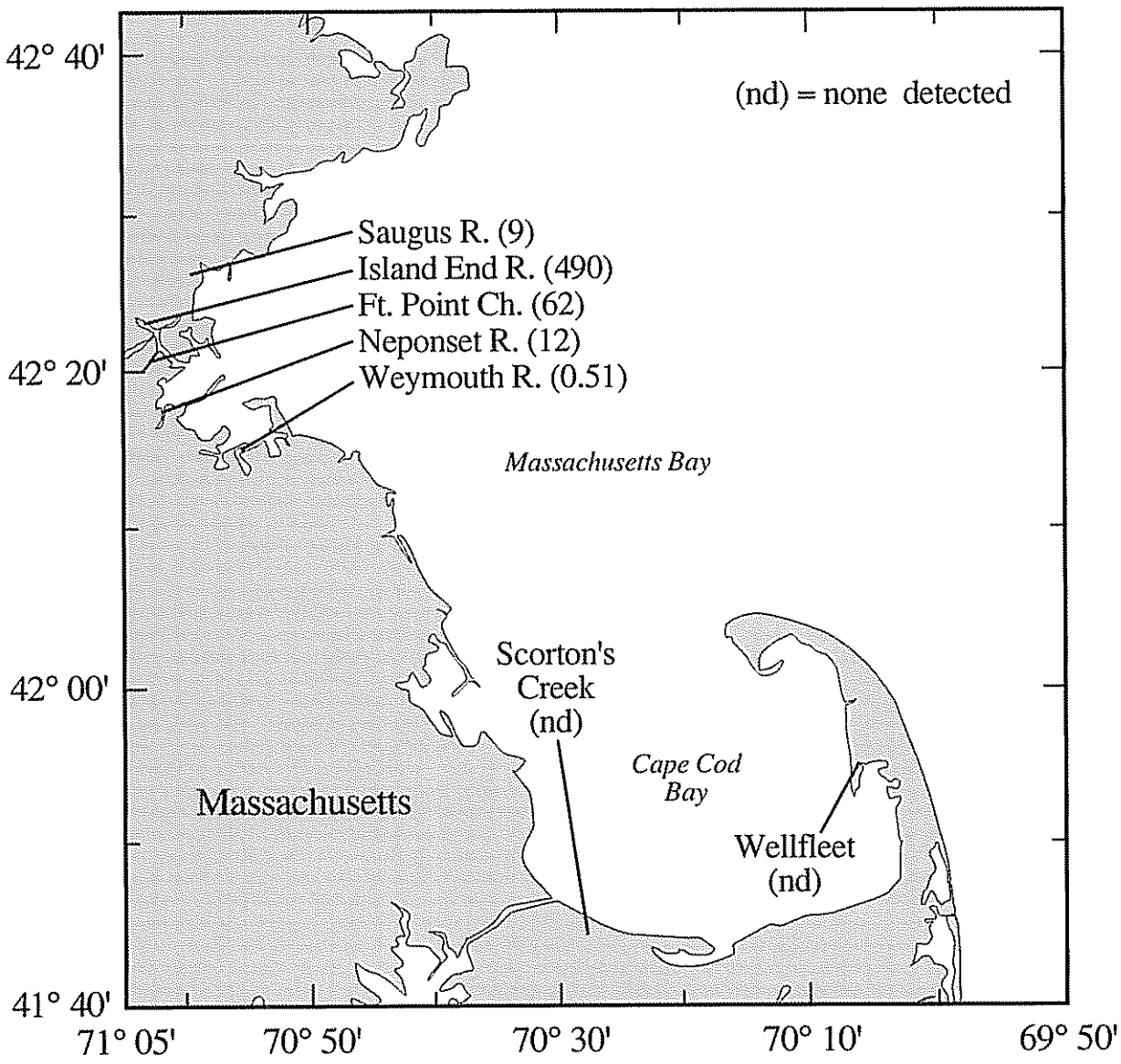
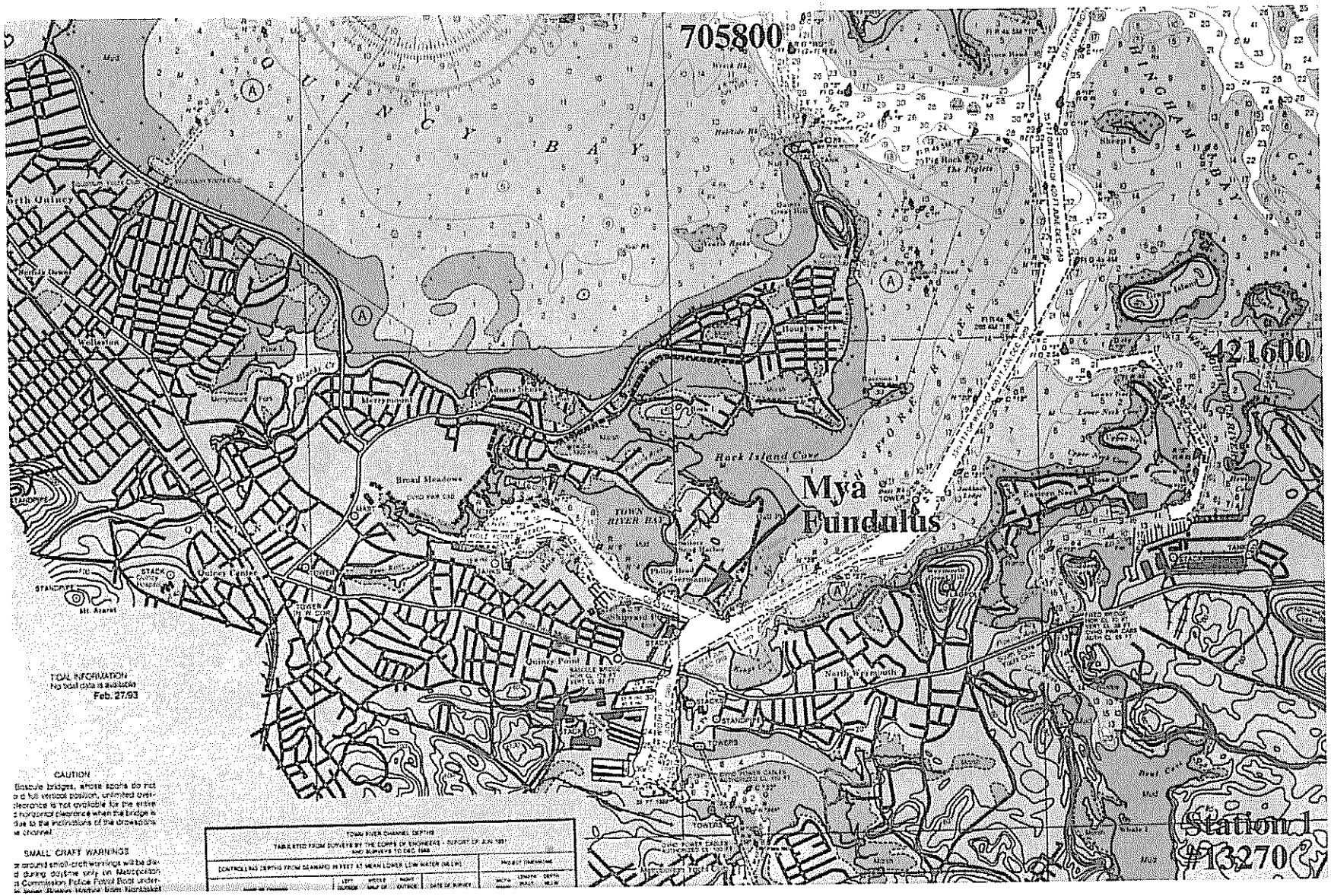
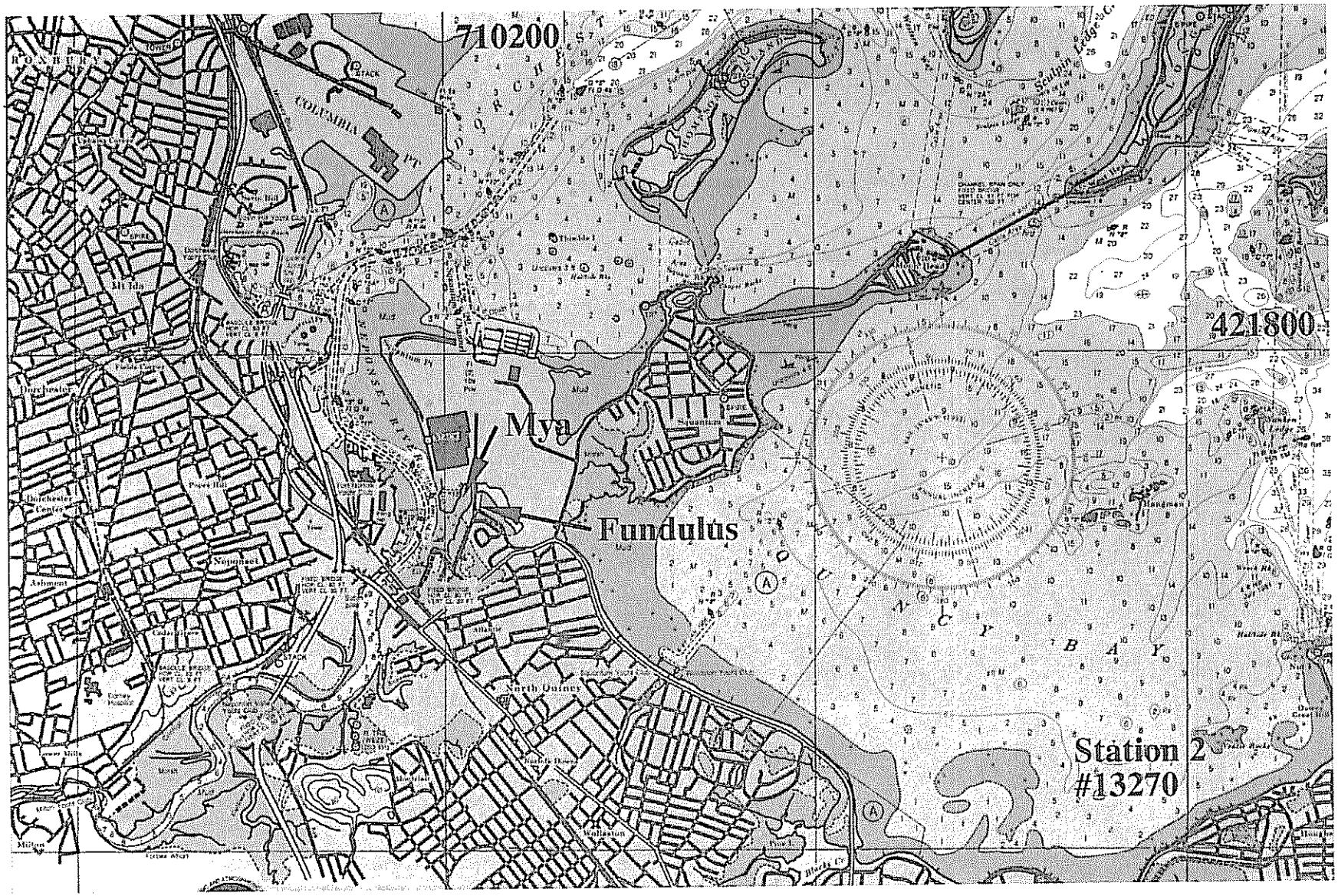
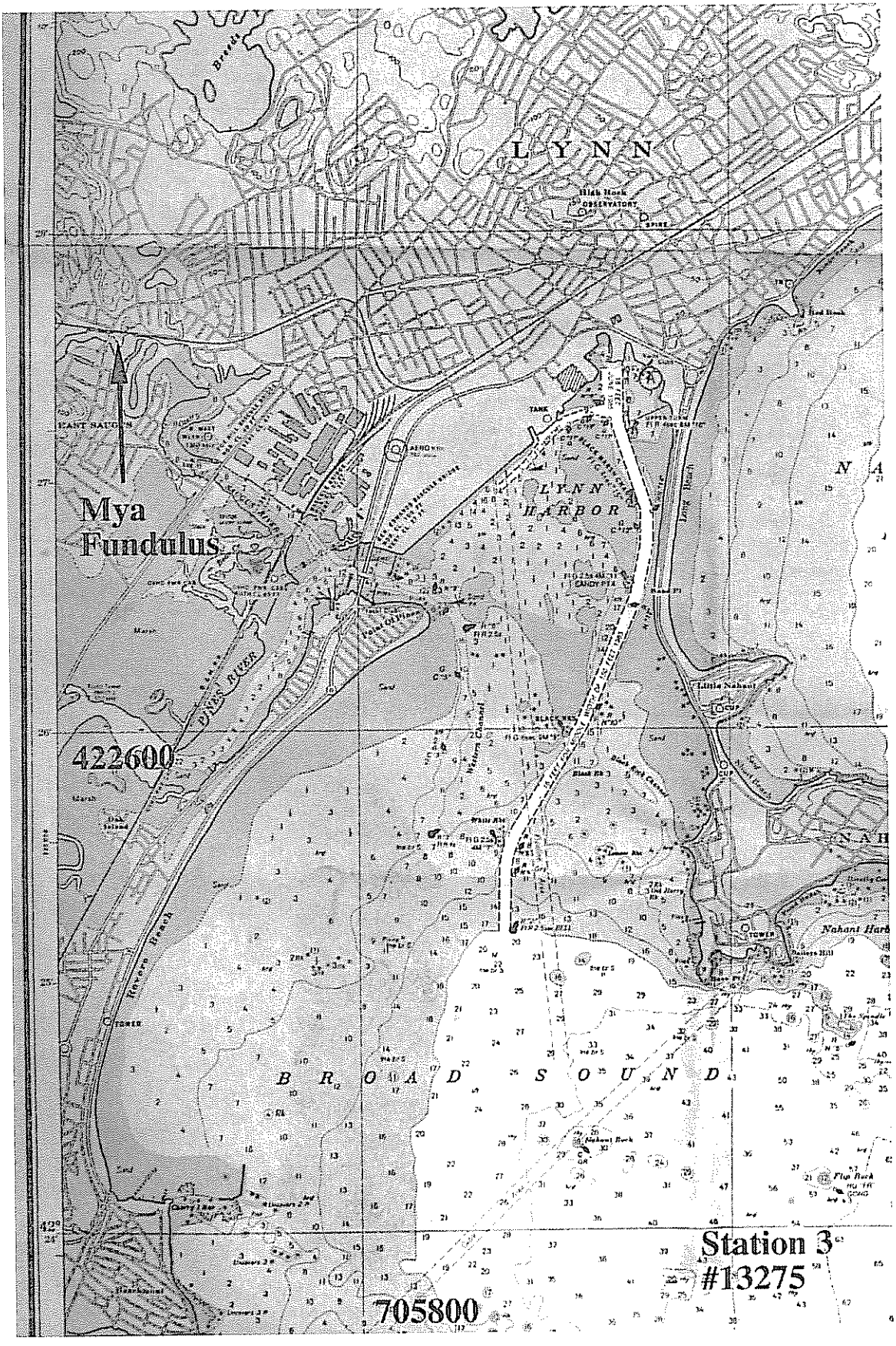
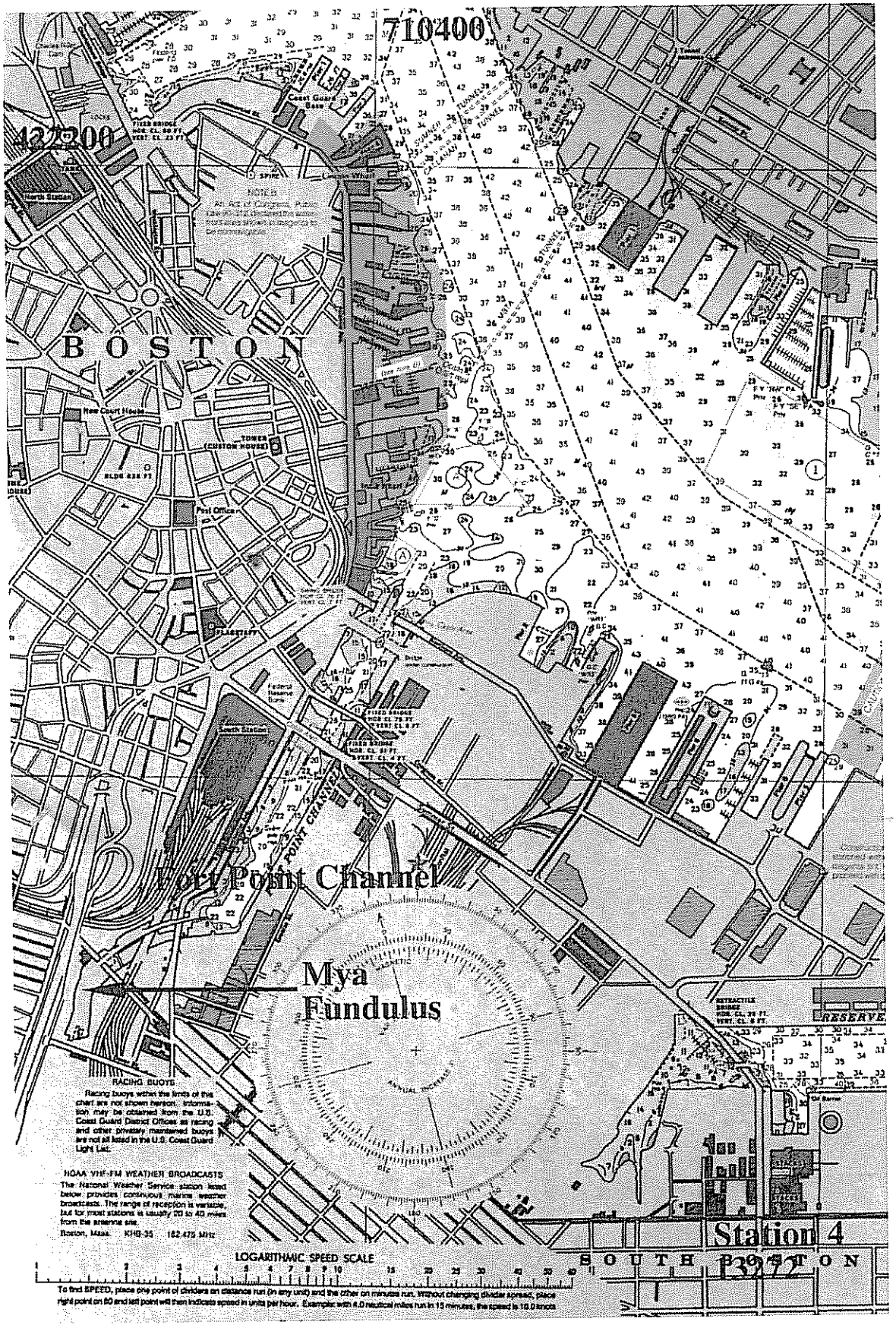
Figure 1: *Fundulus* Collection Sites and Sediment PAH (µg/g)

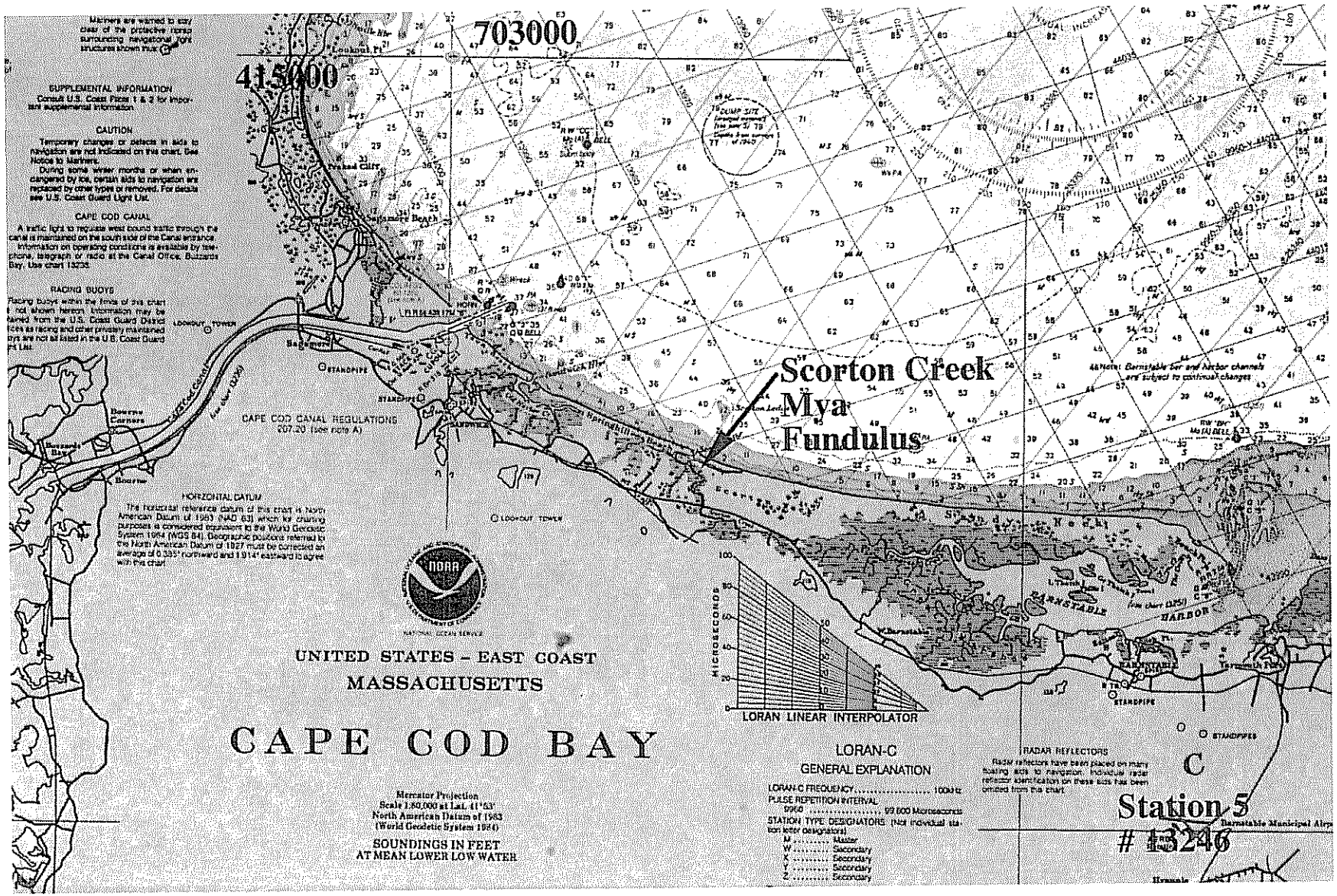



705800
421600
Mya
Fundulus
Station 1
#13270
Q U I N C Y B A Y
Rock Island Cove
Broad Meadows
TOWN RIVER BAY
North Weymouth
Quincy Point
Quincy Center
Wollaston
Merrymount
Houghs Neck
Eastern Neck
Pig Rock
The Piglets
Sheep I
Grape Island
Mt. Ararat
STANDPIPE
TOWERS
TIDAL INFORMATION
No tidal data is available
Feb. 27/93
CAUTION
SMALL CRAFT WARNINGS


710200
421800
Mya
Fundulus
Station 2
#13270

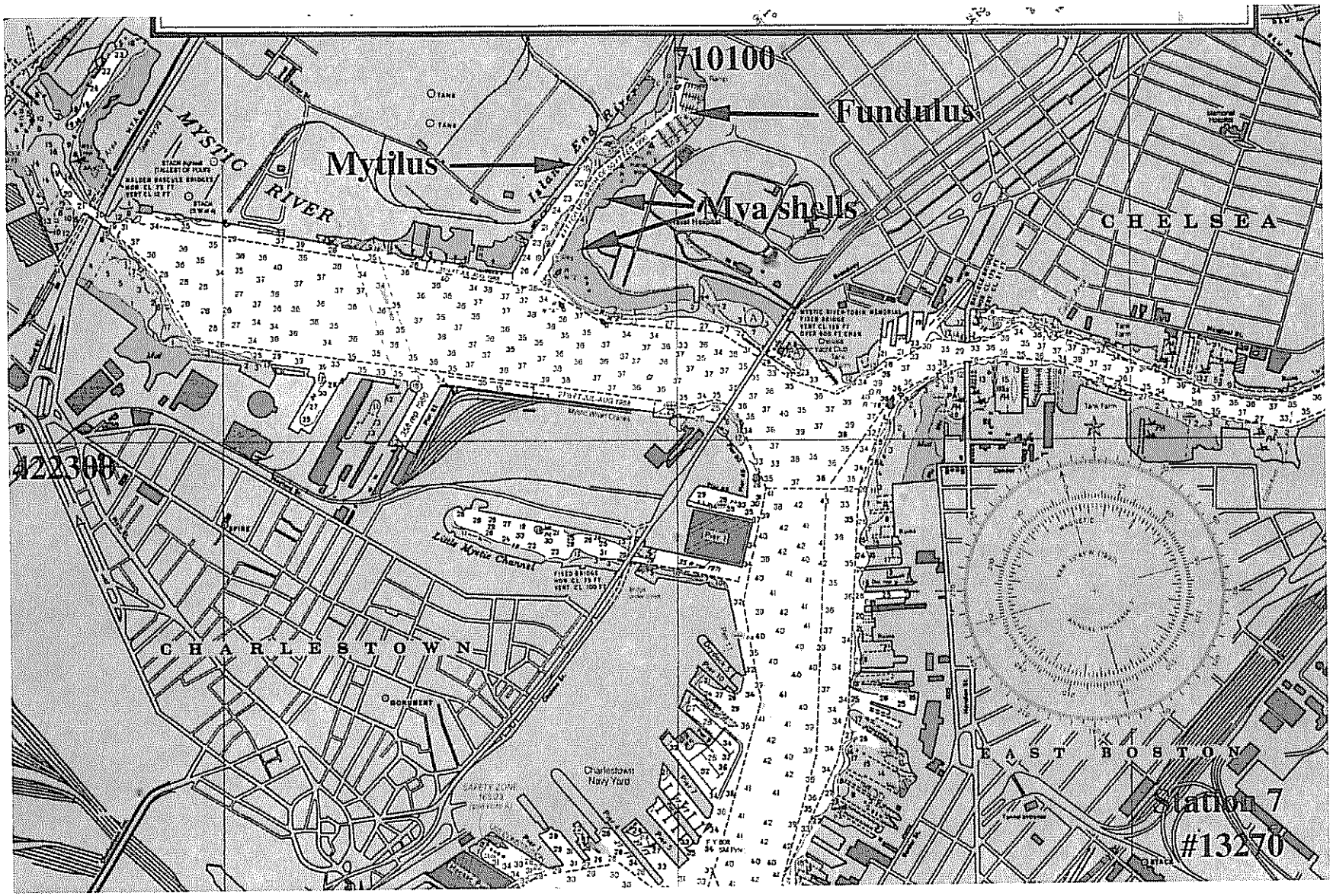

L Y N N
L Y N N
H A R B O R
B R O A D S O U N D
Mya
Fundulus
422600
705800
Station 3
#13275

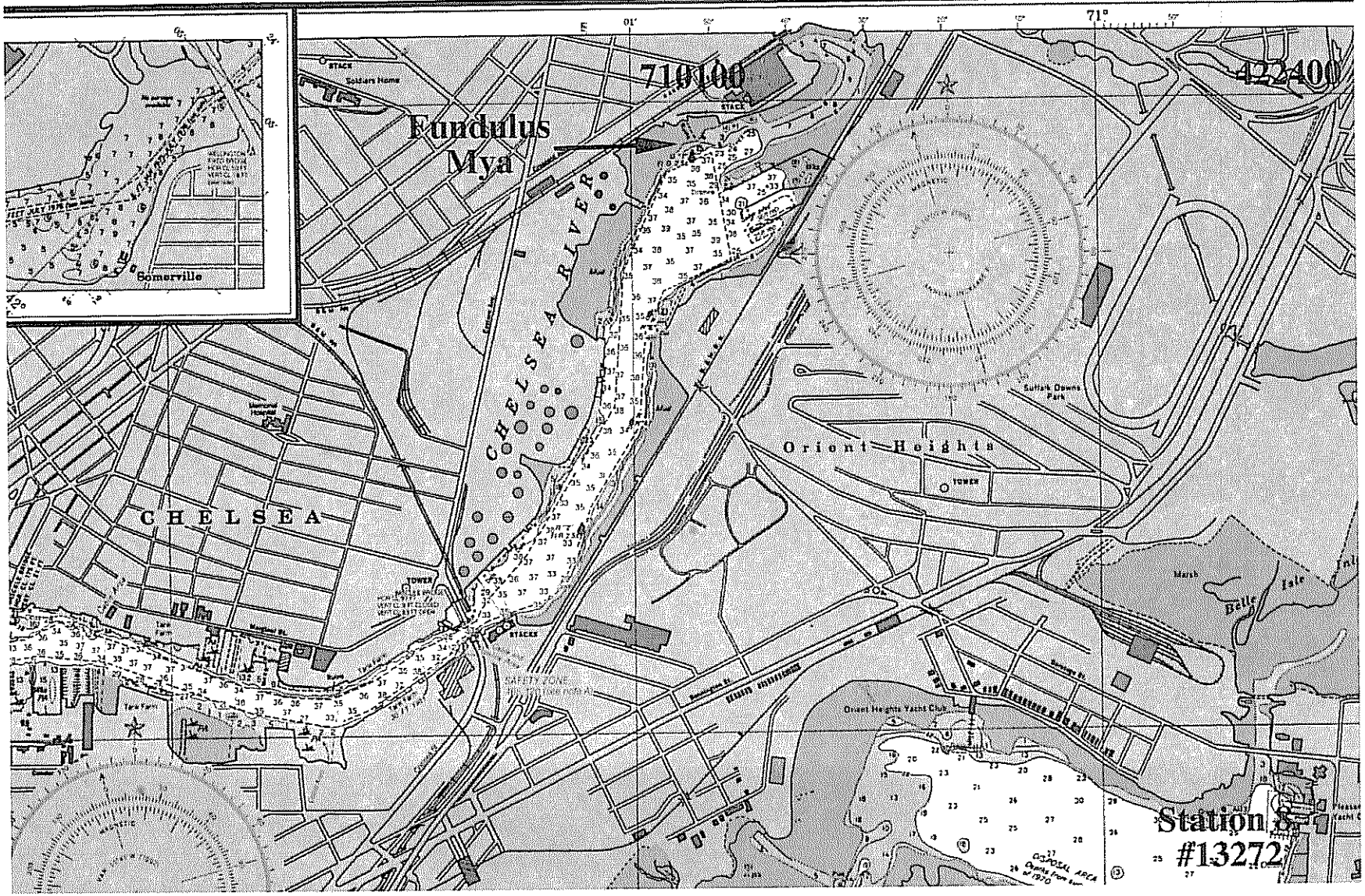

710400
422200
BOSTON
Mya
Fundulus
Station 4
SOUTH BOSTON
RACING BUOYS
Racing buoys within the limits of this chart are not shown hereon. Information may be obtained from the U.S. Coast Guard District Offices as racing and other privately maintained buoys are not all listed in the U.S. Coast Guard Light List.
NOAA VHF-FM WEATHER BROADCASTS
The National Weather Service station listed below provides continuous marine weather broadcasts. The range of reception is variable, but for most stations is usually 20 to 40 miles from the antenna site.
Boston, Mass. KHB-35 162.475 MHz
LOGARITHMIC SPEED SCALE
To find SPEED, place one point of dividers on distance run (in any unit) and the other on minutes run. Without changing divider spread, place right point on 60 and left point will then indicate speed in units per hour. Example: with 4.0 nautical miles run in 15 minutes, the speed is 16.0 knots



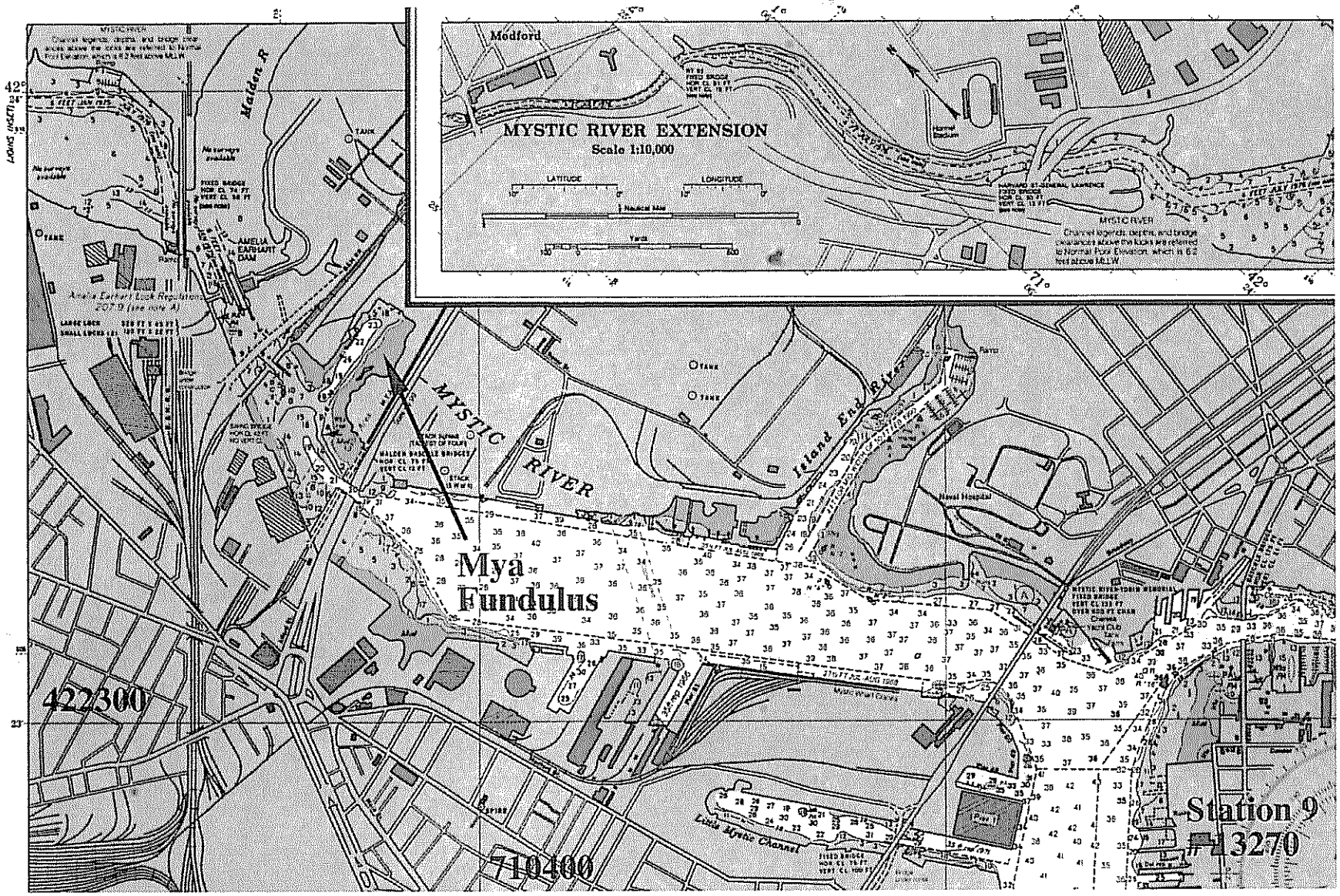
703000
415000
Scorton Creek
Mya
Fundulus
Station 5
13246
UNITED STATES - EAST COAST
MASSACHUSETTS
CAPE COD BAY
Mercator Projection
Scale 1:80,000 at Lat. 41°53'
North American Datum of 1983
(World Geodetic System 1984)
SOUNDINGS IN FEET
AT MEAN LOWER LOW WATER
LORAN LINEAR INTERPOLATOR
LORAN-C
GENERAL EXPLANATION
LORAN-C FREQUENCY 100kHz
PULSE REPETITION INTERVAL
9960 ..... 99.600 Microseconds
STATION TYPE DESIGNATORS (Not individual station letter designators)
M ..... Master
W ..... Secondary
X ..... Secondary
Y ..... Secondary
Z ..... Secondary
RADAR REFLECTORS
Radar reflectors have been placed on many floating aids to navigation. Individual radar reflector identification on these aids has been omitted from this chart.
CAPE COD CANAL REGULATIONS
207.20 (see note A)
HORIZONTAL DATUM
The horizontal reference datum of this chart is North American Datum of 1983 (NAD 83) which for charting purposes is considered equivalent to the World Geodetic System 1984 (WGS 84). Geographic positions referred to the North American Datum of 1927 must be corrected an average of 0.335" northward and 1.914" eastward to agree with this chart.
SUPPLEMENTAL INFORMATION
Consult U.S. Coast Pilots 1 & 2 for important supplemental information.
CAUTION
Temporary changes or defects in aids to navigation are not indicated on this chart. See Notice to Mariners.
During some winter months or when endangered by ice, certain aids to navigation are replaced by other types or removed. For details see U.S. Coast Guard Light List.
CAPE COD CANAL
A traffic light to regulate west bound traffic through the canal is maintained on the south side of the Canal entrance.
Information on operating conditions is available by telephone, telegraph or radio at the Canal Office, Buzzards Bay. Use chart 13235.
RACING BUOYS
Racing buoys within the limits of this chart are not shown hereon. Information may be obtained from the U.S. Coast Guard District offices as racing and other privately maintained buoys are not all listed in the U.S. Coast Guard Light List.
Mariners are warned to stay clear of the protective nonsp surrounding navigational light structures shown thus:
Sagamore Beach
Bourne Corners
Buzzards Bay
Bourne
Sagamore
Lookout Pt
Lookout Tower
Standpipe
Barnstable Harbor
Barnstable Municipal Airp
Hyannis
Note: Barnstable bar and harbor channels are subject to continual changes

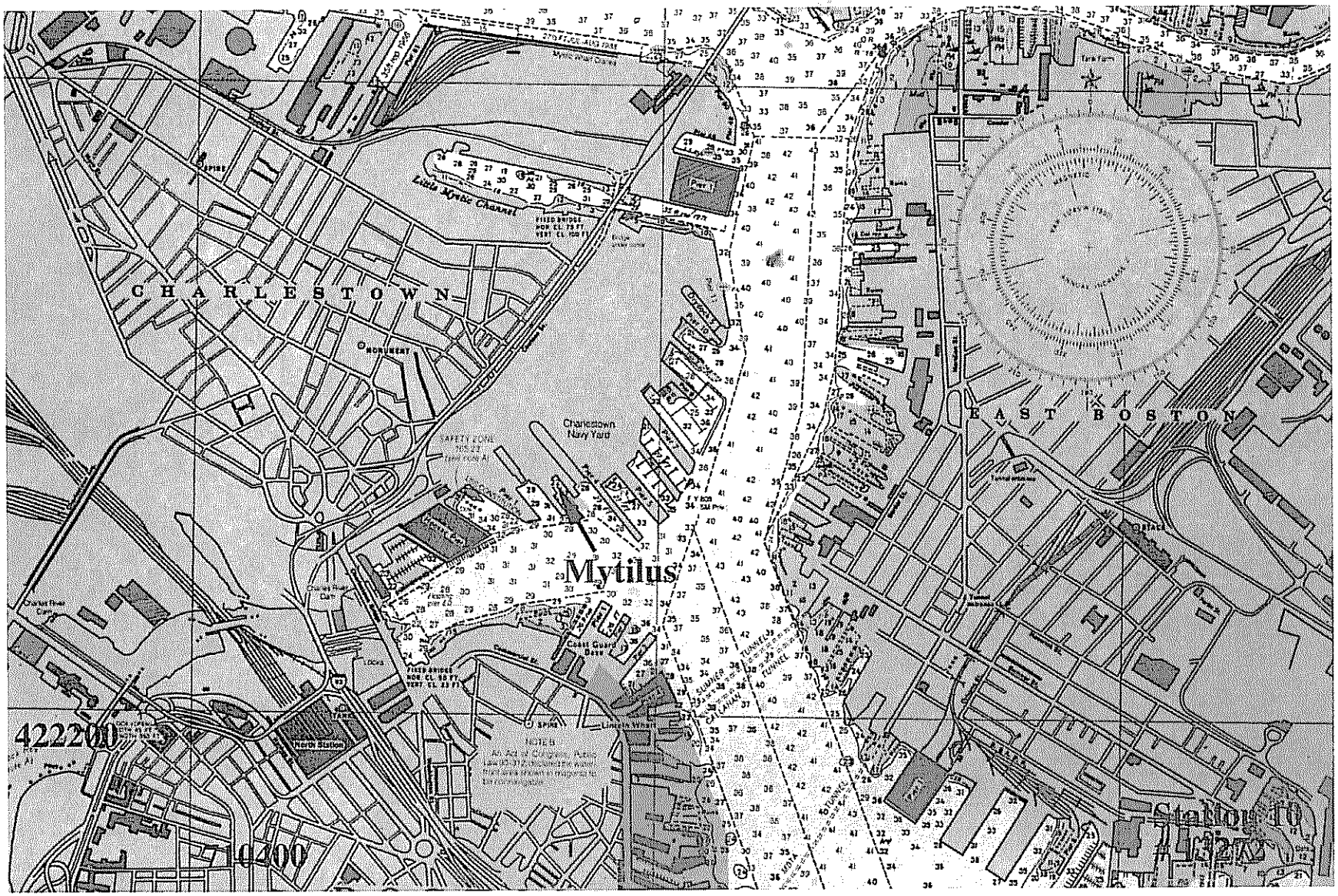
Mya Fundulus
Griffin Island
Great Island
WELLFLEET
Jeremy Pt
Billingsgate Island
PROHIBITED AREA
Station 9
#13250


710100
Fundulus
Mytilus
Mya shells
MYSTIC RIVER
Island End River
CHELSEA
422300
Little Mystic Channel
CHARLESTOWN
MONUMENT
Charlestown Navy Yard
EAST BOSTON
Station 7
#13270



710100
422400
Fundulus
Mya
CHELSEA RIVER
CHELSEA
Orient Heights
Soldiers Home
Somerville
Suffolk Downs Park
Orient Heights Yacht Club
Belle Isle
Station 8
#13272

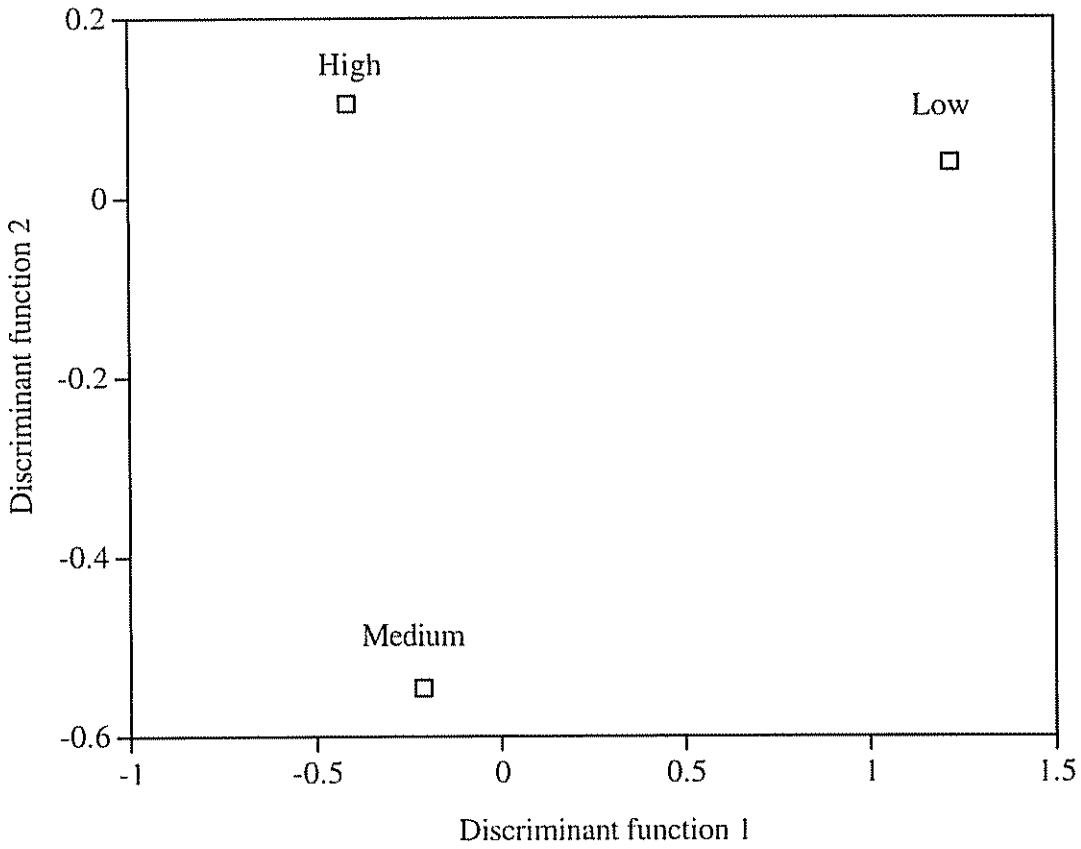

Medford
MYSTIC RIVER EXTENSION
Scale 1:10,000
LATITUDE
LONGITUDE
MYSTIC RIVER
Malden R
MYSTIC RIVER
Island End River
Little Mystic Channel
Mya
Arenaria
422300
710400
Station 9
13270



CHARLESTOWN
EAST BOSTON
Mytilus
Charlestown Navy Yard
Little Mystic Channel
Coast Guard Base
North Station
Lincoln Wharf
Mystic Wharf Cranes
Charles River Dam
Tank Farm
Station 10
422200
710400

Figure 2

Discriminant function analysis of sites grouped into 3 levels of contamination based on analysis of 9 pathological lesion types in *Fundulus heteroclitus.*



DF1=Lv2 and Gl1 DF2=Lv1, Lv3, Sp1 and Gl2 - see Table 7

High = Fort Point Channel and Island End River
Medium = Weymouth, NNeponset, Chelsea, Saugus
Low = Wellfleet, Scorton

Figure 3 Comparison of chemiluminescence and colorimetric P4501A methods

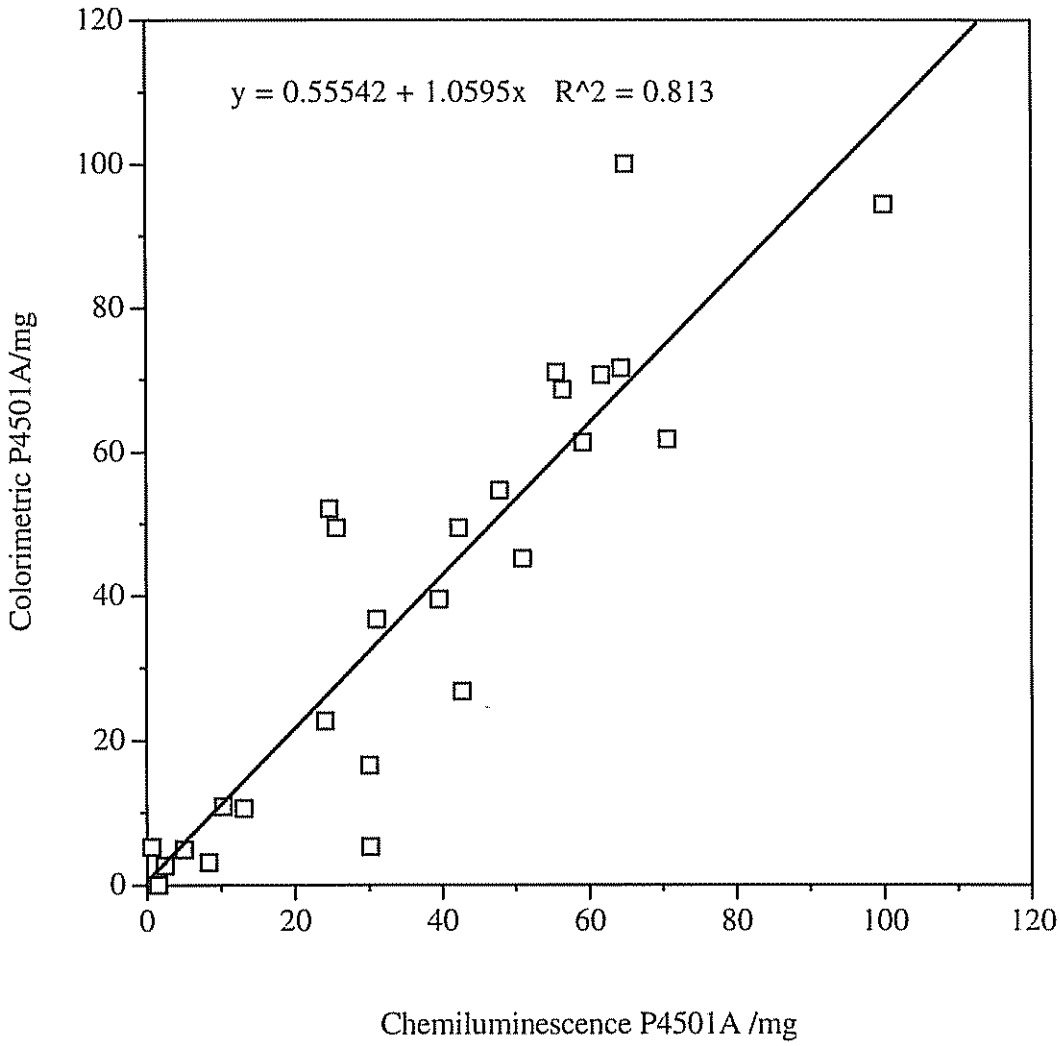


Figure 4 Anti - P4501A immunoblots of F.heteroclitus liver microsomes

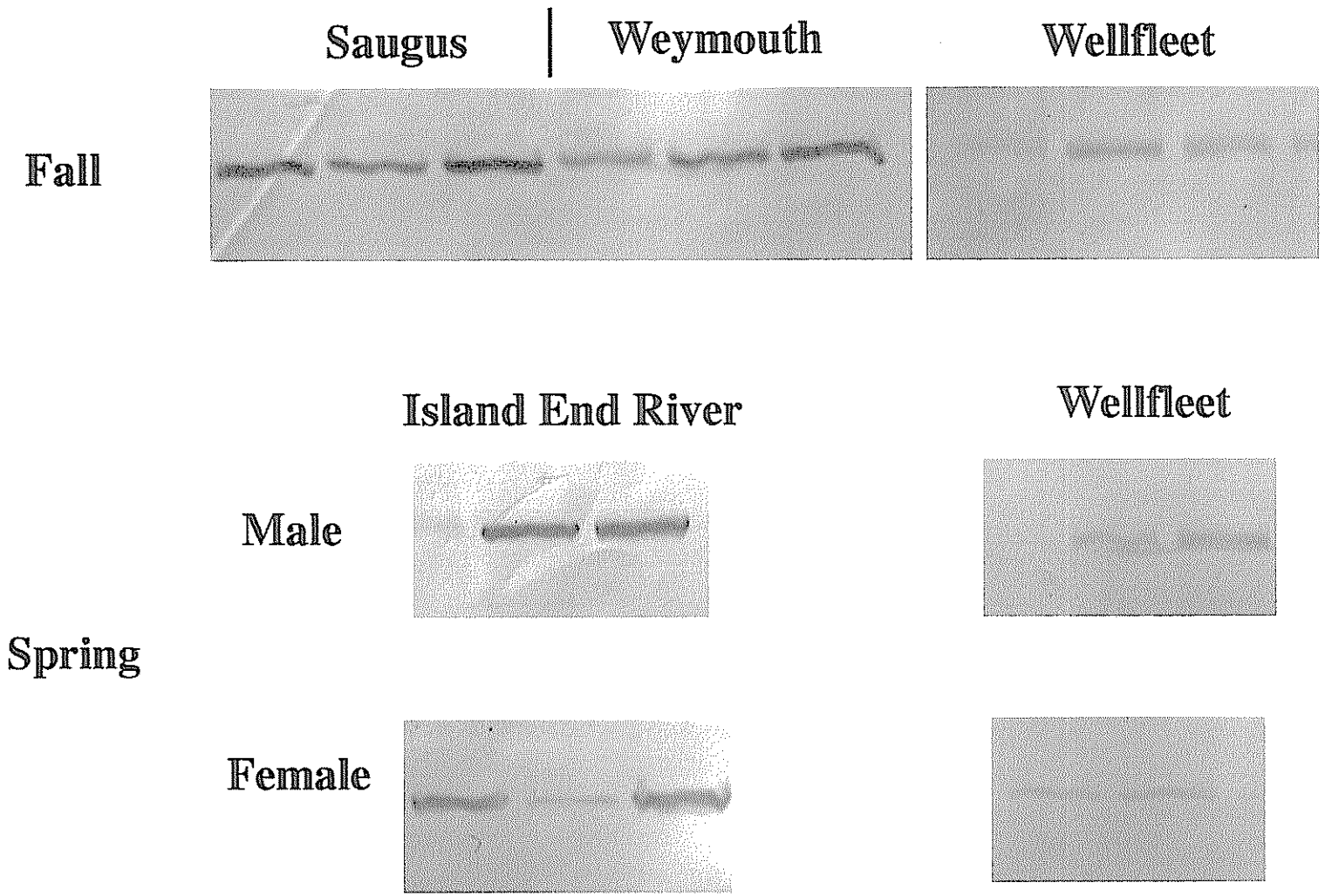


Figure 5

Simple regression of sediment polynuclear aromatic hydrocarbon content per gram carbon vs. Cytochrome P4501A content in *Fundulus heteroclitus* caught from 8 stations in the Massachusetts Bays in the Fall of 1992

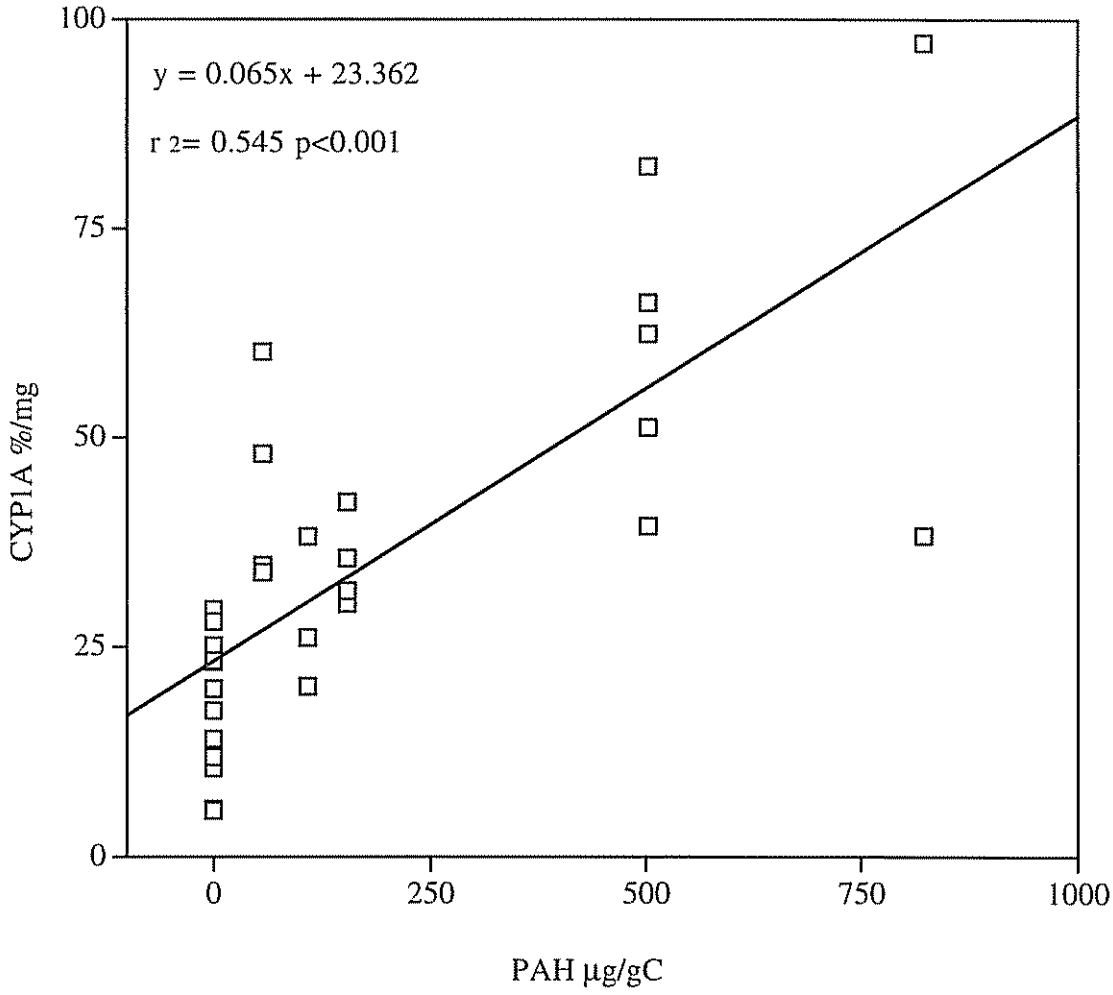
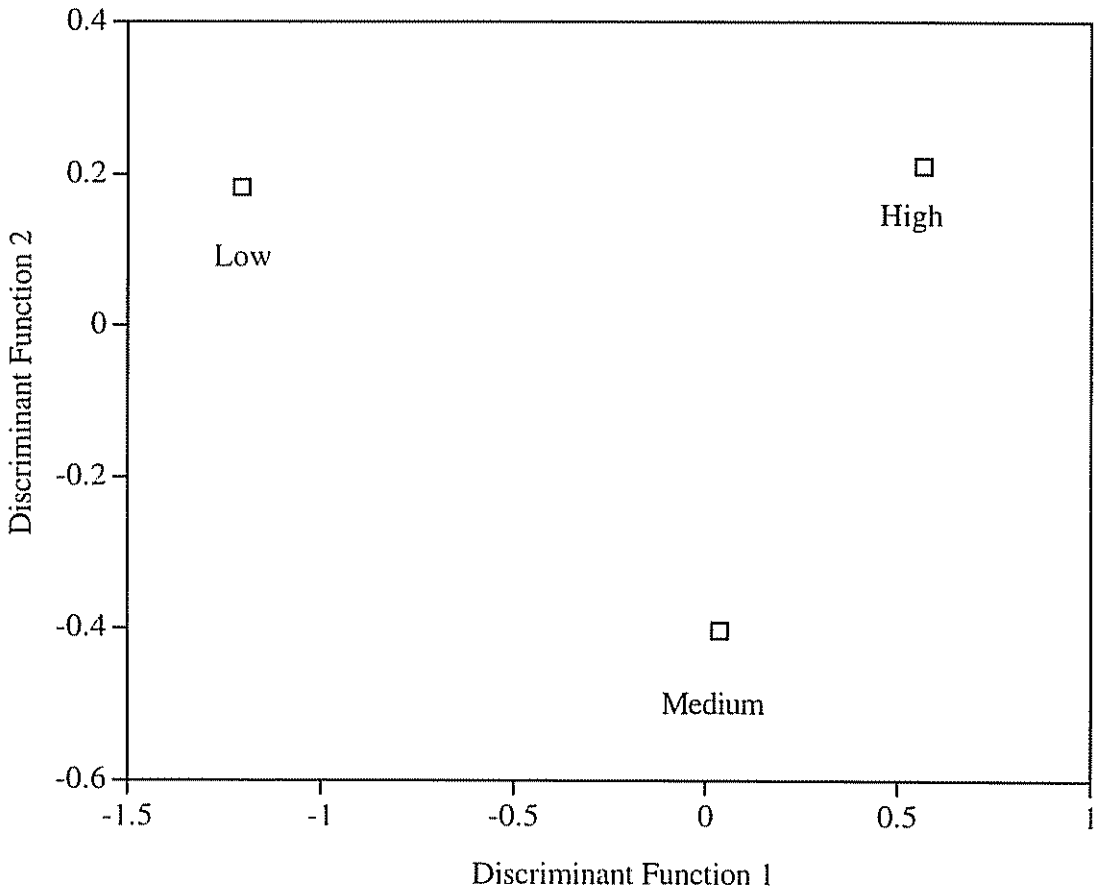


Figure 6

Discriminant function analysis of sites grouped into 3 levels of contamination based on analysis of 14 pathological lesion types in *Mya arenaria*

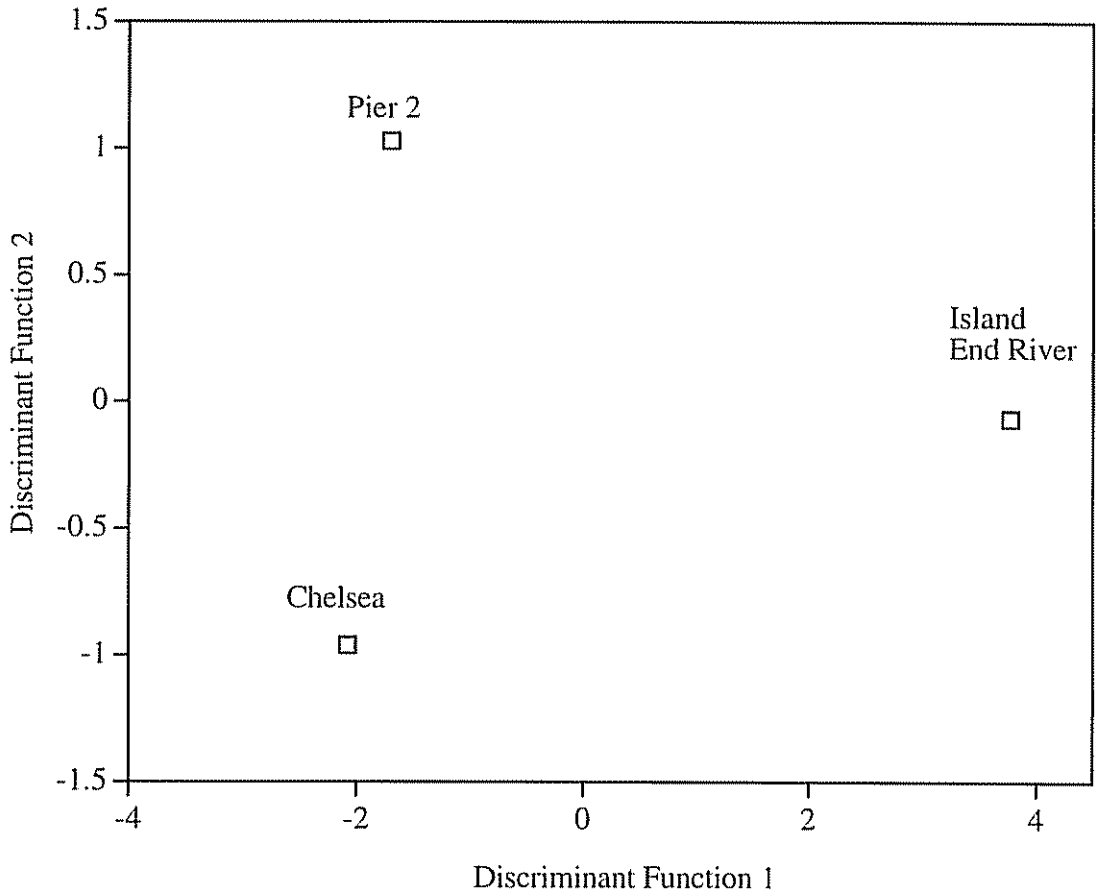


DF1 = Gn2, Kd2, Gn1, Kd1, Gl2, Kd3, Mn1, Dg1and Gl3
DF2 = Gg1, Kd4, Gn1, Gn2, Dg1, Lk1, Gl2, Dg2 and Kd6
For tissue abbreviations see Table 16.

Low = Wellfleet, Scorton
Medium = Weymouth, Neponset, Earhart
High = Saugus, Fort Point Channel, Chelsea

Figure 7

Discriminant function analysis of 3 sites based on analysis of 13 pathological lesion types in *Mytilus edulis*



DF1 = Gl1, Kd2, Kd1 and Kd5
DF2 = Gg1, Kd4, Gn1, Gn2, Dg1, Lk1, Gl2, Dg2 and Kd6
For tissue abbreviations see Table 16

Table 1 - Station Locations for Mass. Bays Program Field Samples

Stn. #	Location	Lat.	Long.	Comment
1	Town River Bay, Weymouth	42 14 93	70 57 86	In bay just west of Germantown Point.
2	Neponset River	42 17 42	71 01 89	By double culvert under road which runs south of old Jordan Marsh warehouse. *Fundulus* to south of road in creek (with hydrocarbon sheens) running west at foot of road embankment, clams on north shore of creek to north of road. Both samples within 50 yds of drain mouths.
3	Saugus River	42 27 55	70 59 29	On south bank just downstream of East Saugus road bridge.
4	Fort Point Channel	42 20 65	71 03 64	50 yds downstream of drains leaving Boston Police parking lot at head of channel. Also took 3 mid-channel sediment samples from lower, middle and upper parts of the channel.
5	Scorton Creek	41 44 57	70 25 59	At old RR Bridge in creek running east from across main creek from parking area.
6	Herring River, Wellfleet	41 55 66	70 03 29	Chequesset Neck. At mouth of Herring R.
7	Island End River, Mystic River	42 23 61	71 03 01	On flats at northeast east tip of creek just north of travelift dock. No live clams.
8	Chelsea River	42 23 95	71 00 91	Intertidal immediately north of green can # 7.
9	Earhart Dam	42 23 30	71 04 10	Intertidal to northeast of railroad tracks.*
10	Pier 2 NavyYard	42 22 36	71 03 21	Pilings at inner end of Pier 2.*

Positions were determined with a Magellan 5000 global positioning system reciever.
*No sediment chemistry analysis.

Table 2 - Location, Sample Size and Mean (SD) Length of *Fundulus heteroclitus* Collected from the Mass Bays 1992-1993.

Station #	Station name	Date collected	WHOI Sample #'s	N	Mean Total Length (mm)
1	Weymouth Fore River	9 15 92	92-1220/1239	20	74.25 ± 8.60
2	Neponset River, Boston	9 15 92	92-1240/1259	20	74.00 ± 17.38
3	Saugus River	9 16 92	92-1260/1279	20	87.90 ± 9.77
4	Fort Point Channel, Boston	9 16 92	92-1280/1304	25	48.04 ± 4.20
5	Scorton Creeek, Sandwich	9 17 92	92-1310/1329	20	88.70 ± 9.94
6	Herring River, Wellfleet	9 15 92	92-1501/1520	19	88.94 ± 20.55
		5 26 93	93-305/324	20	76.6 ± 11.09
7	Island End River River, Boston	9 16 92	92-1660/1684	25	32.28 ± 4.98
		5 18 93	93-234/244	11	51.54 ± 8.62
		6 16 93	93-430/594	59	75.56 ± 10.96
8	Chelsea River, Boston	9 16 92	93-1685/1704	19	57.21 ± 7.93
		5 18 93	93-230-231	2	55-49
9	Earhart Dam	5 15 93	93-210/229	17	54.88 ± 6.68

Table 3 Frequency of Histopathological Lesions in *Fundulus heteroclitus* from 8 Sites in the Massachusetts Bays - 1992

		Weymouth	Neponset	Saugus	Fort Pt. Ch.	Scorton	Wellfleet	Island End	Chelsea R.
Hepatic MA		0	0	0	0	0	0	0	0
	N	19	20	19	19	20	19	20	20
Hepatic coccidia		1	0	0	0	0	15	0	0
	N	19	20	19	19	20	19	20	20
Hepatic necrosis		1	0	0	0	0	3	0	0
	N	19	20	19	19	20	19	20	20
Hepatic clear cells		0	0	0	3	0	0	0	0
	N	20	20	20	19	20	19	20	20
Hepatic Megalocytosis		0	0	0	0	2	0	0	0
	N	20	20	20	20	20	19	20	20
Cardiac nematodes		0	1	0	0	0	0	0	0
	N	3	3	5	1	8	9	5	4
Gill Trematodes		0	10	1	0	0	4	0	0
	N	18	16	16	3	20	14	13	8
Gill hyperplasia		10	13	13	1	8	4	0	0
	N	18	16	16	3	20	14	14	7
Spleen		2	0	0	0	0	0	0	0
	N	14	15	17	7	12	0	16	12
Spleen MA		3	5	9	0	5	0	0	0
	N	13	15	17	7	12	0	16	12

The numbers of fish showing each lesion, and the number (N) of fish examined for each cell type for each station is given. Liver neoplasms and altered foci of hepatocytes were not seen in any fish, nor were abnormalities seen in cardiac muscle, renal tubules, or intestine. See Table 2 for the comparability of the size of fish from each station, note in particular the Island End fish were small in 1992. MA = Macrophage aggregation. Lesions are defined in the text.

Table 4 Frequency of Histopathological Lesions in *Fundulus heteroclitus* from 4 sites in the Massachusetts Bays - 1993

		Wellfleet	Island End	Chelsea R.	Earhart
Hepatic MA		0	26	0	0
	N	14	48	2	14
Hepatic coccidia		7	0	0	0
	N	14	48	2	14
Hepatic necrosis		0	7	0	0
	N	14	48	2	14
Hepatic neoplasm		0	7	0	0
	N	14	48	2	14
Altered hepatocyte foci		0	19	0	0
	N	14	48	2	15
Hepatic clear cell patches		0	5	0	1
	N	14	48	2	14
Hepatic Megalocytosis		3	2	1	0
	N	14	48	2	14
Cardiac nematodes		1	0	0	1
	N	15	27	2	12
Gill Trematodes		1	2	0	2
	N	15	28	2	14
Gill hyperplasia		14	20	1	9
	N	16	28	2	14
Spleen MA		0	11	0	0
	N	8	20	1	9

The numbers of fish showing each lesion, and the number (N) of fish examined for each cell type for each station is given. MA = Macrophage aggregations.

Table 5

Intensity of Selected Lesions in *Fundulus heteroclitus* from 8 Stations in the Massachusetts Bays, Sampled in the Fall of 1992.

	Liver coccidia	Liver necrosis	Patches of clear cells in liver	Hepatic megalocytosis	Gill trematodes
Weymouth Fore River	0.00 ± 0.00	0.05 ± 0.23	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Neponset River, Boston	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	1.25 ± 1.24
Saugus River	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.06 ± 0.25
Fort Point Channel Boston	0.00 ± 0.00	0.00 ± 0.00	0.21 ± 0.54	0.00 ± 0.00	No data
Scorton Creeek, Sandwich	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.15 ± 0.49	0.00 ± 0.00
Herring River, Wellfleet	1.68 ± 1.34	0.21 ± 0.54	0.00 ± 0.00	0.00 ± 0.00	0.29 ± 0.47
Mystic River, Boston	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Chelsea River, Boston	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00

Data expressed as Mean ± S.D of a semi-quantitiative estimate of lesion intensity, scored visually on a range of 0 - 4. O = absent, 1 = mild, 2 = moderate, 3 = severe, 4 = extreme. Sample size was 20 fish from each station. In some cases one or more organs were absent from the sections examined from any one fish. Liver neoplasia and liver ceci were absent from all animals.

Table 6

Intensity of Selected Lesions in *Fundulus heteroclitus* from 4 Stations in the Massachusetts Bays, sampled In 1993.

	N	Liver neoplasia		Liver cell foci		Liver coccidia		Hepatic megalocytosis		Liver necrosis		Gill trematodes	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Herring River, Wellfleet	14	0.00	0.00	0.00	0.00	1.21	1.31	0.29	0.61	0.00	0.00	0.07	0.26
Island End River	57	0.32	0.97	0.74	1.22	0.00	0.00	0.12	0.50	0.19	0.64	0.06	0.24
Chelsea River, Boston	4	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.00	0.00	0.00	0.00
Earhart Dam	18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.33

Data expressed as Mean $\pm$ S.D of a semi-quantitiative estimate of lesion intensity, scored visually on a range of 0 - 4. O = absent, 1 = mild, 2 = moderate, 3 = severe, 4 = extreme.

Table 7 - List of Pathological Observations Analysed for Site Differences in *Fundulus heteroclitus*

Lesion description	Abbreviation
Hepatic MA	(Lv1)
Hepatic coccidia	(Lv2)
Hepatic necrosis	(Lv3)
Liver neoplasm	(Lv4)
Altered hepatocyte foci	(Lv5)
Hepatic megalocytosis	(Lv6)
Gill trematodes	(Gl1)
Gill hyperplasia	(Gl2)
Spleen MA	(Sp1)

MA = macrophage aggregations

Table 8 - Approximated F-values for the Discriminant Function Analyses Performed using the Pathological Data Collected at Various Sites in Boston Harbor and Mass. and Cape Cod Bays.

Genus	*Fundulus*	*Mya*	*Mytilus*
Group	Chemical load	Chemical load	Site
# groups	3	3	3
n	236	178	60
# predictors	9	14	13
# sig. discriminant functions	1	1	2
df1	12	28	26
df2	456	324	90
approximate F-value	8.483	3.012	9.692

All groupings are significant at $p < 0.01$.

Table 9 - Comparison of Sediment PAH and Liver P4501A and EROD in *Fundulus heteroclitus* Caught in the Fall of 1992

	Stn #	Sediment tPAH (µg/g)	Sediment tPAH (µg/g C)	Liver P4501A /mg Mean	SD	N	Liver EROD pmol/min/mg Mean	SD	N
Island End River	7*	490.49	8567.42	No data			753.2		1
Fort Point Channel	4*	62.06	822.39	$67.8^{5,6,8}$	41.6	2	482.5	320.6	2
Neponset River	2	11.51	261.66	$28.2^{3,4}$	9.1	3	324.7	74.1	4
Saugus River	3	9.32	502.35	$60.4^{5,6}$	16.1	5	638.4	217.9	5
Chelsea River	8	3.83	153.15	35.0	5.4	4	320.6	57.7	4
Weymouth Fore River	1	0.51	56.38	$44.2^{4,5,6}$	12.5	4	387.1	151.3	5
Scorton Creek	5	nd	nd	24.4	7.2	4	302.5	109.7	4
Wellfleet	6*	nd	nd	14.8^{8}	8.1	11	471.8	284.9	9

* Pooled samples of 2-4 fish per pool
Superscripts indicate significant difference(s) with station(s) of that number (ANOVA $p<0.05$)
P4501A data are relative values /mg microsomal protein. Absolute data cannot be given in the absence of purified *Fundulus*P4501A protein as a standard. Full chemistry data is given in Table A1. nd = below detection limits.

Table 10 - Comparison of Sediment PAH and Liver P4501A and EROD in *Fundulus heteroclitus* Caught in the Spring of 1993

		Wellfleet (Stn 6)			Island End River (Stn 7)		
	Sediment tPAH (µg/g)	Below detection limits			490.5		
	Sediment tPAH (µg/gC)	Below detection limits			8567.4		
		Mean	SD	N	Mean	SD	N
P4501A	Males	20.6 [7]	1.2	2	65.9	2.4	3
	Females	2.5	2.3	5	14.0	20.4	3
EROD	Males	150.2[7]	74.9	2	374.7	64.4	3
	Females	115.4	81.9	4	186.5	158.6	3

Superscripts indicate significant difference(s) with station(s) of that number (ANOVA $p<0.05$)

Table 11

Results of Significant Simple Regression Analyses of P4501A Expression in *Fundulus heteroclitus* from 8 Sites in the Massachusetts Bays Compared with Σ PAH per g. Sediment and per g. Sediment Carbon

Sediment	Statistic	All Fall animals (N=32)	All Males (N=15)
Σ PAH µg/g Carbon	r^2	0.545	0.372
	p	<0.0001	0.0094
Σ PAH µg/g	r^2	0.292	0.394
	p	0.0014	0.0122

Table 12
A Listing of Average Occurrences[a] and Intensities[b] of P4501A By Site and Cell Type as Evaluated with Immunohistochemical Staining of Tissue Sections.

Sample site (n)	Sediment PAH (µg/g)	Liver hepatocytes	Proximal renal tubules	Distal renal tubules	Atrial endothelium	Ventricular endothelium	Gill epithelium	Gill endothelium	Gut epithelium
Wellfleet River (11)	nd	1/1 1[c]	3/4 12	2/2 4	2/3 6	1/3 3	1/2 2	1/2 2	2/3
Scorton's Creek (6)	nd	3/2 6	3/4 12	2/1 2	2/3 6	2/3 6	2/3 6	1/2 2	2/2
Weymouth River (7)	0.5	2/1 2	3/4 12	2/2 4	1/2 2	1/3 3	1/2 2	1/2 2	2/2
Chelsea River (6)	3.8	3/3 9	3/2 6	2/1 2	1/2 2	x	0/0 0	0/1 0	2/3
Saugus River (4)	9.3	3/3 9	3/5 15	3/3 9	2/4 8	2/2 4	3/4 12	1/3 3	3/4
Neponset River (6)	11.5	2/1 3	3/4 12	2/1 2	2/2 4	1/2 2	2/3 6	2/2 4	2/2
Ft. Point Channel (6)	62.1	2/1 3	3/4 12	2/2 4	2/2 4	x	2/3 6	1/2 2	2/2
Island End River (14)	490.5	2/2 4	2/3 6	1/1 2	2/3 6	2/3 6	2/3 6	1/2 2	2/3

[a]Occurrence is the frequency of cells staining (x=tissue not present in slide, 0=no cells staining, 1=rare cells staining, 2= many cells staining, 3= all cells staining).
[b]Intensity is the brightness of the stain when it does occur (0=none, 1=negative/very mild, 2=mild, 3=moderate, 4= strong, 5= very strong).
[c]Numbers are given as occurence/intensity and the product of those scores as an estimate of P4501A protein expression.

Table 13 - Location, Sample Size and Mean (SD) Length of *Mya arenaria* Collected from the Mass Bays 1992-1993.

	Station	Date collected	WHOI Sample #'s	N	Mean Valve Length (mm)
1	Weymouth Fore River	9 15 92	92-1100/1123	23	72.77 ± 4.03
2	Neponset River, Boston	9 15 92	92-1124/1147	24	71.78 ± 8.18
3	Saugus River	9 16 92	92-1148/1171	24	71.78 ± 8.19
4	Fort Point Channel, Boston	9 16 92	92-1172/1195	24	58.52 ± 3.21
5	Scorton CreeFk, Sandwich	9 17 92	92-1196/1219	24	76.77 ± 5.66
6	Herring River, Wellfleet	9 15 92	92-1220/1238	19	79.04 ± 3.55
8	Chelsea River, Boston	5 19 93	92-190/209	20	53.58 ± 7.27
9	Earhart Dam	5 19 93	93-170/179	20	56.5 ± 7.54

Table 14 - Frequency of Occurence of Specific Histopathological Conditions in *Mya arenaria* - 1992

Tissue	Lesion	Station number						
		1	2	3	4	5	6	8
blood cells	leukemia	0	1	0	4	0	1	2
gonad	inflammation	6	6	12	10	1	0	3
	parasites	0	2	0	0	6	1	3
	neoplasia	0	0	3	0	0	0	0
gill	parasites	5	13	16	6	10	4	3
	inflammation	7	13	19	12	5	9	10
	mucous cell (avg)	2.15	2.05	2.10	2.00	2.00	2.00	2.00
	hyperplasia	5	14	13	1	2	9	6
kidney	brown cell # (avg)	2.35	2.70	2.10	2.65	2.00	2.11	2.65
	parasites	3	9	7	0	10	9	4
	gr/br debris	7	3	13	17	1	5	12
	hyperplasia (avg)	2.75	3.15	2.95	3.00	2.10	2.26	3.00
heart	sac hyperplasia	0	0	0	0	0	0	0
	inflammation	0	0	0	0	1	0	0
colon		0	0	0	0	0	0	0
mantle	inflammation	3	4	4	4	1	2	2
	other abnorm	0	2	3	1	0	2	1
neural tissue		0	0	2	1	0		0
foot	inflammation	0	0	0	0	1	1	1
	other	0	1	1	0	1	3	0
style sac		1	3	0	0	2	0	0
intestine epithelia	parasite	0	2	0	0	3	1	1
	inflammation	0	0	0	0	0	0	0
	necrosis	0	1	0	0	0	0	0
	hyperplasia	0	1	0	0	0	1	0
	brown cell # (avg)	2.16	1.84	2.05	2.30	1.30	2.00	2.10
lumen	parasite	0	1	0	0	0	0	1
	other abnorm	0	0	0	0	0	0	0
digestive gland	parasites	8	7	0	3	4	5	0
	brown cells in ct (avg)	1.8	2.3	2.3	1.75	0.85	1.79	1.95
absorptive cells	vacuolation (avg)	4.15	4.7	4.45	4.65	4.5	4.79	3.95
	height (avg)	4.1	4.7	4.45	4.7	4.5	4.79	3.9
reserve cells	occurrence (avg)	4.1	4.4	4.25	4.45	3.75	4.89	3.95
mantle edge	inflammation	0	1	4	2	1	1	1
	mucous cell # (avg)	0	0	0.22	0	0	0	0
green gland	abnorm (avg)	2.69	2.87	3.38	2.94	1.91	2.54	2.80
adductor muscle	abnormality	0	0	1	1	0	0	0
siphon	inflammation	2	1	3	1	0	6	0
	hyperplasia	1	1	0	0	0	0	0
	parasite	0	1	0	0	1	1	0
	other	0	0	0	0	0	0	0

20 individuals examined per station
Integers represent number of affected individuals per station.
Fractional numbers are averages of extent of condition at each station

Table 15 - Frequency of Occurence of Specific Histopathological Conditions in *Mya Arenaria* - 1993

Tissue	Lesion	Station # 8	Station # 9
Blood Cells	leukemia	1/20	1/20
Gonad	inflammation	7/20	5/20
	parasites	0/20	1/20
	neoplasia	5/20	0/20
Gill	parasites	5/20	11/20
	inflammation	20/20	20/20
	hyperplasia/ papilloma	8/20	2/20
Kidney	brown cell	19/19	14/14
	parasites	0/19	0/14
	gr/br debris	19/19	7/14
	hyperplasia	19/19	No data
Mantle	inflammation	17/19	15/20
Digestive Gland	brown cells in ct	19/19	20/20
Green Gland	abnorm	20/20	20/20

20 Individuals Examined Per Station, unless otherwise noted
Integers Represent Number Of Affected Individuals Per Station.

Table 16: A List of Pathological Observations Analysed for Site Differences in *Mya arenaria* and *Mytilus edulis*

Lesion description	Abbreviation
Gonad inflammation	(Gn1)
Gonad parasites	(Gn2)
Gonad neoplasia	(Gn3)
Gill parasites	(Gl1)
Gill inflammation	(Gl2)
Gill hyperplasia/papilloma	(Gl3)
Brown cells in the kidney	(Kd1)
Kidney parasites	(Kd2)
Green/brown debris in kidney	(Kd3)
Kidney hyperplasia	(Kd4)
Granularity of cells in kidney	(Kd5)
Cells in the lumen of Kidney	(Kd6)
Inflammation in the mantle	(Mn1)
Brown cells in the digestive gland connective tissue	(Dg1)
Parasites in the digestive gland	(Dg2)
Abnormality in the green gland	(Gg1)

Table 17 - Intensity of Hemopoietic Neoplasia in *Mya arenaria*

	Number of clams in each group			
	O	I	II	III
Weymouth	20	0	0	0
Neponset	19	1	0	0
Saugus	20	0	0	0
Fort Point Channel	16	2	1	1
Chelsea River	18	2	0	0
Scorton Creek	20	0	0	0
Wellfleet	20	2	0	0

Groups of clams defined as:

O: No evidence of any neoplastic hemocytes

I: Between 1 to 15 % of hemocytes were neoplastic

II: Between 16 to 70 % of hemocytes were neoplastic

III: Greater than 70 % of hemocytes were neoplastic

Table 18 - Location, Sample Size and Mean (SD) Length of *Mytilus edulis* Collected from the Mass Bays 1992-1993.

	Station	Date collected	WHOI Sample #'s	N	Mean Valve Length (mm)
7	Island End River	5 19 93	93-285/304	20	39.6 ± 6.3
8	Chelsea River, Boston	5 19 93	93-245/264	20	52.85 ± 2.75
10	Pier 2 Navy yard	5 19 93	93-265/284	20	42.05 ± 6.57

Table 19 - Frequency of Occurence of Specific Histopathological Conditions in *Mytilus edulis* - 1993

Tissue	Lesion	Station # 7	8	10
blood cells	leukemia	0/20	1/20	0/20
gonad	inflammation	4/20	7/20	15/20
	parasites	2/20	1/20	4/20
	neoplasia	0/20	0/20	0/20
gill	parasites	0/20	1/20	2/20
	inflammation	0/20	1/20	0/20
	hyperplasia/ papilloma	0/20	0/20	0/20
kidney	granularity of cells	19/19	17/17	20/20
	parasite	0/20	17/17	1/20
	hyperplasia	19/19	17/17	20/20
	cells in lumen	13/19	13/17	15/20
	brown cells in epith.	18/19	8/17	10/20
digestive gland	brown cells in ct	0/20	5/20	3/20
	parasite	No data	1/20	3/20
green gland	abnorm	8/8	16/16	17/17

20 individuals examined per station, unless otherwise stated
Integer represent numbers of affected individuals per station