145	2	23.70	46.80	34.89	5.25	16.00
145	3	24.20	38.90	34.34	3.68	14.00
145	4	25.00	36.30	30.76	3.23	17.00
146	1	27.40	38.50	33.29	3.63	14.00
146	2	28.00	40.00	34.71	3.46	15.00
146	3	24.10	39.40	34.76	3.40	14.00
146	4	18.20	36.30	30.93	4.50	15.00
147	1	20.80	39.00	32.29	4.73	14.00
147	2	21.00	40.00	33.62	4.98	17.00
147	3	23.10	40.00	33.99	4.28	14.00
147	4	25.50	36.70	31.31	3.05	18.00
148	1	17.90	38.90	31.88	5.65	14.00
148	2	19.30	40.00	32.71	5.59	15.00
148	3	21.40	40.00	32.45	5.36	14.00
148	4	24.00	36.00	30.26	3.16	16.00

Table 16. Salinity statistics for National Park Service and Dade County water quality monitoring stations

The column with heading SDV in Table 16 lists the computed standard deviations. Note that the number of observations varies. Any statistic calculated using 10 or less points is probably unreliable. The SDV can be viewed as a scale for the variation around the mean. It is then not surprising that the stations nearer the canal mouths have larger values. An SDV value of 7 ppt as obtained near the western shore of the Bay would correspond to salinity fluctuations of 14 ppt, in good agreement with the Hydrosonde data. It is interesting that the SDV is smaller for seasons 1 and 4 (winter and autumn, respectively) near the coast while seasons 1 and 2 (winter and spring, respectively) values are smaller at other stations. This may be a reflection of the canal discharge curve in the first instance and larger scale, regional freshening of the coastal water in the other. The SDV values on the east side of the Bay in season 3 (summer) are about 5 ppt with a mean of about 34 ppt, indicating a range of 29 to 39 ppt. On the east side, the mean salinity near canal mouths is in the low twenties with the SDV about 7 ppt. Away from canal mouths mean salinities are in the high twenties.

Based on the minimum, maximum, and mean values with the number of observations greater than 13, the interpolation scheme described by Chin Fatt and Wang (1986) was used to produce the maps shown in Figures 30 - 41 (Appendix 2). The maps show isohaline contours at 2 ppt intervals with the 10 ppt, 20 ppt, and 30 ppt contours shown in bold line-width. All measurement stations were given equal weight in the interpolation algorithm. The

possibility of hypersaline conditions during seasons 2 and 3 is evident in Figures 37 and 40. An abnormally low value was observed at station 65. This is probably an error. These maps can be used for easy reference when information on minimum, maximum, or mean salinity is desired at a particular location in the Bay. Due to the smoothing of the interpolation scheme more accurate results can be obtained by consulting the tables.

TEMPERATURE

In biological and chemical processes, temperature often plays as important or even more important a role as salinity. The temperature distribution in the Bay is primarily a function of the meteorological conditions and therefore spatially more uniform. Figure 45 shows the temperature and salinity obtained at the mouth of Mowry Canal beginning 28 May 1986. The temperature appears unaffected by astronomical tides, as noted by Chin Fatt and Wang (1986), and by canal discharge and varies within a range of about 4° C per day. Records obtained at Markers 1 and 1A for September 1985 showed variations in range of about 1° C per day.

The statistics presented in Table 17 show that the temperature vary within very narrow ranges. The standard deviation at any station is usually less than about 4° C. There appears to be no consistent variation of temperature with the Bay, however, the northern part seems to be slightly cooler. This may reflect the more shallow nature of the northern portion of the Bay. In several samplings, the lowest value was found at the mouth of a

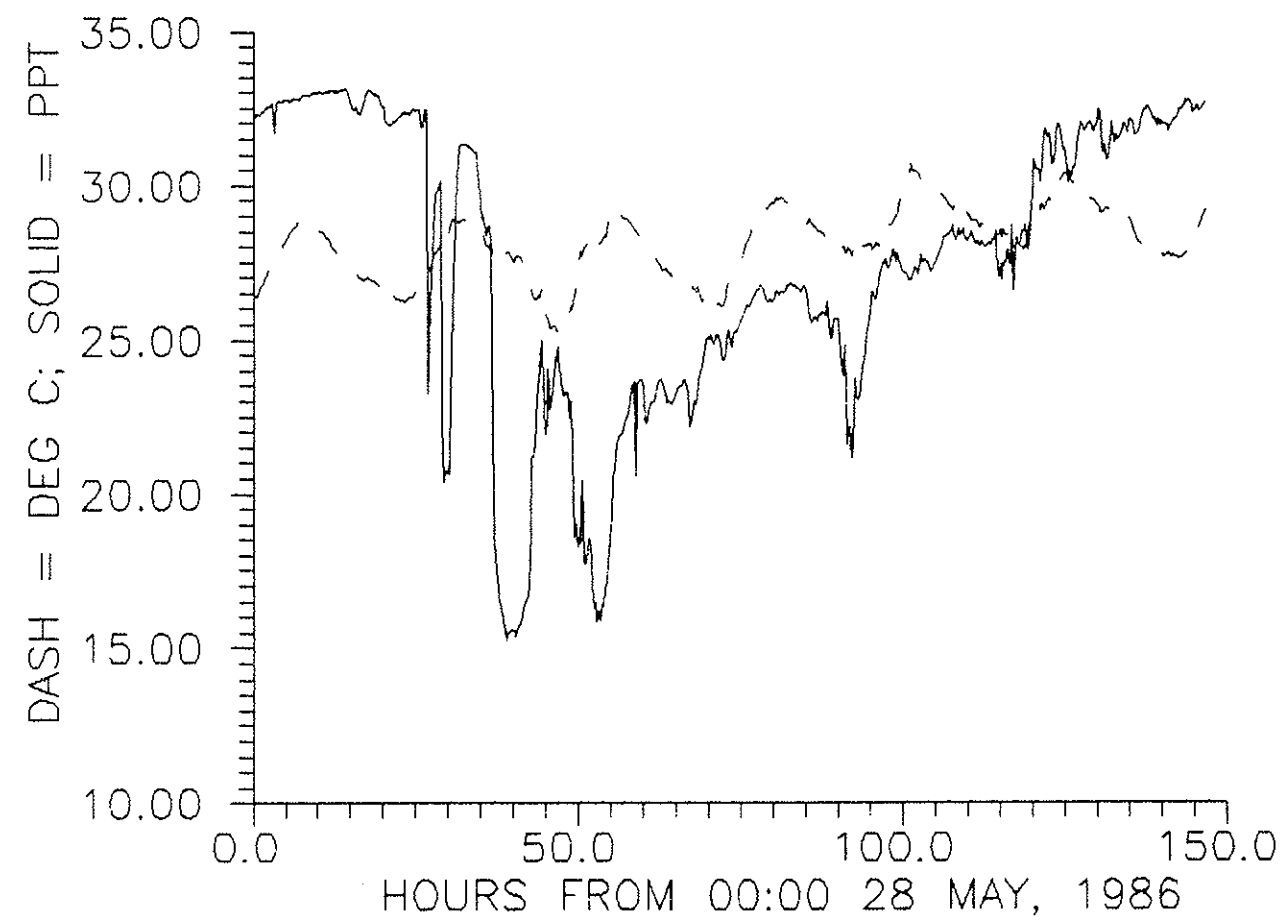


Figure 42. Temperature and salinity variations in Mowry Canal outlet, May - June 1986

Snapper Creek. The temperature ranges in the Bay for each quarter and for minimum, maximum, and mean conditions is presented below:

JANUARY - MARCH

MIN 11.4 - 15.0° C
MAX 22.8 - 28.8° C
MEAN 19.9 - 21.2° C

APRIL - JUNE

MIN 22.2 - 24.0° C
MAX 29.3 - 33.9° C
MEAN 25.5 - 28.0° C

JULY - SEPTEMBER

MIN 24.9 - 28.8° C
MAX 31.1 - 35.5° C
MEAN 29.4 - 30.5° C

OCTOBER - DECEMBER

MIN 16.6 - 19.5° C
MAX 29.0 - 30.6° C
MEAN 23.6 - 25.0° C

Two errors were found in the third quarter salinities at stations 88 and 92 (see Table 17). The values of 59.8° C and 58.7° C were changed to 31.8° C and 31.7° C, respectively for the analyses.

CONCLUSIONS

A high correlation between canal discharge and bay salinities has been found in the vicinity of Mowry Canal (C-103). Most likely the same holds true for the other canals in south Biscayne Bay. It has been shown that significant leakage around or through the control structure (S-20F) at Mowry Canal does not occur. It is plausible to extend this conclusion to other canals.

It is clear that the operating rules for the structure gates result in highly intermittent discharges. These irregular discharge pulses are observed in Bay salinities as dips lasting for periods of 1 to 3 hours. These dips of 15 ppt are more severe near canal mouths and become less severe across Biscayne Bay.

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
2	1	12.80	28.60	22.34	3.76	26.00
2	2	24.80	32.00	28.13	1.95	33.00
2	3	26.40	32.60	28.98	1.86	30.00
2	4	21.50	27.60	24.61	1.67	26.00
4	1	13.20	28.50	22.14	3.61	29.00
4	2	24.80	32.30	28.36	2.01	30.00
4	3	27.70	32.70	30.11	1.40	28.00
4	4	20.30	28.40	24.36	2.27	29.00
6	1	12.60	28.50	21.34	3.52	36.00
6	2	24.70	31.50	28.46	1.95	31.00
6	3	27.60	33.60	30.64	1.41	28.00
6	4	20.80	29.20	24.32	2.15	28.00
7	1	13.40	28.10	21.83	3.30	26.00
7	2	25.60	31.10	28.53	1.69	25.00
7	3	26.20	32.60	29.60	1.62	20.00
7	4	21.60	27.30	24.44	1.64	18.00
8	1	14.70	28.30	22.81	3.02	28.00
8	2	25.90	31.60	28.66	1.71	30.00
8	3	26.40	32.30	29.92	1.48	26.00
8	4	21.70	29.10	25.19	1.95	25.00
10	1	15.00	23.30	21.40	3.21	5.00
10	2	22.40	25.60	24.00	1.60	2.00
10	3	50.00	.00	.00	.00	.00
10	4	50.00	.00	.00	.00	.00
11	1	11.00	28.80	21.19	4.29	42.00
11	2	22.50	31.50	27.68	2.39	46.00
11	3	27.00	33.20	30.22	1.26	38.00
11	4	18.50	29.40	24.30	2.76	37.00
12	1	15.20	25.80	20.09	4.00	7.00
12	2	25.80	29.00	26.88	1.07	9.00
12	3	28.40	31.30	30.02	.97	9.00
12	4	20.80	28.20	24.53	2.28	7.00
13	1	15.20	25.60	20.62	3.73	6.00
13	2	25.30	28.70	26.76	1.02	9.00
13	3	28.60	30.60	29.63	.78	7.00
13	4	23.80	28.10	25.60	1.47	5.00
14	1	15.00	25.40	21.52	3.22	10.00
14	2	23.20	30.60	26.64	1.74	13.00
14	3	28.20	30.50	29.47	.87	7.00
14	4	23.60	27.90	25.48	1.47	5.00
15	1	11.90	27.80	20.73	4.03	42.00
15	2	22.60	30.70	27.35	2.27	45.00
15	3	28.10	31.90	29.98	.97	38.00
15	4	18.10	29.10	24.07	2.70	37.00
16	1	50.00	.00	.00	.00	.00
16	2	25.20	26.20	25.70	.50	2.00
16	3	50.00	.00	.00	.00	.00
16	4	50.00	.00	.00	.00	.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
18	1	11.80	27.50	20.43	4.12	32.00
18	2	22.40	30.90	27.56	2.33	35.00
18	3	28.40	32.10	30.31	1.00	34.00
18	4	18.10	29.50	24.09	2.88	33.00
19	1	13.10	27.50	20.88	3.64	27.00
19	2	23.70	30.60	27.97	2.01	30.00
19	3	28.30	32.60	30.52	1.17	27.00
19	4	19.50	29.00	24.09	2.34	25.00
20	1	16.80	16.80	16.80	16.80	1.00
20	2	50.00	.00	.00	.00	.00
20	3	50.00	.00	.00	.00	.00
20	4	50.00	.00	.00	.00	.00
21	1	11.30	28.90	20.93	4.38	41.00
21	2	22.30	31.10	27.53	2.37	42.00
21	3	27.10	32.80	30.15	1.22	38.00
21	4	18.20	30.10	24.22	2.67	38.00
22	1	15.20	25.50	20.28	3.70	6.00
22	2	25.60	30.70	27.39	1.60	9.00
22	3	28.50	30.90	29.71	.90	7.00
22	4	23.90	28.30	25.76	1.56	5.00
23	1	15.10	25.20	20.22	3.69	6.00
23	2	25.20	30.70	27.43	1.75	7.00
23	3	27.90	30.70	29.47	.96	7.00
23	4	23.60	28.10	25.56	1.57	5.00
24	1	15.00	25.20	21.60	3.31	10.00
24	2	23.70	30.70	26.85	1.87	10.00
24	3	28.00	30.80	29.53	.94	7.00
24	4	23.60	28.00	25.52	1.54	5.00
25	1	12.00	27.60	20.33	4.20	38.00
25	2	22.70	30.60	27.50	2.19	40.00
25	3	28.20	31.80	29.94	.91	39.00
25	4	18.20	29.10	24.07	2.61	37.00
26	1	15.80	25.00	20.30	3.49	6.00
26	2	24.90	30.50	27.34	1.54	8.00
26	3	28.20	31.40	29.64	1.09	7.00
26	4	23.60	28.00	25.54	1.55	5.00
27	1	22.80	23.30	23.02	.23	4.00
27	2	22.60	25.20	23.90	1.30	2.00
27	3	50.00	.00	.00	.00	.00
27	4	50.00	.00	.00	.00	.00
28	1	11.70	27.60	20.71	3.93	36.00
28	2	22.40	30.60	27.16	2.35	34.00
28	3	28.00	32.40	30.31	1.04	33.00
28	4	18.20	29.60	24.04	2.73	32.00
29	1	11.80	28.00	20.70	4.10	30.00
29	2	23.80	31.10	28.03	2.14	29.00
29	3	28.60	32.80	30.53	1.03	25.00
29	4	19.40	29.50	24.36	2.59	29.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
30	1	15.50	15.50	15.50	15.50	1.00
30	2	50.00	.00	.00	.00	.00
30	3	50.00	.00	.00	.00	.00
30	4	50.00	.00	.00	.00	.00
31	1	12.10	28.10	20.92	4.14	43.00
31	2	22.90	30.90	27.37	2.22	44.00
31	3	28.00	32.80	30.23	1.08	38.00
31	4	17.50	29.80	24.23	2.72	38.00
32	1	15.10	25.40	20.22	3.74	6.00
32	2	25.30	29.00	27.08	1.11	8.00
32	3	28.40	31.20	29.71	.95	7.00
32	4	23.70	28.20	25.68	1.59	5.00
33	1	14.80	25.10	20.02	3.72	6.00
33	2	25.20	28.90	27.09	1.11	8.00
33	3	28.00	31.10	29.51	.98	7.00
33	4	23.50	27.60	25.44	1.46	5.00
34	1	15.10	25.10	21.28	3.22	10.00
34	2	23.50	28.80	26.48	1.48	10.00
34	3	28.10	31.00	29.53	.94	7.00
34	4	23.40	27.60	25.38	1.50	5.00
35	1	11.90	27.80	20.22	4.15	38.00
35	2	22.60	30.70	27.39	2.11	41.00
35	3	28.30	31.40	29.92	.87	40.00
35	4	17.90	29.10	23.95	2.64	38.00
36	1	15.70	24.80	20.99	3.36	8.00
36	2	23.20	28.40	26.34	1.51	10.00
36	3	28.00	31.00	29.49	.95	7.00
36	4	23.30	27.70	25.36	1.57	5.00
37	1	22.30	22.70	22.50	.20	2.00
37	2	50.00	.00	.00	.00	.00
37	3	50.00	.00	.00	.00	.00
37	4	50.00	.00	.00	.00	.00
38	1	12.20	27.60	20.85	3.90	36.00
38	2	22.50	31.30	27.49	2.39	36.00
38	3	28.20	32.20	30.34	1.02	34.00
38	4	18.10	29.50	24.02	2.72	32.00
39	1	12.20	27.80	20.70	4.03	30.00
39	2	23.70	31.80	27.99	2.19	30.00
39	3	28.80	32.60	30.54	.98	25.00
39	4	19.00	29.50	24.32	2.58	29.00
50	1	14.50	25.60	20.97	3.96	6.00
50	2	25.50	28.80	27.15	1.65	2.00
50	3	50.00	.00	.00	.00	.00
50	4	23.70	26.00	24.60	.97	4.00
51	1	11.40	27.70	20.32	4.18	46.00
51	2	22.80	31.40	27.14	2.19	41.00
51	3	27.90	31.90	29.73	1.05	38.00
51	4	18.50	29.90	23.92	2.67	38.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
52	1	14.60	25.50	20.55	3.83	6.00
52	2	25.30	32.70	27.81	2.12	8.00
52	3	27.70	31.50	29.41	1.19	7.00
52	4	23.50	27.40	24.92	1.44	5.00
53	1	14.80	25.20	20.48	3.77	6.00
53	2	25.30	28.40	27.13	1.13	7.00
53	3	27.90	31.50	29.49	1.13	7.00
53	4	23.50	27.60	24.94	1.52	5.00
54	1	14.90	25.10	21.69	3.17	10.00
54	2	23.00	28.40	26.47	1.68	9.00
54	3	28.20	31.50	29.60	1.04	8.00
54	4	23.60	27.80	25.02	1.55	5.00
55	1	11.90	27.90	20.26	4.15	38.00
55	2	23.10	31.10	27.45	2.03	39.00
55	3	27.70	31.50	29.88	.94	38.00
55	4	18.20	29.20	23.91	2.54	39.00
57	1	22.20	24.50	23.42	.89	4.00
57	2	22.90	25.00	23.95	1.05	2.00
57	3	50.00	.00	.00	.00	.00
57	4	50.00	.00	.00	.00	.00
58	1	12.40	27.60	20.86	3.80	36.00
58	2	22.20	31.40	27.54	2.49	35.00
58	3	28.50	32.10	30.35	.99	33.00
58	4	18.40	29.70	24.06	2.67	32.00
60	1	50.00	.00	.00	.00	.00
60	2	50.00	.00	.00	.00	.00
60	3	50.00	.00	.00	.00	.00
60	4	27.50	27.50	27.50	27.50	1.00
61	1	11.70	27.80	20.14	4.49	37.00
61	2	23.10	33.60	27.63	2.32	40.00
61	3	28.10	32.10	29.86	1.03	39.00
61	4	18.20	29.50	23.77	2.70	38.00
62	1	14.60	25.60	20.73	3.92	6.00
62	2	25.00	28.80	27.17	1.30	7.00
62	3	27.80	31.60	29.50	1.13	7.00
62	4	23.30	27.40	24.84	1.53	5.00
63	1	14.70	25.40	20.63	3.86	6.00
63	2	25.10	28.60	27.17	1.22	7.00
63	3	27.80	31.70	29.41	1.12	7.00
63	4	23.40	27.80	24.92	1.62	5.00
64	1	15.00	25.20	20.60	3.77	6.00
64	2	24.90	28.50	27.19	1.21	7.00
64	3	27.80	31.50	29.50	1.07	7.00
64	4	23.40	27.60	24.90	1.56	5.00
65	1	11.80	28.20	20.34	4.23	38.00
65	2	23.60	31.00	27.43	2.06	40.00
65	3	28.00	31.60	29.88	.94	38.00
65	4	18.20	29.20	23.85	2.61	38.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

	STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
68	1		13.00	27.60	20.57	3.91	32.00
68	2		23.70	31.30	27.82	2.31	33.00
68	3		28.60	32.40	30.39	.97	31.00
68	4		18.30	29.70	23.95	2.66	33.00
70	1		16.70	27.30	22.93	3.95	6.00
70	2		25.50	28.50	27.00	1.50	2.00
70	3		28.70	31.30	30.64	.98	5.00
70	4		25.10	29.00	26.58	1.46	5.00
71	1		11.60	27.80	20.54	4.38	41.00
71	2		23.30	34.00	27.54	2.40	42.00
71	3		27.80	33.10	29.97	1.09	38.00
71	4		18.40	29.50	23.87	2.73	38.00
72	1		15.10	25.60	20.87	3.69	6.00
72	2		25.00	32.80	28.14	2.34	8.00
72	3		27.20	32.20	29.51	1.38	7.00
72	4		23.50	27.40	25.00	1.46	5.00
73	1		14.70	25.40	20.72	3.80	6.00
73	2		24.90	29.00	27.29	1.33	7.00
73	3		27.40	32.30	29.54	1.34	7.00
73	4		23.50	27.50	24.92	1.47	5.00
74	1		14.90	25.30	21.74	3.18	10.00
74	2		23.20	28.60	26.57	1.75	9.00
74	3		27.60	32.10	29.59	1.24	7.00
74	4		23.50	27.50	24.90	1.48	5.00
75	1		12.00	28.50	20.59	4.15	41.00
75	2		22.90	31.00	27.36	2.13	42.00
75	3		27.50	32.00	29.94	.95	37.00
75	4		18.20	29.30	23.83	2.61	38.00
78	1		11.40	27.70	20.94	3.96	36.00
78	2		21.90	31.30	27.39	2.44	31.00
78	3		28.80	32.50	30.46	.97	31.00
78	4		17.70	30.00	23.83	2.69	33.00
80	1		16.00	27.30	22.43	4.01	6.00
80	2		25.20	28.70	26.95	1.75	2.00
80	3		50.00	.00	.00	.00	.00
80	4		24.70	25.80	25.10	.45	4.00
81	1		11.90	28.10	20.18	4.47	37.00
81	2		23.70	33.80	27.61	2.36	40.00
81	3		27.10	32.50	29.87	1.13	38.00
81	4		17.80	29.70	23.66	2.74	38.00
82	1		15.20	26.10	21.78	3.93	6.00
82	2		25.00	29.50	27.19	1.62	7.00
82	3		27.10	32.10	29.60	1.39	7.00
82	4		23.70	27.00	25.02	1.24	5.00
83	1		14.70	25.20	21.17	3.78	6.00
83	2		24.90	29.30	27.30	1.47	7.00
83	3		27.10	32.40	29.50	1.47	7.00
83	4		23.50	27.40	25.02	1.46	5.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

	STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
84	1		14.90	25.60	22.21	3.78	8.00
84	2		24.90	29.00	27.37	1.37	7.00
84	3		27.40	31.90	29.49	1.24	7.00
84	4		24.00	27.50	25.18	1.29	5.00
85	1		11.80	27.50	20.29	4.31	37.00
85	2		23.60	31.30	27.48	2.06	38.00
85	3		27.60	31.80	29.95	.94	37.00
85	4		18.10	29.50	23.79	2.68	38.00
87	1		50.00	.00	.00	.00	.00
87	2		25.90	27.30	26.60	.70	2.00
87	3		50.00	.00	.00	.00	.00
87	4		50.00	.00	.00	.00	.00
88	1		11.40	27.90	20.06	4.18	28.00
88	2		23.70	31.40	27.91	2.48	28.00
88	3		28.70	59.80	31.54	5.25	31.00
88	4		17.90	29.80	24.03	2.60	32.00
89	1		50.00	.00	.00	.00	.00
89	2		26.90	26.90	26.90	.00	2.00
89	3		50.00	.00	.00	.00	.00
89	4		50.00	.00	.00	.00	.00
91	1		15.10	26.10	21.83	3.88	6.00
91	2		25.10	29.90	27.20	1.69	8.00
91	3		27.50	32.10	29.79	1.28	7.00
91	4		23.80	27.40	25.22	1.35	5.00
92	1		11.50	27.90	19.87	4.65	36.00
92	2		23.90	32.50	27.38	2.19	36.00
92	3		26.90	58.70	30.62	5.04	34.00
92	4		16.50	29.10	23.66	2.75	34.00
93	1		14.70	25.60	21.15	3.89	6.00
93	2		24.50	29.20	27.20	1.56	7.00
93	3		27.10	31.90	29.56	1.37	7.00
93	4		23.60	27.20	24.98	1.33	5.00
94	1		14.70	25.60	21.17	3.94	6.00
94	2		24.60	30.30	27.50	1.78	7.00
94	3		27.20	32.40	29.53	1.43	7.00
94	4		23.50	27.30	25.00	1.43	5.00
95	1		14.70	24.80	21.73	3.08	10.00
95	2		22.40	28.90	26.42	2.00	9.00
95	3		27.30	31.90	29.49	1.29	7.00
95	4		23.70	27.00	25.16	1.32	5.00
96	1		11.90	27.40	20.34	4.27	37.00
96	2		23.80	31.40	27.46	2.07	36.00
96	3		27.40	31.90	29.93	1.08	38.00
96	4		18.00	29.40	23.84	2.72	38.00
97	1		23.00	23.90	23.50	.37	4.00
97	2		23.00	25.80	24.40	1.40	2.00
97	3		50.00	.00	.00	.00	.00
97	4		50.00	.00	.00	.00	.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

	STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
127	1		15.00	24.10	20.51	2.31	14.00
127	2		22.80	29.40	25.70	2.04	20.00
127	3		26.00	31.50	29.49	1.41	18.00
127	4		18.00	29.70	24.50	3.31	19.00
128	1		15.00	23.60	20.65	2.28	14.00
128	2		22.70	29.30	25.64	1.99	20.00
128	3		26.50	33.60	29.51	1.56	18.00
128	4		19.00	29.50	24.99	3.06	19.00
129	1		13.30	24.20	20.21	2.70	14.00
129	2		22.90	29.40	25.52	2.04	19.00
129	3		26.50	31.50	29.59	1.36	18.00
129	4		18.00	29.80	24.22	3.55	19.00
130	1		13.00	24.30	20.51	3.00	14.00
130	2		23.00	29.90	25.93	2.11	20.00
130	3		27.70	32.00	29.82	1.18	18.00
130	4		17.80	30.10	24.68	3.79	18.00
131	1		13.00	23.90	20.14	2.73	14.00
131	2		22.70	29.40	25.69	2.07	19.00
131	3		26.90	31.50	29.49	1.30	17.00
131	4		17.50	29.60	24.20	3.78	19.00
132	1		14.00	22.80	20.35	2.50	11.00
132	2		23.50	30.40	26.81	2.40	13.00
132	3		28.00	35.50	30.62	1.97	14.00
132	4		18.00	30.50	24.68	3.63	15.00
133	1		13.20	25.00	20.61	3.03	14.00
133	2		23.00	30.00	26.02	1.87	18.00
133	3		24.90	32.00	29.46	1.87	18.00
133	4		18.00	29.00	24.39	3.54	18.00
134	1		13.50	24.70	20.34	2.79	14.00
134	2		23.20	29.70	25.96	2.02	18.00
134	3		25.60	31.50	29.65	1.51	18.00
134	4		18.00	29.70	24.36	3.81	19.00
135	1		13.20	23.10	20.21	2.65	13.00
135	2		23.50	30.40	26.79	2.18	15.00
135	3		28.00	35.00	30.37	1.97	14.00
135	4		18.00	30.20	24.69	3.58	17.00
136	1		13.00	23.90	20.01	2.74	14.00
136	2		23.50	29.30	25.90	1.91	18.00
136	3		27.40	31.50	29.59	1.17	18.00
136	4		18.00	29.60	24.44	3.60	18.00
137	1		13.00	23.80	20.41	2.84	14.00
137	2		23.50	30.30	26.75	2.43	15.00
137	3		28.00	34.50	30.71	1.96	14.00
137	4		18.00	30.40	24.31	3.72	16.00
138	1		13.70	23.00	19.83	2.68	12.00
138	2		23.30	29.80	26.24	2.03	17.00
138	3		27.00	32.00	29.46	1.32	17.00
138	4		17.70	30.40	24.59	3.79	18.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

	STAT	QUART	MIN	MAX	MEAN	SDV	NUMBER
139	1		14.00	25.00	20.74	2.84	14.00
139	2		22.50	29.40	26.32	1.98	18.00
139	3		27.40	32.00	29.26	1.31	17.00
139	4		17.10	30.30	24.51	3.74	18.00
140	1		13.00	25.10	21.02	3.30	13.00
140	2		23.00	31.10	26.81	2.24	17.00
140	3		26.60	34.00	30.48	2.02	16.00
140	4		17.80	30.40	25.03	3.97	17.00
141	1		14.00	23.20	19.98	2.68	12.00
141	2		23.00	29.80	26.22	2.06	17.00
141	3		27.40	31.00	29.75	1.08	15.00
141	4		17.80	30.20	24.61	3.99	17.00
142	1		14.00	23.80	20.67	3.07	12.00
142	2		23.80	31.00	27.59	2.24	15.00
142	3		28.00	36.00	31.13	2.20	15.00
142	4		18.10	30.60	24.86	3.76	13.00
143	1		15.00	23.40	20.29	2.52	11.00
143	2		24.00	29.50	26.70	1.87	15.00
143	3		25.30	35.00	30.06	2.25	15.00
143	4		18.60	29.90	24.54	3.54	14.00
144	1		14.00	23.60	20.16	2.94	11.00
144	2		24.00	30.20	26.86	1.98	16.00
144	3		25.80	35.00	30.34	2.27	14.00
144	4		18.20	29.90	24.87	3.44	15.00
145	1		14.50	23.30	20.30	2.96	11.00
145	2		23.50	30.00	26.72	2.07	15.00
145	3		27.90	35.00	30.22	2.05	13.00
145	4		18.00	30.00	24.73	3.44	14.00
146	1		14.00	23.70	20.09	2.82	12.00
146	2		23.80	30.30	26.84	2.01	14.00
146	3		28.30	35.50	30.50	1.96	13.00
146	4		18.00	30.00	24.41	3.75	12.00
147	1		14.50	23.40	20.17	2.61	11.00
147	2		23.80	29.90	26.91	1.90	16.00
147	3		25.60	35.00	30.02	2.29	13.00
147	4		18.80	30.30	25.04	3.33	15.00
148	1		14.00	23.70	20.46	2.84	11.00
148	2		24.00	30.40	26.88	2.12	14.00
148	3		28.10	35.00	30.41	1.89	13.00
148	4		19.30	29.90	24.71	3.16	13.00

Table 17. Temperature statistics for National Park Service and Dade County water quality monitoring stations

near canal mouths and become less severe across Biscayne Bay.

The high intermittency of gate openings makes it difficult to model salinity distributions because time and length scales become very small. The possibility of these strong pulses affecting the marine flora and fauna in the area exists.

Operation rules should be changed to provide a more constant discharge with less severe extremes. Further studies are needed to determine the biological effect of these freshwater discharges.

ACKNOWLEDGMENTS

The support of this study by the National Park Service, Biscayne National Park under contract CX 5000-4-1097 to the second author is gratefully appreciated. The information and the opinions in this report are those of the authors and do not constitute official management guidelines or policies of the National Park Service, U. S. Department of the Interior.

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APPENDICES

APPENDIX 1. Tables 2 - 15

APPENDIX 2. Figures 30 - 41

APPENDIX 1

Table 2. Daily precipitation at Station S331, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.06	.30	.00	.00	.00	.32	.00	.15	.00	.36
2	.00	.00	.00	.00	.00	.00	.48	.00	.00	.00	.00	.04
3	.00	.00	.00	.00	.00	.00	.09	.01	.00	.00	.00	.00
4	.00	.00	.00	.00	.97	.04	.14	1.83	.64	.00	.23	.00
5	.00	.00	.04	.00	.02	.00	.11	.00	.00	.00	.00	.00
6	.00	.00	.00	.00	.00	.10	.03	.00	.45	.00	.03	.50
7	.00	.00	.00	.00	.00	.00	.01	.02	.18	.00	.00	.00
8	.81	.00	.00	.00	.61	1.05	.00	.00	.01	.00	.00	.00
9	.83	.00	.00	.00	.00	.00	.61	.06	.71	.09	.00	.00
10	.08	.00	1.79	.00	.00	.00	.00	.48	.00	.00	.00	.00
11	.24	.00	.00	.00	.00	.00	.00	.30	.00	.00	.18	.44
12	.21	.10	.00	.00	.00	.04	.04	.41	.00	.00	.01	.00
13	.02	.00	.07	.75	.00	.51	.00	.08	.00	.00	.00	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.35	.00
15	.00	.00	.09	.00	.37	.31	.00	.00	.00	.25	.04	.00
16	.00	.00	.00	.00	.00	.06	.00	1.36	.08	.00	.00	.00
17	.00	.00	.31	.00	.00	.30	.00	1.40	.13	.00	.00	.00
18	.00	1.15	.00	.00	.00	.08	.04	.60	.00	.00	.00	.00
19	.00	.00	.00	.00	.00	.93	.00	.33	.00	.09	.00	.00
20	.00	.00	.00	.00	.00	.56	.00	.00	.00	.00	.00	.00
21	.00	.00	.82	.00	2.90	.00	.00	.00	.07	.00	.00	.00
22	.00	.00	.00	.00	3.25	.05	.00	.00	.00	.00	.65	.02
23	.00	.00	.00	.00	.09	1.51	.05	.00	.25	.04	.02	.04
24	.00	.00	.00	.00	.00	.01	.00	.36	.00	.00	.00	.50
25	.00	.00	.03	.00	.00	.00	.20	.10	.00	.00	.00	.00
26	.12	.00	2.60	.00	.00	.80	.47	.00	.00	.00	.00	.08
27	.00	.00	1.61	.00	.00	.05	.00	.00	.00	.00	.37	.40
28	.00	.04	.00	.00	.00	1.26	.00	.57	.00	1.06	.13	.15
29	.00		.00	.00	.00	1.14	.00	.00	.00	.36	.45	.00
30	.00		.96	.00	.00	.02	.00	.09	.65	.00	.09	.00
31	.00		.00		.00		.00	.60		.03		.86

Table 3. Daily precipitation at Station HOMES.ES, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.09	.00T	.00	.05	.00	.00	.00	.00	.00X	.00
2	.00	.00	.00	.00T	.00	.00	.30	.00	.00	.00	.00X	.72
3	.00	.00	.00	.00	.00	.02	.09	.00	.00	.00	.01A	.05
4	.00T	.00	.00	.00	.00X	.00	.14	.00	.18	.00X	.00T	.00
5	.00T	.00	.07	.00T	.10A	.00	.00	1.99	.22	.00X	.04	.00
6	.00	.00	.00	.00	.08	.00	.00	.16	.00	.22A	.25	.02
7	.02	.00	.00	.00	.00	.04	.06	.00	1.99	.00	.00	.00X
8	.36	.00T	.00	.00	.00	2.58	.13	.00	.43	.00	.00T	.11A
9	.74	.00	.00	.00	.54	.34	.00	.06	2.55	.00	.00	.00
10	1.37	.00	1.05	.00	.00	.00T	.55	.00X	.00	.00	.05	.00
11	.52	.00	.65	.00	.00	.00	.10	.39A	.00	.00	.00	.04
12	.00	.25	.83	.00	.00	.00	.00	.00	.00	.00	.00T	.18
13	.41	.00	.00T	.94	.00	.00T	.00	.03	.00	.00	.00X	.00
14	.00	.00	.08	.00	.00	.03	.00	.02	.00	.00	.06A	.00X
15	.00	.00	.00	.00	.01	.06	.00	.00	.00	.00	.32	.12A
16	.00	.00	.00	.00	.07	2.17	.00	.72	.00	.59	.00	.00T
17	.00	.00	.53	.00	.00	.02	.02	.00X	.00	.00	.00T	.00
18	.01	.53	.38	.00	.00	.14	.00	1.48A	.19	.00	.00T	.00
19	.05	.22	.00	.00	.00	.00	.00	.17	.00	.00X	.00	.00
20	.00	.00	.00	.00	.00	.97	.00	.31	.04	.07A	.00	.00T
21	.00	.00	.65	.00	.75	.03	.35	.00	2.54	.01	.00T	.00
22	.00	.00T	.01	.00	.79	1.17	.00	.02	.00	.00	.00	.00
23	.00	.00	.00	.00	.38	.44	.00	.00	.52	.00	.55	.00
24	.00	.00	.02	.00	.21	1.70	.26	.00	.28	.00	.00	.35
25	.00	.00	.00T	.00	.00	.13	.33	.00	.00	.00	.00	1.20
26	.00X	.00	.25	.00	.00	.00	.04	.02	.00	.00	.00T	.09
27	.04A	.00	2.45	.00	.00	.23	.00X	.00	.00	.00	.00	.13
28	.00	.00	.88	.00	.00	.41	.02A	.00	.00	.00	.00T	.00X
29	.00		.04	.00	.00	.66	.00T	.00	.25	.20	1.54	.23A
30	.00		.18	.00	.00	.04	.00	.00X	.00	.03	.00T	.00T
31	.00		.65		.00		.00	.75A		.00		.00T

Table 4. Daily precipitation at Station HOMES, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.10	.00	.00	.00	M	.00				
2	.00	.00	.00	.00	.00	.00	M	.00				
3	.00	.00	.00	.00	.00	.00	M	.00				
4	.00	.00	.00	.00	.10	.00	M	2.00				
5	.00	.00	.10	.00	.00	.00	M	.20				
6	.00	.00	.00	.00	.00	.00	M	.00				
7	.30	.00	.00	.00	.00	2.60	M	.00				
8	.70	.00	.00	.00	.60	.40	M	.00				
9	1.40	.00	.00	.00	.00	.10	M	.00				
10	.10	.00	1.60	.00	.00	.00	M	.20				
11	.50	.10	.90	.00	.00	.00	M	.20				
12	.40	.10	.00	.00	.00	.00	M	.00				
13	.00	.00	.10	1.00	.00	.00	M	.10				
14	.00	.00	.00	.00	.00	.00	M	.00				
15	.00	.00	.40	.00	.00	2.20	M	.70				
16	.00	.00	.10	.00	.00	.00	M	1.10				
17	.00	.00	.40	.00	.00	.20	M	.40				
18	.00	.80	.00	.00	.00	.00	M	.10				
19	.00	.00	.00	.00	.00	1.00	M	.40				
20	.10	.00	.00	.00	.80	.00	M	.00				
21	.00	.00	.70	.00	.70	1.20	M	.00				
22	.00	.00	.00	.00	.40	.40	M	.00				
23	.00	.00	.00	.00	.20	.00	M	.00				
24	.00	.00	.00	.00	.00	.00	M	.00				
25	.00	.00	.10	.00	.00	.00	M	.00				
26	.00	.00	2.40	.00	.00	.00	M	.00				
27	.00	.00	1.00	.00	.00	.00	M	.00				
28	.00	.00	.00	.00	.00	.00	M	.00				
29	.00		.20	.00	.00	.00	M	.00				
30	.00		.70	.00	.00	.00	M	.70				
31	.00		.00		.00		M	.10				

Table 5. Daily precipitation at Station EVERGLAD, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	M	M	.00	.11	1.80	.00	M	.00?	.22	M		M
2	M	.00	.14	.00	.00	1.30	M	.00?	.02	M		.01
3	M	.00	.01	.00	.06	.37	M	.02?	.00	M		.00
4	M	.00	.00	.06	.01	.31	M	.00?	.10	M		.00
5	M	.00	.00	1.00	.19	.04	M	.00?	1.58	M		.00
6	M	.00	.19	.89	.00	.22	M	.00?	.00	M		.02
7	M	.00	.00	.01	.87	.00	M	.00?	.94	M		.01
8	M	1.92	.00	.04	.00	.39	M	.00?	.14	M		.00
9	M	.14	.00	.00	.01	.02	M	.00?	.03	M		.03
10	M	.00	.00	.00	.00	.00	M	.00?	.00	M		.00T
11	M	.00	.00	.34	.00	.10	M	.00?	.00	M		.00T
12	M	.00	.00	.16	.00	.00	M	.00?	.00	M		.00T
13	M	.00	.03	.23	.00	.88	M	.06?	.00	M		.02
14	M	.00	.00	.21	.04	2.03	M	2.23?	.00	M		.00
15	M	.00	.06X	.82	.00X	1.20	M	.00?	.00	M		.00T
16	M	.00	.00A	.00	.02A	.65	M	.00?	.46	M		.00
17	M	.00	.00	.10	.00	.15	M	.00?	.00	M		.00
18	M	.00X	.02	.21	1.65	.00	M	.00?	.00	M		.00
19	M	.00A	.00	2.19	.00	.50	M	.00?	.29	M		.00T
20	M	.00	.06	.12	.13	.00	M	.00?	.00	M		.00T
21	M	.00	.00	.87	.01	.00	M	.48?	.00	M		.00
22	M	.00	.00	.01	.06	.01	M	.00?	.00	M		.00
23	M	.00	.00	.27	.04	.19	M	.00?	.02	M		.18
24	M	.00	.00	.46	.12	.00	M	.00?	.00	M		.20
25	M	.00	.00X	.05	.00	.00	M	.00?	.03	M		1.74
26	M	.00	.00A	.02	.08	.00	M	.00?	.00	M		.02
27	M	.00	.00	.00	.00	.00	M	.16?	.00	M		.18
28	M	.00	.00	.00	.00	.47	M	.11?	.00	M		.64
29	M		.00X	.16	.00	M	M	.00?	.01	M		.00T
30	M		.00A	.00	.14	M	M		.10	M		.00
31	M		.00		.40		.00?	M		M		.00

Table 6. Daily precipitation at Station S18C, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.00
2	.00	.00	.00	.00	.00	.00	.73	.00	.00	.00	.00	.05
3	.00	.00	.00	.00	.00	.00	.32	.00	1.28	.00	.00	.00
4	.00	.00	.00	.00	.00	.00	.00	.00	.59	.00	.06	.00
5	.00	.00	.00	.00	.00	.00	.10	.08	.00	.00	.00	.00
6	.05	.00	.00	.00	.00	.00	.00	.00	.27	.00	.27	.00
7	.24	.00	.00	.00	.00	.75	.13	.42	.01	.00	.00	.00
8	.31	.00	.00	.00	.00	.75	.08	.00	.00	.00	.00	.00
9	.68	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.00
10	.06	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
11	.24	.47	.00	.00	.00	.00	.00	.29X	.00	.00	.00	.16
12	.24	.22	.00	.00	.00	.00	.14	.00X	.00	.00	.33	.00
13	.00	.00	.43	.70	.00	.00	.00	.00X	.00	.00	.02	.00
14	.01	.00	.00	.00	.00	.00	.00	.00X	.00	.00	.25	.00
15	.01	.00	.09	.00	.00	.14	.00	.00X	.00	.86	.05	.18
16	.00	.00	.06	.00	.00	.00	.00	.00X	.00	.17	.00	.00
17	.00	.00	.08	.00	.00	1.00	.15	.00X	.42	.00	.00	.00
18	.00	.34	.00	.00	.00	.00	.00	4.49A	.00	.00	.00	.00
19	.00	.00	.00	.00	.00	.00	.00	.09	.00	.46	.00	.00
20	.00	.00	.00	.00	.20	.21	.00	.00	.06	.05	.00	.00
21	.00	.00	.22	.00	.00	1.23	.00	.28	.18	.00	.00	.00
22	.00	.00	.00	.00	1.03	.37	.00	.00	.02	.00	1.43	.00
23	.00	.00	.00	.00	.00	1.80	.00	.00	.00	.00	.00	.04
24	.00	.00	.00	.00	.00	.03	.00	.00	.00	.00	.00	1.00
25	.00	.00	.00	.00	.00	.03	.00	.00	.00	.00	.00	.07
26	.00	.00	1.37	.00	.00	.17	.15	.00	.02	.00	.00	.00
27	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.29
28	.00	.06	.00	.00	.00	.14	.00	.00	.19	.00	.12	.30
29	.00		.20	.00	.00	.12	.00	.00	.00	.00	.81	.00
30	.00		.00	.00	.00	.00	.00	.20	.78	.00	.00	.00
31	.00		.00		.00		.00	.15		.00		1.13

Table 7. Daily precipitation at Station TRAIL.RG, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.10	.10	.00	.20	M	.10				
2	.00	.00	.00	.00	.10	.00	M	.10				
3	.00	.00	.00	.00	.00	.00	M	.00				
4	.00	.00	.00	.00	.00	.10	M	.30				
5	.10	.00	.00	.00	.00	.00	M	.00				
6	.00	.00	.00	.00	.20	.00	M	.00				
7	.10	.50	.00	.00	.00	.00	M	.00				
8	1.00	.10	.00	.00	.00	.80	M	.00				
9	.70	.00	.00	.00	.70	.10	M	.00				
10	.20	.00	4.20	.00	.00	.00	M	.40				
11	.30	.00	.00	.00	.10	.00	M	.90				
12	.10	.00	.00	.00	.00	.70	M	.10				
13	.00	.00	.10	.80	.00	.00	M	.20				
14	.00	.00	.00	.00	.20	.20	M	.20				
15	.00	.00	.20	.00	.20	.50	M	.00				
16	.00	.10	.60	.00	.00	.00	M	2.10				
17	.00	.00	.00	.00	.00	.00	M	.20				
18	.00	2.00	.00	.00	.00	.10	M	.10				
19	.00	.10	.10	.00	.00	1.10	M	.00				
20	.00	.00	.00	.00	.00	.50	M	.00				
21	.00	.00	.70	.00	1.00	.70	M	.00				
22	.00	.00	.00	.00	.10	.40	M	.00				
23	.00	.00	.00	.00	.00	.00	M	.00				
24	.00	.00	.00	.00	.00	.10	M	.70				
25	.00	.00	.10	.00	.00	.00	M	.10				
26	.10	.00	2.40	.00	.00	.00	M	.20				
27	.00	.00	1.00	.00	.00	.40	M	.00				
28	.00	.00	.00	.00	.00	.10	M	.00				
29	.00		.10	.00	.00	.60	M	.10				
30	.00		.50	.00	.00	.00	M	.00				
31	.00		.00		.00		M	.10				

Table 8. Daily precipitation at Station S331, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.00X	.00	.00	.00X	.00	.00	.00X	.07A	.00X	1.72
2	.00	.00	.00X	.00	.00	.03A	.00	.00	.35A	.31	.00X	.35
3	.00	.00	.12A	.00	.00X	.04	.86	.00	.00	.00	.00X	.04
4	.00X	.00	.00	.00	.00X	.00	.00X	.00	.01	.00X	.00X	.00
5	.00X	.00	.07	.00	.05A	.01	.00X	.51	.13	.00X	.35A	.00
6	.02A	.00	.00X	.00	.00	.00	.00X	.27	.00X	.15A	.63	.00X
7	.04	.00	.00X	.00	.05	.00X	.39A	.02	.00X	.00	.00	.00X
8	.18	.00X	.00X	.00	.00	.00X	.04	.00	3.37A	.00	.00	.13A
9	.39	.00X	.00X	.00	.64	2.88A	.00	.00X	.77	.00	.00	.00
10	1.05	.01A	.07A	.00	.00	.00	.12	.00X	.04	.00	.13	.00
11	.00X	.00	1.43	.00	.00	.00	.00	.35A	.06	.00	.00	.02
12	.00X	.30	.21	.00X	.00	.00	.00X	.05	.00	.00	.00	.06
13	.58A	.03	.01	.00X	.00	.00	.00X	.03	.00	.00	.07	.00X
14	.00	.00	.02	.97A	.00	.00X	.09A	.48	.00	.00	.00	.00X
15	.00	.00	.00X	.00	.00	.00X	.00	.00	.00	.12	.00	.07A
16	.00	.00	.00X	.00	.05	1.00A	.00	.00X	.46	.57	.00	.13
17	.00	.00	.80A	.00	.00	.28	.00	.00X	.00	.00	.20	.00
18	.00X	.00	.05	.00	.00	.43	.06	1.55A	.30	.00X	.00	.00
19	.00X	.67	.00	.00	.00	.00	.00	.32	.35	.00X	.00	.00
20	.08A	.00	.00	.00	.00	.84	.00	.10	.00X	.88A	.00	.00
21	.00	.00	.00	.00	.40	.00X	.00	.00	.00X	.07	.00	.00
22	.00	.00X	.00X	.00	.08	.00X	.16	.11	1.58A	.00	.00	.00
23	.00	.00X	.00X	.00	.93	2.35A	.00	.00	.74	.00	.00	.02
24	.00	.01A	.42A	.00	.00X	.82	.00	.00	.14	.00	1.42	.16
25	.00X	.00	.05	.00	.00X	.20	1.37	.00	.00	.00	.00	.00X
26	.00X	.00	.30	.00	.00X	.00	.00X	.10	.00	.00	.00	.00X
27	.03A	.00	3.52	.00	.31A	.03	.00X	.00	.00	.00	1.72	.00X
28	.00	.00	.65	.00	.00	.00X	.72A	.00	.00	.00	.00	.00X
29	.00		.00X	.00	.00	.00X	.15	.00	.00	.15	.00	1.38A
30	.00		.00X	.00	.00	3.32A	.00	.00X	.11	.02	.00	.02
31	.00		.42A		.00X		.00	.00X		.00		.00

Table 9. Daily precipitation at Static

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.00	.01	.00	.00X	.00	.00	.00X	.07A	.00X	1.20
2	.00	.00	.00	.18	.00	.10A	.07	.00X	.45A	.10	.00X	.30
3	.00	.00	.00	.00	.00X	.02	.82	.00X	.00	.00	.02A	.05
4	.00	.00	.00	.00	.00X	.00	.00X	.15A	1.20	.00	.10	.00
5	.00	.00	.02	.00	.65A	.04	.00X	.72	.05	.00	.00	.05
6	.00	.00	.00X	.00	.20	.02	.00X	.05	.00X	.00	.20	.00X
7	.03	.00	.00X	.00	.00	.00X	.40A	.00	.00X	.00	.00	.00X
8	.21	.00X	.00X	.00	.00	.00X	.38	.00	.48A	.00	.00X	.10A
9	1.90	.00X	.00X	.00	1.10	2.10A	.15	.00X	.00	.00	.00X	.00
10	1.25	1.00A	.15A	.00	.00X	.00	2.28	.00X	.20	.00	.25A	.00
11	.00X	.00	3.85	.00	.00X	.00	.00	1.38A	.00	.00	.00X	.00
12	.00X	.03	.00	.00X	.58A	.00	.00X	.10	.00	.00	.10A	.73
13	.85A	.10	.01	.00X	.00	.01	.00X	.48	.00	.00	.58	.00
14	.00	.00	.10	.52A	.00	.00X	1.08A	.05	.00	.00	.03	.00
15	.00	.00	.00X	.00	.30	.00X	.00	.00X	.00	.00	.00X	.00
16	.00	.00	.00X	.00	.22	4.45A	.00	.00X	.00	.80	.00X	.00
17	.00	.00	1.05A	.00	.00X	.20	.02	.48A	.00	.00	1.62A	.00
18	.00X	.00	.08	.00	.00X	.42	.00	.00	.05	.00X	.00	.00
19	.00X	1.22	.00	.00	.01A	.00	.00X	.00	.00	.00X	.00	.00
20	.05A	.00	.00	.00	.00	1.22	.00X	.02	.00X	1.00A	.00	.00
21	.00	.00	.02	.00	.00	.00X	.78A	.00	.00X	.05	.02	.00
22	.00	.00	.00X	.00	4.69	.00X	.00	.00	.55A	.10	.00X	.00
23	.00	.00	.00X	.00	.97	2.42A	.30	.00	.10	.62	.00X	.08
24	.00	.00	.80A	.00	.00X	.00	.00	.00	.20	.00	.47A	.10
25	.00X	.00	.02	.00	.00X	.00	.20	.00	.05	.00	.00	.00X
26	.00X	.00	.60	.00	.00X	.32	.00X	.05	.02	.00	.00	.00X
27	.07A	.00	3.03	.00	.10A	.55	.00X	.10	.00	.00	.00	.00X
28	.00	.00	.72	.00	.00	.00X	2.05A	.10	.00	.18	.00	.00X
29	.00		.00X	.00	.00	.00X	.30	.00	.00	.10	.00	1.00A
30	.00		.00X	.00	.00	.25A	.00	.00X	.50	.10	.00	.03
31	.00		.85A		.00X		.00	.00X		.02		.01

Table 10. Daily precipitation at Station MIAMI.12, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.00X	.00	.00	.07	.00	.00	.00X	.00	.00	.00
2	.00	.00	.00X	.04	.00	.00	.00	.00X	.00X	.00	.00	.00
3	.00	.00	.45A	.00	.00X	.03	.00	.00X	.00X	.00	.04	.00
4	.00X	.00	.00	.00	.00X	.00	.00X	.17A	.06A	.00	.07	.00
5	.00X	.00	.03	.00	.55A	.00	.00X	.16	.13	.00	.18	.00
6	.98A	.00	.00	.00	.00	.00	.48A	.00	.00X	.00	.00	.00
7	.18	.00	.00	.00	.00	1.32	.13	.00	.26A	.00	.00	.00
8	.08	.00X	.00X	.00	.00	.00	.65	.00	.42	.09	.00	.00
9	.29	.00X	.00X	.00	.05	.20	.03	.00X	.00	.00	.13	.00
10	.49	.14A	.13A	.00	.00	.00	.00	.00X	.00	.00	.00	.00
11	.00X	.00	2.28	.00	.00	.00	.00	.56A	.00	.00X	.00	.00
12	.00X	.21	.00	.00X	.00	.00	.00X	.00	.00	.00X	.00	.00
13	1.12A	.00	.00	.00X	.00	.00	.00X	.78	.00	.00X	.08	.00
14	.00	.00	.00	.00X	.00	.00X	.28A	.00X	.00	.05A	.00	.00
15	.00	.00X	.00X	.57A	.11	.00X	.00	.77A	.00	.00X	.00	.00
16	.00	.00X	.00X	.00	.36	1.30A	.00	.00X	.00	.35A	.00	.00
17	.00	.00X	.56A	.00	.00	.67	.00	.16A	.00	.00	.27	.00
18	.00X	.73A	.00	.00	.00	.00X	.00	.00X	1.38	.00	.00	.00
19	.00X	.00	.00	.00	.00	.00X	.25	.63A	.14	.00	.00	.00
20	.00X	.00	.00	.00	.00	.00X	.00	.04	.00	.00	.00	.00
21	.05A	.00	.00	.00	.08	.00X	.00	.00	.22	.20	.00	.00
22	.00	.00	.00	.13	1.77	5.25A	.00	.00	.06	.00	.00	.00
23	.00	.00	.00	.00	.14	.00	.00	.00X	.00X	.16	.00	.00
24	.00	.00	.58	.00	.00X	.28	.00	.26A	1.31A	.00	.22	.00
25	.00X	.00	.00	.00	.00X	1.71	.00	.00	.00X	.00	.00	.00
26	.00X	.00	.45	.00	.00X	.00	.00X	.00	.00X	.00	.00	.00
27	.14A	.00	1.26	.00	.00X	.00	.00X	.00	.00X	.00	.00	.00
28	.00	.00	.15	.00	.05A	.00X	.85A	.00	.00X	.00	.00	.00
29	.00		.00X	.00	.00	.00X	.20	.00	.47A	.10	.00	.00
30	.00		.00X	.00	.00	1.03A	.00	.00	.00	.00	.87	.00
31	.00		.70A		.00		.00	.00		.00		.00

Table 11. Daily precipitation at Station S20F, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.02	.00	.00	.00	.00	.00	.00	.11	.00	1.10
2	.00	.00	.00	.00	.00	.00	2.17	.00	.00	.00	.06	.14
3	.00	.00	.00	.00	.00	.00	.08	.00	.00	.00	.02	.00
4	.00	.00	.00	.00	.00	.00	.00	.08	.80	.00	.21	.00
5	.00	.00	.00	.00	.00	.00	.03	.69	.00	.00	.00	.00
6	.16	.00	.00	.00	.00	.00	.12	.00	.20	.00	.70	.10
7	.00	.00	.00	.00	.00	4.27	.00	.05	.12	.00	.00	.00
8	.30	.00	.00	.00	.00	.38	.00	.00	.00	.00	.00	.00X
9	.57	.00	.00	.00	.00	.00	.07	.00	.00	.00	.00	.00X
10	.10	.00	.72	.00	.00	.00	.00	.16	.00	.00	.00	.00X
11	.06	.31	.00	.00	.00	.00	.00	.25	.00	.00	.00	.00X
12	.31	.43	.00	.00	.00	.00	.00	.11	.00	.00	.11	.00X
13	.01	.00	.11	.87	.00	.00	.05	.84	.00	.14	.00	.00X
14	.02	.62	.00	.00	.00	.00	.00	.00	.00	.49	.00	.00X
15	.00	.00	.19	.00	.00	.10	.00	.00	.00	.40	.00	.39A
16	.00	.00	.18	.00	.00	.15	.00	1.29	.00	.03	.00	.00
17	.00	.00	.00	.00	.00	.51	.00	1.21	.00	.00	.00X	.00
18	.00	.13	.00	.00	.00	.27	.00	.02	.00	.00	.00X	.00
19	.00	.00	.00	.00	.00	.71	.00	.02	.38	1.30	.00X	.00
20	.00	.00	.00	.00	.00	.09	.00	.00	.00	.00	.00X	.00
21	.00	.00	.61	.00	.01	.67	.00	.15	.00	.00	.00X	.00
22	.00	.00	.00	.00	.36	.00	.00	.00	1.68	.00	.00X	.00
23	.00	.00	.00	.00	.28	.00	.00	.00	.25	.00	.00X	.07
24	.00	.00	.00	.00	.00	.91	.00	.00	.05	.00	.49A	.90
25	.00	.00	.02	.00	.00	.07	.12	.02	.00	.00	.00	.05
26	.00	.00	.83	.00	.00	.00	.00	.00	.00	.00	.00	.44
27	.00	.00	.35	.00	.00	.03	.00	.00	.00	.00	.00	.13
28	.00	.02	.00	.00	.00	.14	.94	.00	.00	.00	.00	.18
29	.00		.00	.00	.00	.03	.00	.00	.00	.00	.54	.00
30	.00		.03	.00	.00	.14	.00	.12	.00	.06	.00	.00
31	.00		.00		.00		.00	.11		.01		.00X

Table 12. Daily precipitation at Station S20, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.06	.00	.00	.00	.00	.00	.00	.00	.00	.83
2	.00	.00	.00	.00	.00	.00	.04	.00	.00	.00	.00	.00
3	.00	.00	.00	.00	.00	.00	.15	.00	.00	.00	.00	.00
4	.00	.00	.00	.00	.25	.00	.00	.00	.65	.06	.03	.00
5	.00	.00	.02	.00	.00	.00	.05	1.11	.00	.00	.00	.00
6	.40	.00	.00	.00	.00	.00	.00	.00	.15	.00	.17	.00
7	.00	.00	.00	.00	.00	.14	.35	.06	.00	.00	.00	.00
8	.49	.00	.00	.00	.00	.56	.00	.00	.00	.00	.05	.03
9	.65	.00	.00	.00	.00	.00	.00	.02	.00	.05	.27	.00
10	.02	.00	.24	.00	.00	.00	.00	.00	.00	.00	.00	.03
11	.04	.44	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10
12	.49	.27	.00	.00	.00	.00	.00	.11	.00	.00	.00	.00
13	.00	.00	.00	1.16	.00	.00	.03	.47	.00	.00	.08	.00
14	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.09	.00
15	.00	.00	.03	.00	.00	.40	.00	.00	.00	.63	.07	.00
16	.00	.00	.07	.00	.00	.25	.00	.98	.00	.20	.00	.00
17	.00	.00	.21	.00	.00	.97	.00	.84	.00	.00	.00	.00
18	.00	.69	.01	.00	.00	.00	.00	.12	.00	.00	.00	.25
19	.00	.00	.00	.00	.00	1.81	.00	.37	.00	.77	.00	.00
20	.00	.00	.00	.00	.00	.00	.13	.00	.00	.64	.00	.00
21	.00	.00	.43	.00	.00	.07	.00	.00	.56	.03	.00	.00
22	.00	.00	.00	.00	.20	2.55	.00	.00	.00	.00	2.77	.00
23	.00	.00	.00	.00	.00	.09	.00	.00	.00	.00	.00	.12
24	.00	.00	.00	.00	.00	.30	.23	.00	.03	.00	.00	1.04
25	.00	.00	.04	.00	.00	.00	.52	.85	.00	.00	.00	.21
26	.00	.00	1.28	.00	.00	.00	.00	.00	.00	.00	.00	.01
27	.00	.00	.34	.00	.00	.00	.00	.00	.00	.00	.00	.25
28	.00	.02	.00	.00	.00	.54	.00	.00	.20	.00	.46	.20
29	.00		.00	.00	.00	.00	.00	.00	.18	.00	.54	.00
30	.00		.00	.00	.00	.00	.00	.00	.27	.00	.00	.00
31	.00		.00		.00		.00	.00		.00		2.43

Table 13. Daily precipitation at Station HIALEAH, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.00	.21	.00	.02	.00	.00	.00	.00	.00	
2	.00	.00	.00	.00	.00	.00	.92	.25	.00	.00	.00	
3	.00	.00	.00	.00	.00	.00	.15	.15	.45	.00	.11	
4	.00	.00	.02	.00	.28	.12	.43	.24	.01	.00	.00	
5	.00	.00	.00	.00	.26	.00	.09	.03	.02	.00	.08	
6	.05	.00	.00	.00	.00	.00	.55	.07	.07	.00	.05	
7	.44	.47	.00	.00	.00	1.54	.40	2.17	.02	.00	.05	
8	1.57	.00	.00	.00	1.34	1.28	.06	.07	.17	.00	.25	
9	1.55	.00	.92	.00	1.45	.00	.61	.41	.00	.00	.20	
10	.68	.00	3.38	.00	.00	.00	.42	1.10	.00	.00	.10	
11	.00	.00	1.00	.00	.00	.00	.11	.85	.00	.10	.07	
12	.54	.08	.00	.45	.00	.00	.08	.71	.00	.00	.67	
13	.00	.00	.08	.08	.00	.00	.05	.00	.00	.00	.17	
14	.00	.00	.14	.10	.00	.08	.00	.33	.00	.00	1.64	
15	.00	.00	.40	.00	.00	2.25	.00	1.20	.22	.72	.15	
16	.00	.01	.02	.00	.40	1.85	.02	2.12	.00	.00	.00	
17	.01	.59	.07	.00	.30	.36	.00	1.55	.21	.00	.00	
18	.09	.24	.00	.00	.00	.20	.00	.94	.00	.95	.00	
19	.00	.00	.00	.00	.00	2.43	.14	.00	.06	1.05	.00	
20	.00	.21	.22	.00	.00	.07	1.45	.19	.00	.10	.00	
21	.00	.02	.34	.00	.32	.07	.40	.00	.17	.00	.00	
22	.00	.00	.00	.00	4.00	.76	.53	.05	.11	.47	.46	
23	.00	.00	.04	.00	1.87	.06	.08	.00	.00	.00	.00	
24	.00	.00	.03	.11	.72	.00	.80	.00	.04	.00	.00	
25	.00	.00	2.45	.00	.00	.00	2.10	.15	.00	.00	.00	
26	.03	.00	4.08	.00	.00	.04	.00	.00	.00	.00	.00	
27	.00	.00	.28	.00	.00	.00	.31	.17	.00	.91	.00	
28	.00	.00	.31	.00	.00	.11	.42	.00	.00	.11	.61	
29	.00		.44	.00	.00	.22	.00	.00	.06	.11	.00	
30	.00		2.84	.00	.00	.02	.00	.42	.00	.12	.02	
31	.00		.00		.00		.10	.00		.01		

Table 14. Daily precipitation at Station MIAMI.AP, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.03	.14	.00	.03	.00T	.15	.00	.28	.00T	
2	.00	.00	.00	.00	.00	.00T	1.20	.17	.00	.00	.00	
3	.00	.00	.00	.00	.00	.00	.11	.00T	.83	.00T	.57	
4	.00	.00	.00	.00	.15	.05	.69	.53	.03	.00	.01	
5	.07	.00	.00T	.00	.54	.01	.02	.00	.00T	.00	.00	
6	.05	.00	.00	.00	.00T	.00	.45	.11	.37	.00	.05	
7	.18	.79	.00	.00	.00	2.48	.55	.00T	.00T	.00	.00T	
8	1.92	.00	.00	.00	.04	.98	.00T	.15	.00	.00	.05	
9	1.57	.00	.00	.00	.20	.00T	.70	.24	.48	.00	.15	
10	.00T	.00	2.35	.00	1.22	.00	.00	.39	.00T	.00	.00T	
11	.48	.00	.00	.00	.00	.00	.00	.36	.00	.00	.16	
12	.75	.06	.00	.00	.00	.00T	.04	.75	.00	.00	1.23	
13	.00T	.00	.14	.57	.00T	.00T	.13	.18	.00	.00T	.00	
14	.00	.00	.16	.00	.00	.00T	.00	.00	.00	.03	1.37	
15	.00	.00	.51	.00	.36	2.54	.00	.07	.22	.81	.04	
16	.00	.00	.00T	.00	.00	.38	.00	1.13	.00T	.00	.11	
17	.00	.00	.30	.00	.00	.02	.00	1.81	.57	.00	.00	
18	.00T	.84	.00	.00	.04	.35	.01	.47	.02	.00T	.00	
19	.00T	.00	.00T	.00	.00T	1.12	.08	.00T	.00	.99	.00	
20	.00	.02	.00	.00T	.00T	.08	.88	.11	.30	.39	.00T	
21	.00	.00	.48	.00	3.90	.00T	.85	.01	.72	.02	.00T	
22	.00	.00	.00	.00	1.41	.06	.09	.00	.12	.00	.29	
23	.00	.00	.00T	.00	.38	.71	.00	.00T	.07	.11	.10	
24	.00	.00	.00T	.00	.00	.00	1.14	.00	.00T	.00	.00	
25	.00	.00	.13	.00	.00	.04	.21	.01	.13	.00	.00T	
26	.02	.00	2.22	.00	.00T	.07	.00T	.42	.00	.00	.00	
27	.00	.00	1.06	.00	.00	.00	.30	.10	.00	1.20	.00	
28	.00	.00	.24	.00	.00	.00T	.36	.00T	.00	.02	.32	
29	.00		.39	.00	.00	.14	.00	.00	.00	.00T	.24	
30	.00		2.56	.00	.00	.00T	.00	.20	.52	.05	.06	
31	.00		.00		.00		.00	.31		.06		

Table 15. Daily precipitation at Station MIAMI.BE, 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	.00	.00	.12	.00T	.00	.01	.00	.00	.00	.04	.02	
2	.00	.00	.00	.00	.00	.04	.00T	.03	.00	.00	.00	
3	.00	.00	.00	.00	.00	.00	.01	.00T	.11	.00	.00T	
4	.00	.00	.00	.00	.25	.07	.00	.01	.22	.00	.00T	
5	.00	.00	.00	.00	.01	.00T	.21	.19	.00T	.00	.00	
6	.12	.00	.00	.00	.04	.00	.40	.22	1.11	.00	.00T	
7	.60	.13	.00	.00	.00	1.17	.22	.06	1.66	.00	.00T	
8	1.47	.04	.00	.00	.00	.59	.00	.00	.84	.08	.00T	
9	.49	.00	.00	.00	.00	.00T	.00	.51	.00T	.00T	.10	
10	.88	.00	1.21	.00	.32	.00	.00	.19	.00	.00	.00T	
11	1.11	.09	.35	.00	.00	.00	.00	.45	.00	.02	.00T	
12	.08	.10	.00T	.00	.00T	.06	.02	.11	.00	.00	.11	
13	.09	.00	.00	.50	.00T	.06	.10	.05	.00	.00	.00T	
14	.00	.00	.00	.12	.02	.01	.00T	.00T	.00	.02	.07	
15	.00	.00	.00	.00	.30	.71	.00	.00	.00T	.23	.03	
16	.00	.00	.87	.00	.00T	.20	.00	.03	.00T	.00T	.00T	
17	.00	.00	.00	.00	.00	1.53	.00	.19	.12	.03	.00	
18	.02	.86	.00T	.00	.00	.00T	.00	.05	.00T	.00	.00	
19	.00T	.03	.00	.00	.00	.91	.00	.00	.00	.14	.00	
20	.00	.00	.02	.00	.00T	.61	.00	.00	.00T	.02	.00	
21	.00	.00	.96	.00T	2.08	1.83	.46	.00	1.64	.02	.00	
22	.00	.00	.00T	.00	.00T	.02	.00	.00	2.79	.47	3.28	
23	.00	.00	.00T	.00	.00	.37	.00	.00	1.92	.04	2.08	
24	.00	.00	.43	.00	.00	.03	.00	.00	.17	.00	.00	
25	.00	.00	.00T	.00	.00	.00T	.00	.00	.00T	.00	.00	
26	.00	.00	2.37	.00	.00	.00	.00	.18	.00	.00	.00	
27	.05	.00	1.05	.00	.00	.12	.05	.06	.00	.00	.00	
28	.00	.00	.08	.00	.00	.00	.04	.00	.07	.00	.00	
29	.00		.09	.00	.00	.27	.00	.00	.00	.00	.26	
30	.00		.36	.00	.00	.00T	.00	.02	.00	.00T	.23	
31	.00		.00		.00		.00	.43		.00		

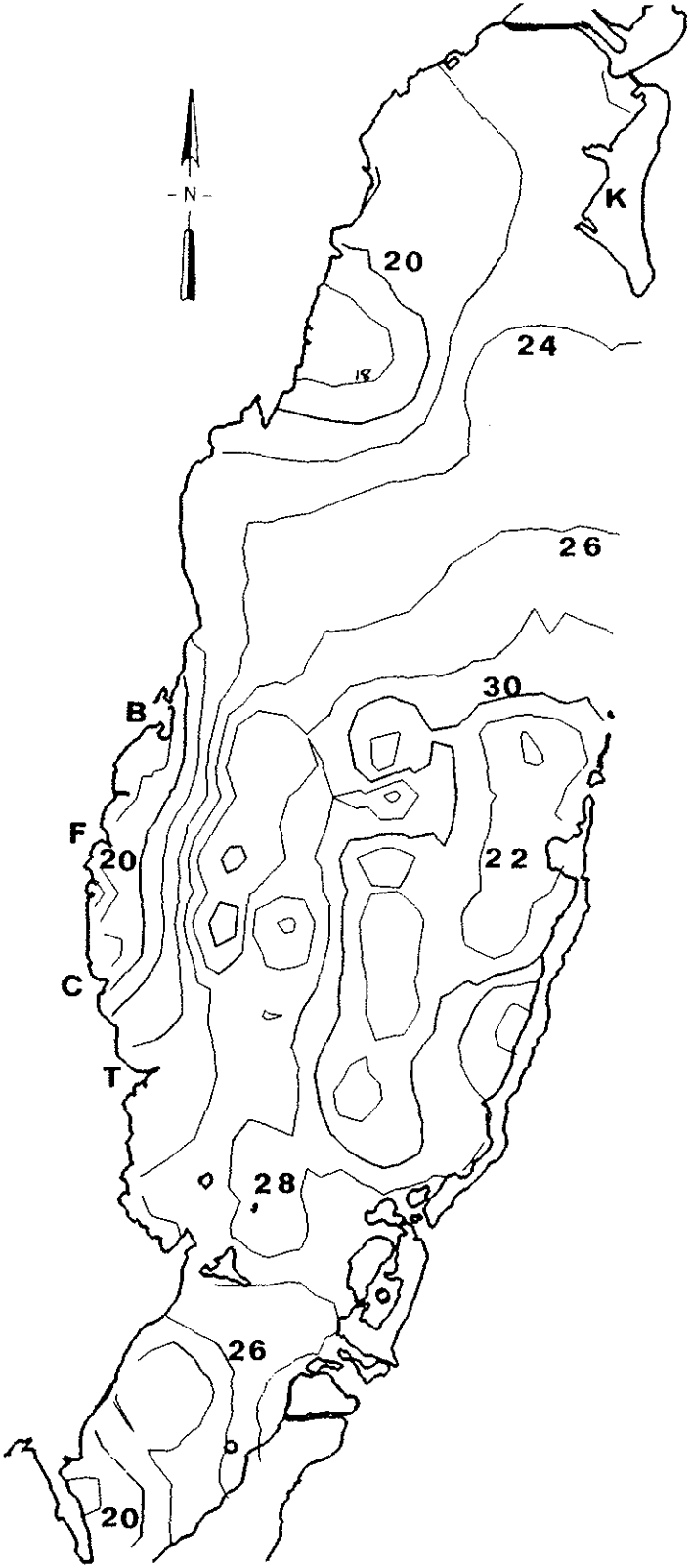


Figure 30. Isohaline map. Minimum salinities, January - March, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

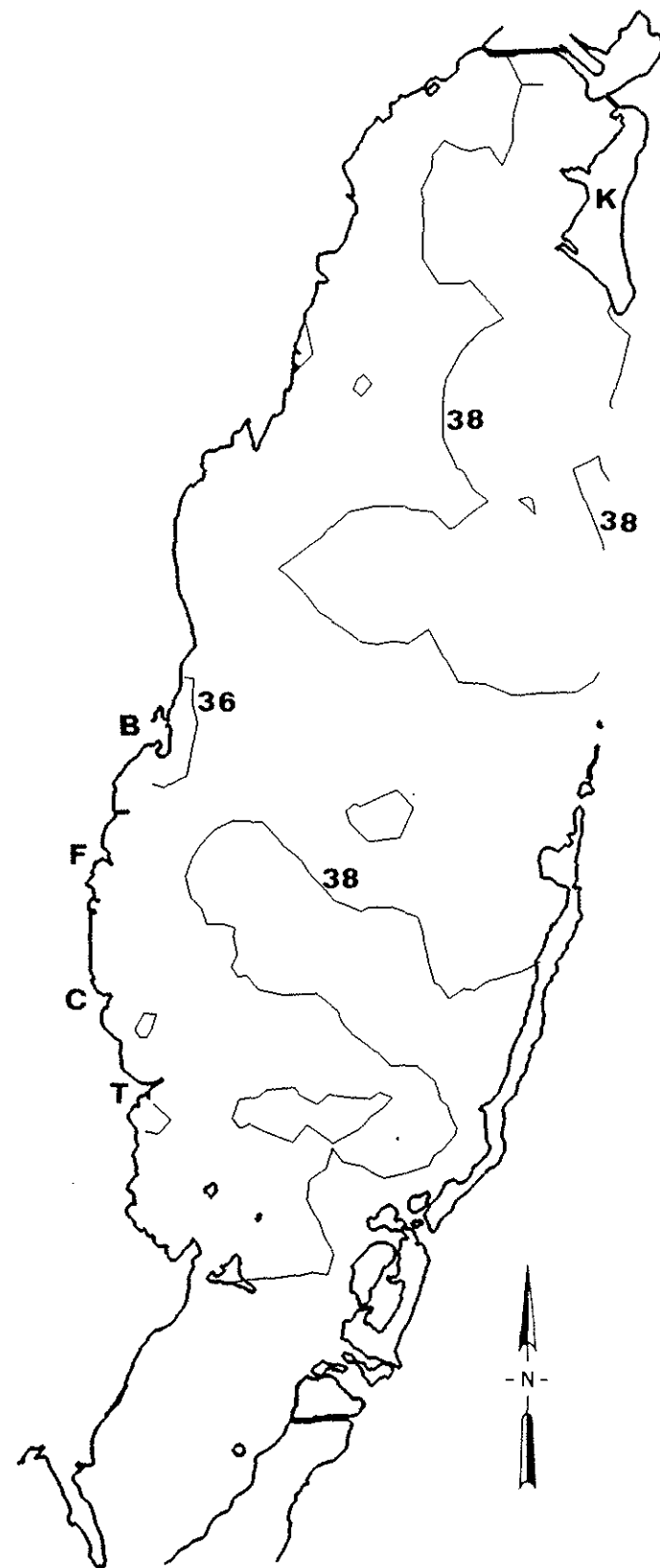


Figure 31. Isohaline map. Maximum salinities, January - March, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

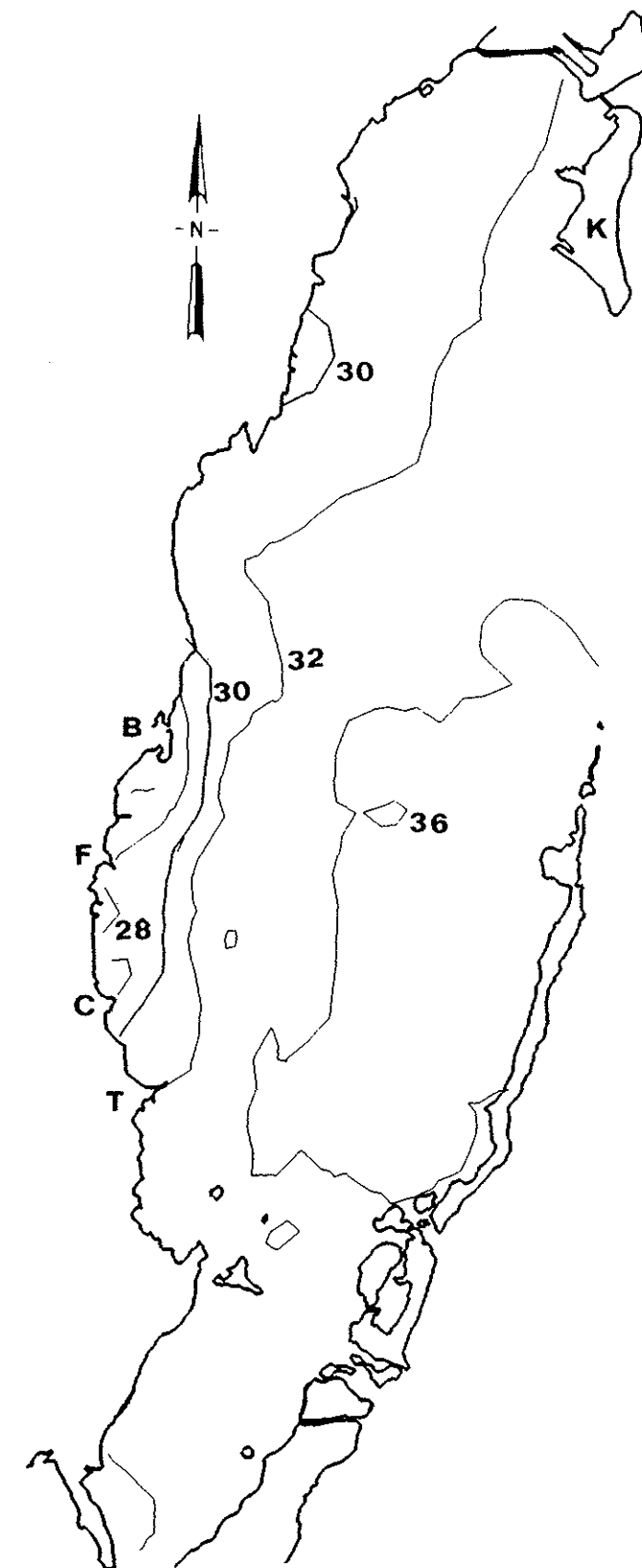


Figure 32. Isohaline map. Mean salinities, January - March, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

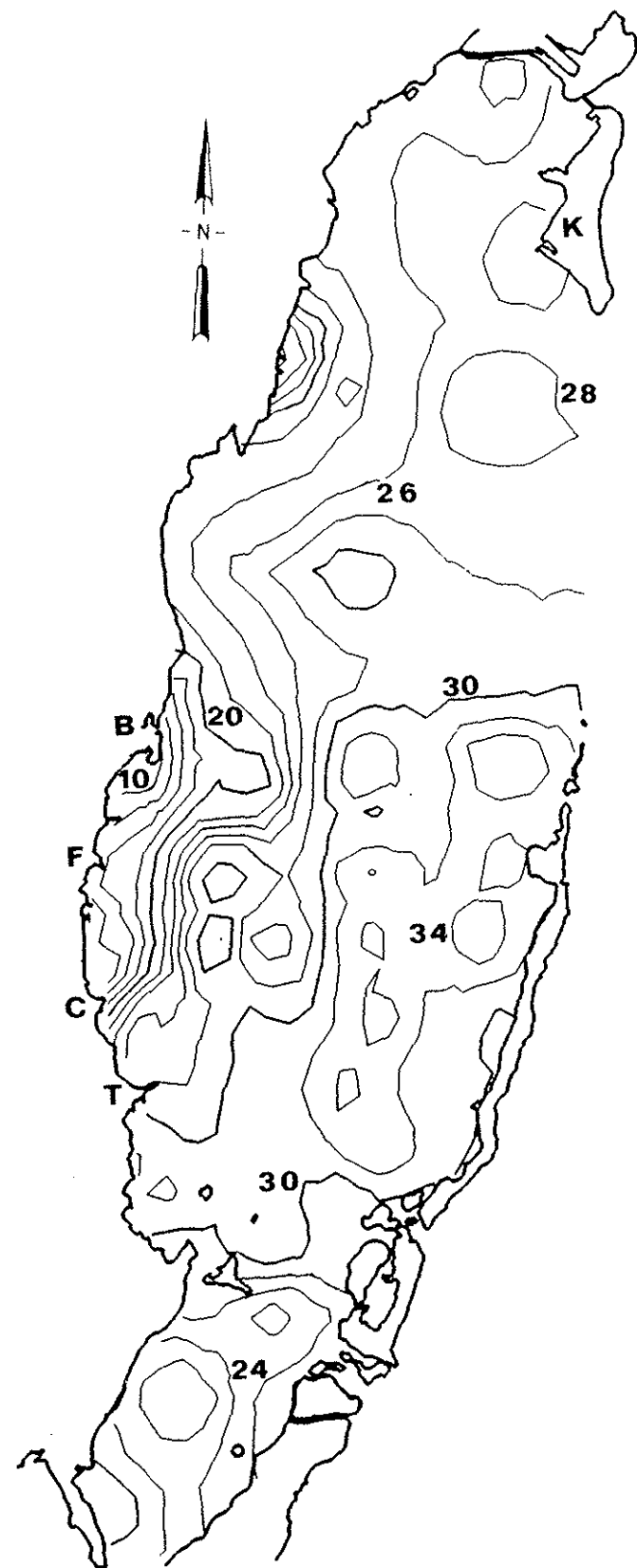


Figure 33. Isohaline map. Minimum salinities, April - June, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

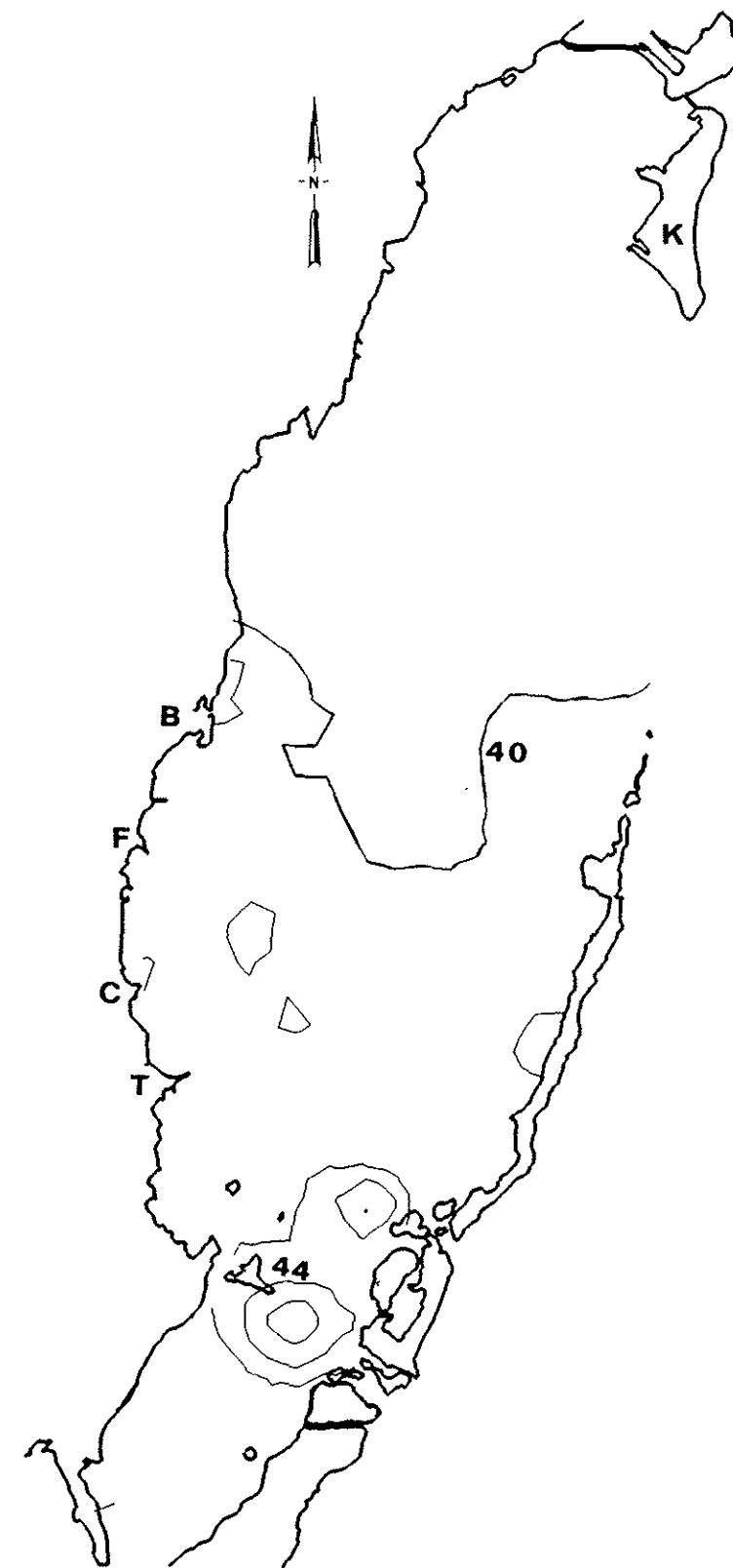


Figure 34. Isohaline map. Maximum salinities, April - June, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

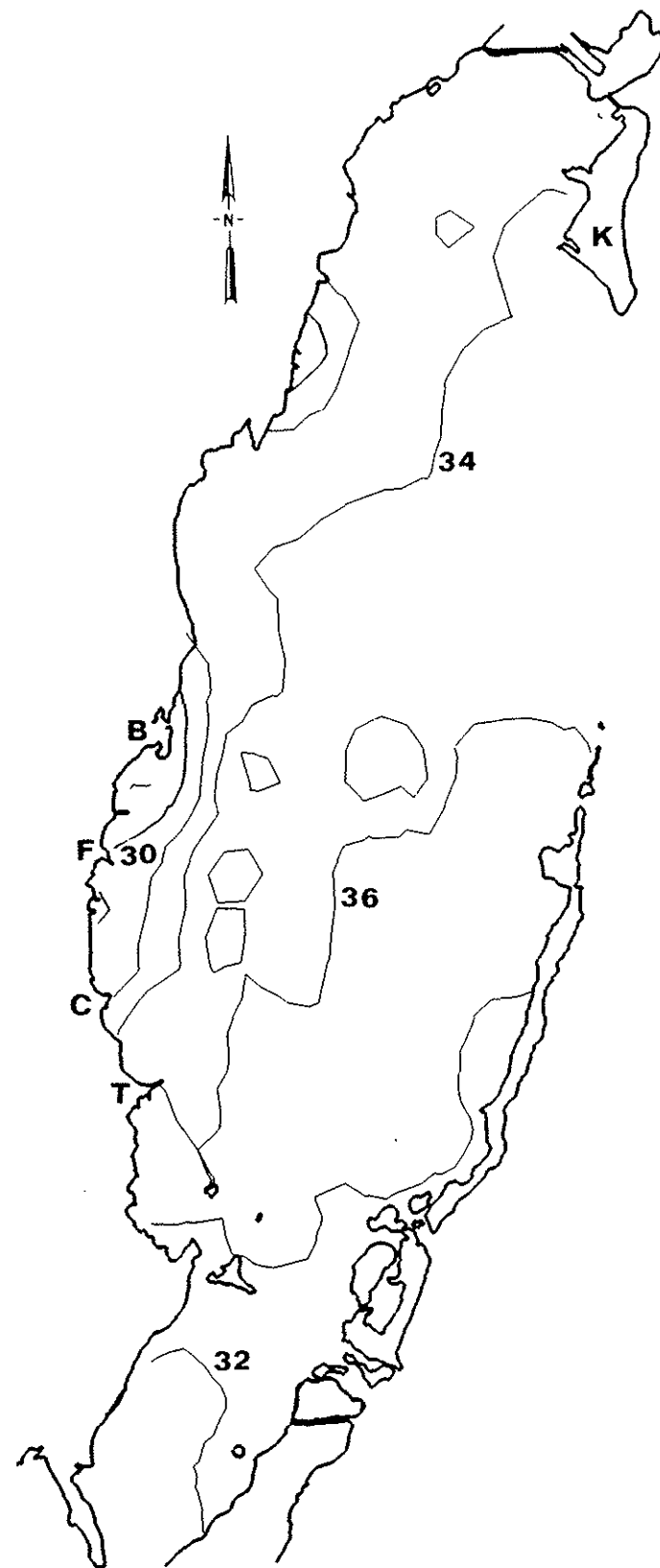


Figure 35. Isohaline map. Mean salinities, April - June
K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

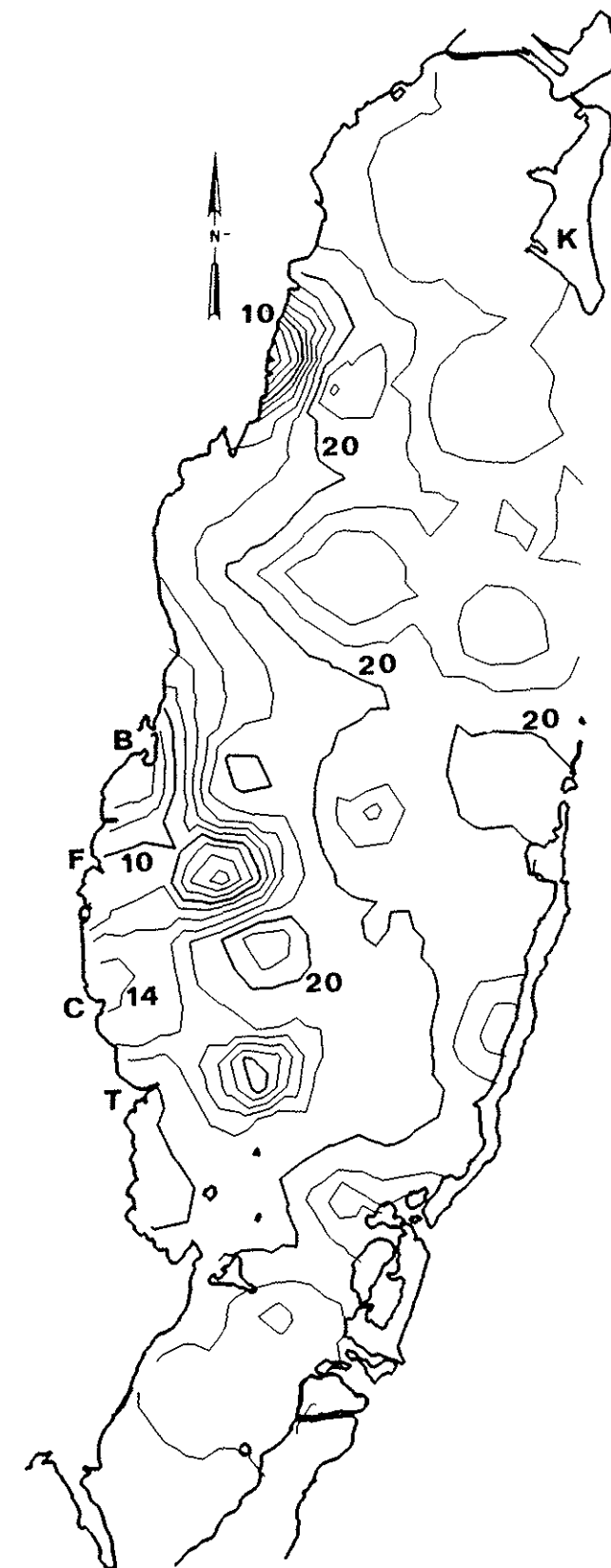


Figure 36. Isohaline map. Minimum salinities, July - September, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

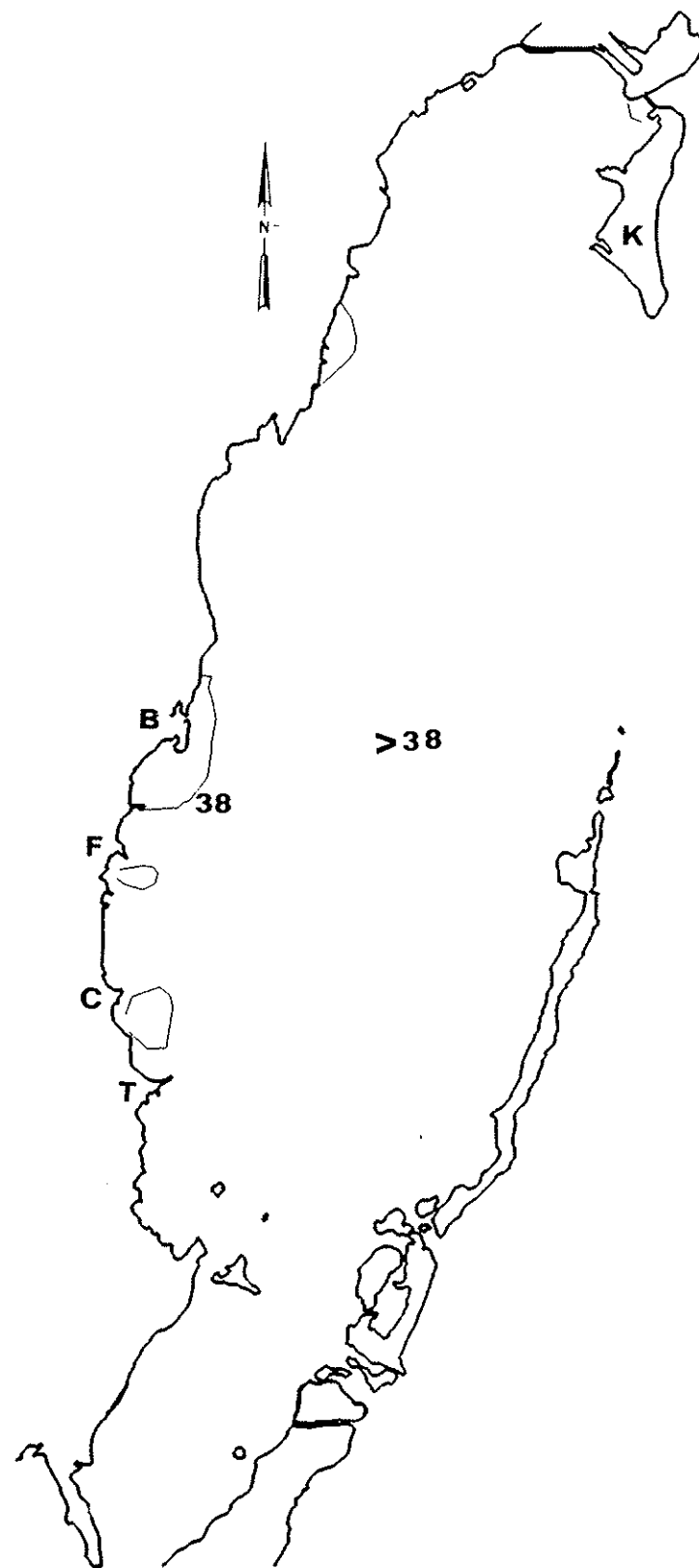


Figure 37. Isohaline map. Maximum salinities, July - September, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

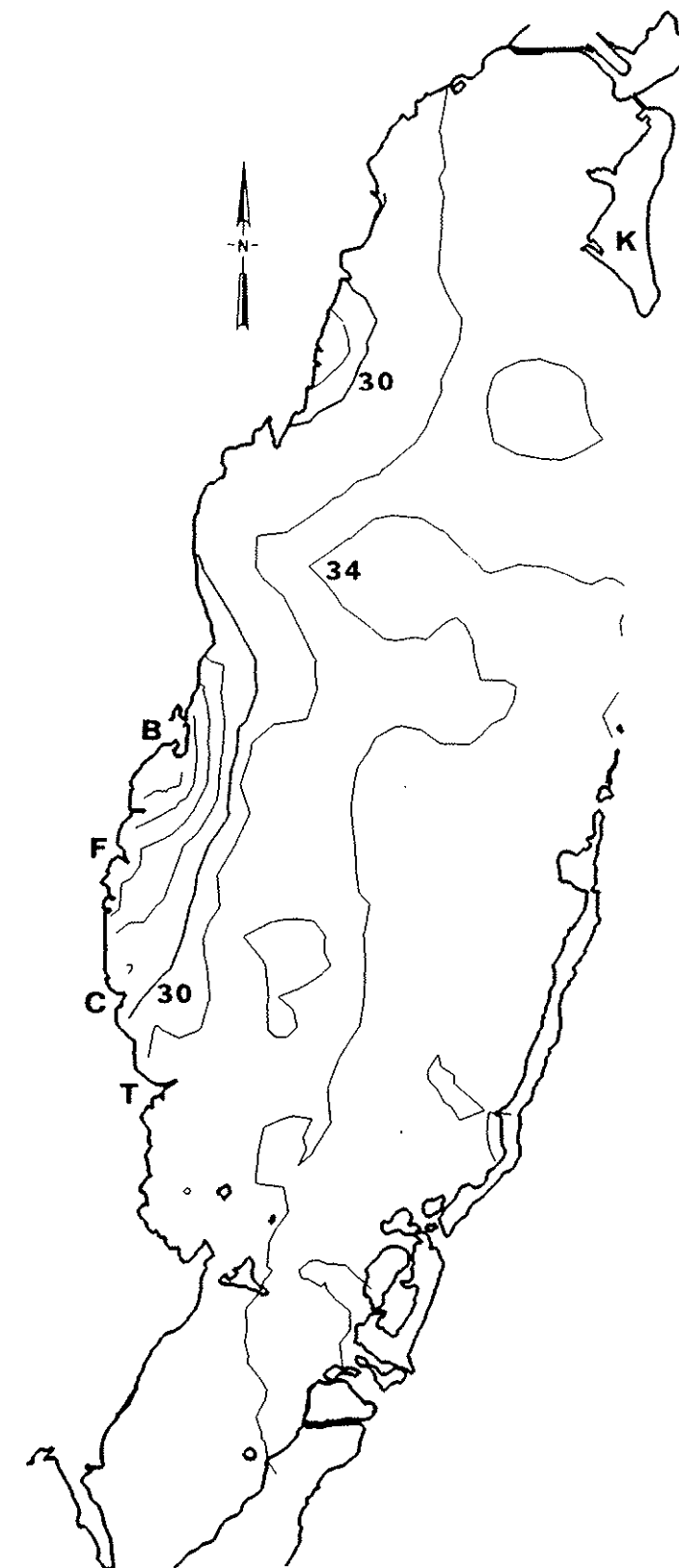


Figure 38. Isohaline map. Mean salinities, July - September, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

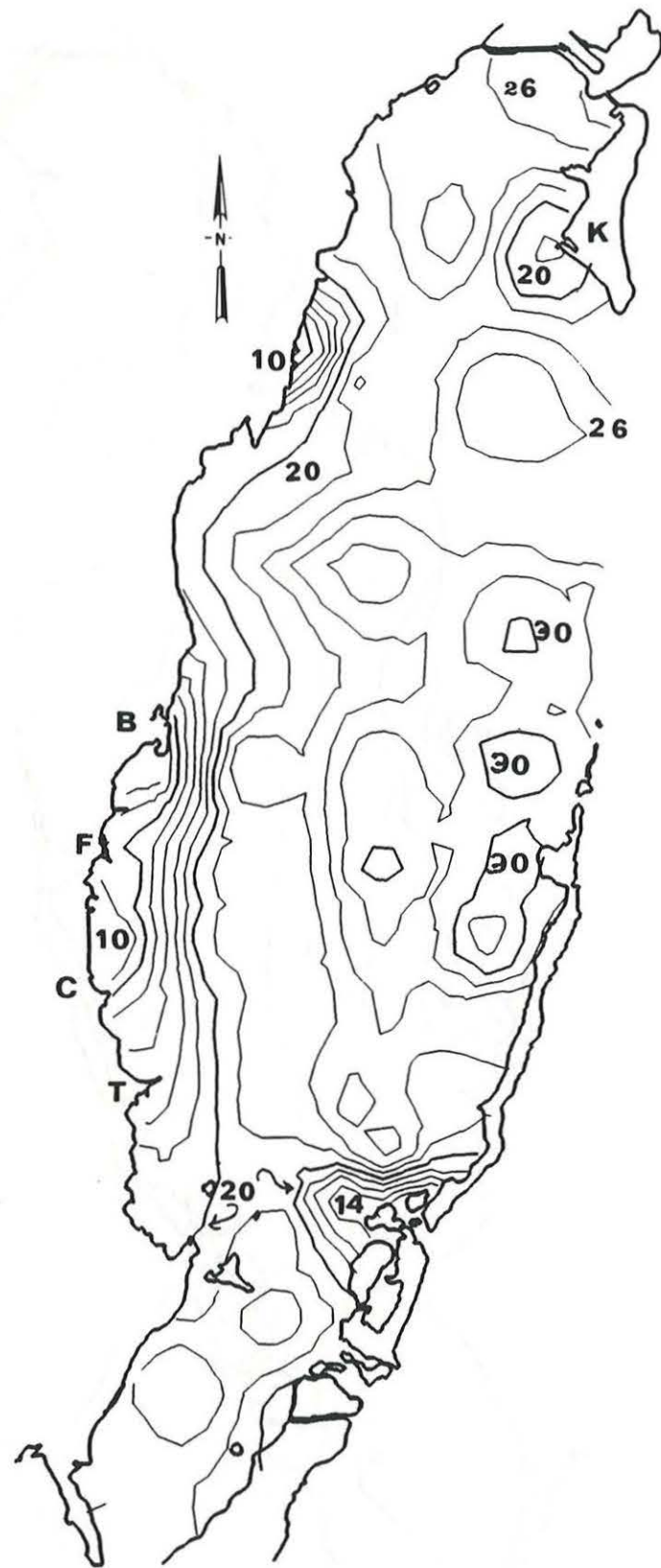


Figure 39. Isohaline map. Minimum salinities, October - December, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

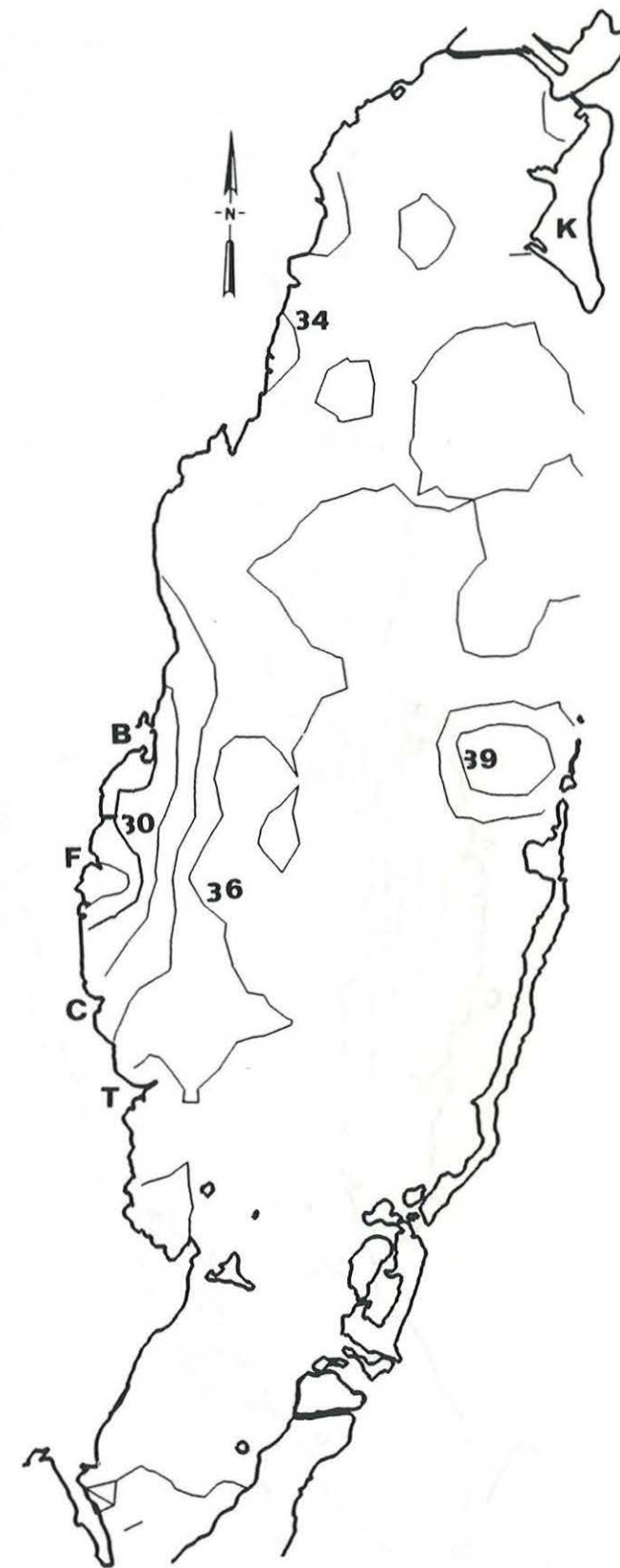


Figure 40. Isohaline map. Maximum salinities, October - December, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point

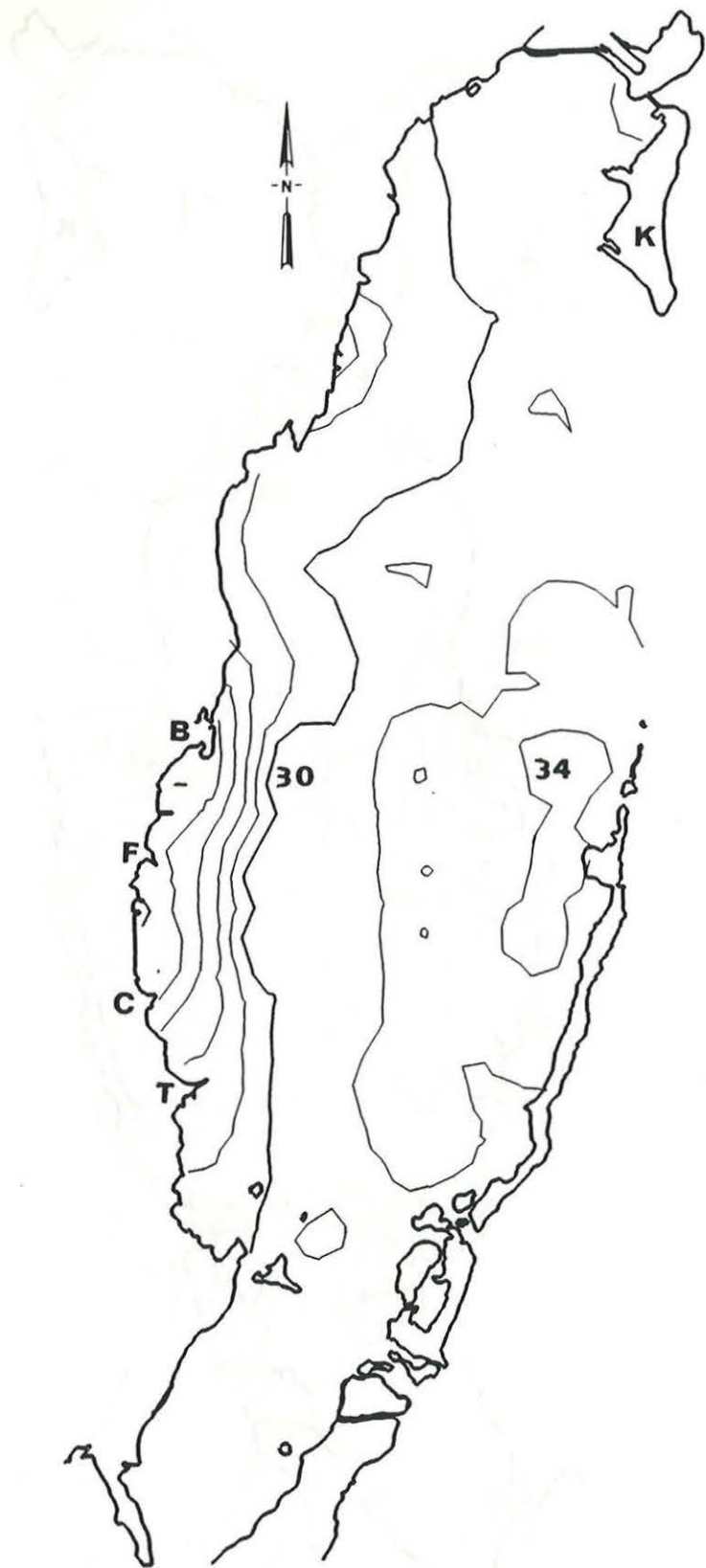


Figure 41. Isohaline map. Mean salinities, October - December, K: Key Biscayne, B: Black Point, F: Fender Point, C: Convoy Point, T: Turkey Point