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Liver pathology of winter flounder: Boston Harbor, Massachusetts Bay, and Cape Cod Bay - 1992

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Final Report

Liver pathology of winter flounder: Boston Harbor, Massachusetts Bay, and Cape Cod Bay - 1992

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SUMMARY AND CONCLUSIONS

1. Winter flounder were collected from the same five stations as sampled in 1991. These were Deer Island Flats in Boston Harbor, Nantasket Beach, Broad Sound, the Future Outfall Site, and Eastern Cape Cod Bay; fish were also collected from Dorchester Bay and Quincy Bay in Boston Harbor.

2. Fin erosion was significantly more prevalent in fish from Deer Island and Broad Sound, than from Eastern Cape Cod Bay.

3. Chemical contaminant-associated liver disease in winter flounder was significantly more prevalent at all stations as compared to Eastern Cape Cod Bay. The level of disease at the Future Outfall Site was substantially above background, as in 1991.

4. Cohort specific analysis of lesion prevalence revealed a possible trend of more rapid disease onset in the most recent cohort examined.

5. Overall disease prevalence at Deer Island Flats, Boston Harbor continues to be substantially lower than in the late 1980's, although the above cohort specific analysis may suggest a recent reversal of this trend.

INTRODUCTION

We have monitored the prevalence of toxic chemical-associated liver lesions in winter flounder from Deer Island Flats, Boston Harbor since 1987 (Moore 1991, Moore, Woodin et al. 1992). In addition, samples from four stations in Massachusetts and Cape Cod Bays were studied in 1991 (Moore et al. 1992). The reason for pursuing these studies further is to build an internally consistent baseline data set on winter flounder liver pathology for the Deer Island and Future Outfall sites, in addition to other sites in the region. This is necessary because of the current biological effects of the existing outfalls at Deer Island, and the need to understand and document the change in biological impact on this ecosystem of recent and projected changes in sewage management by the Massachusetts Water Resources Authority (M.W.R.A.). These changes include cessation of sludge dumping at the beginning of 1992, planned initiation of primary and potentially secondary treatment, and the relocation of the outfall to the future site scheduled to occur in 1995.

The rationale and necessary background information on the biology and toxicology of winter flounder has been reported previously (Moore, Woodin et al. 1992). This 1992 survey was designed to build on the conclusions and data from our previous studies which showed that hydropic vacuolation in the liver of winter flounder was detectable at all the stations sampled, but substantially more prevalent at the contaminated near-urban sites. In contrast, liver neoplasia was a rare lesion and absent from all but the most contaminated sites. We have previously shown a close association between hydropic vacuolation and liver neoplasms in this species (Moore 1991). Others have shown that hydropic vacuolation was closely correlated with a suite of chemical contaminants (Johnson, Stehr et al. 1992). At these latitudes this bottom-feeding species seemingly does not migrate substantially (Howe and Coates 1975), although this issue should be revisited. Therefore, surveys for hydropic vacuolation prevalence, given age-specific analysis, and between-year consistency in histopathological interpretation are an appropriate long-term monitor for the effects of benthic chemical contaminants on winter flounder at these latitudes. Hydropic vacuolation can be regarded as a harbinger of neoplastic risk, given adequate duration and level of exposure to carcinogens.

This report describes the 1992 prevalence of hydropic vacuolation, neoplasms and other liver lesions in winter flounder from the same five stations studied in 1991 and compares that data with that of previous years. Additional data is presented from two other stations in Boston Harbor.

METHODS

Stations and Sampling

Seven stations were sampled; 1 - Deer Island Flats, Boston Harbor; 2 - Nantasket Beach; 3 - Broad Sound; 4 - Future Outfall site; 5 - Eastern Cape Cod Bay (see Figure 1); 10 - Quincy Bay; and 11 - Dorchester Bay.

Fish collections

All fish, except for those caught on 5/16/92 were collected by commercial otter trawl using a commercial dragger, the F/V *Odessa,* from Gloucester, skipper William B. Crossen. The fishing gear comprised a Western Atlantic trawl, with a 4 seam chain sweep, 53 foot head rope, 83 foot footrope, 10 fathom legs, 10 fathom ground cables, 400 pound Bison steel doors, and 25 fathom of main wire for shallow stations with more for the deep stations. Trawling speed was approximately 2 knots. On 5/16/92 fish from stations 1, 10 and 11 were collected by hook and line and dissected at the New England Aquarium during Fish Day 2 (Farrington, M. A., New England Aquarium, unpublished data). Trawl location and duration are given in Table 1. Fish were placed in through-flow sea water tanks prior to dissection.

Sample Numbers

Each fish was assigned a sample identification number, that was unique within our multi-year winter flounder archive and database. Datasheets and histological casettes bearing this number were prepared in advance to ensure complete collection of both numerical information and samples.

Dissection of Fish

Fish were killed by cervical section. Fish were placed blind side up and measured for total and standard length. Their external condition was noted, and the condition of their fins with respect to erosion was scored on a scale of 0 - 4. An oval incision was made in the ventral body wall overlying the liver and anterior ventral gonad. Gonads were either white and triangular in males, pink and elongated caudally in females, or small and blue-gray in immature fish. Livers were removed by severance of the peritoneal attachments, and then cut into 4 mm thick slices, in a series of transverse cuts. Each slice was examined for grossly visible abnormalities and graded for gross abnormality 0 - 2. Routine samples were taken from three equidistant sections through the liver. Liver sections were immediately placed into pre-labelled histological casettes. Other area(s) of visibly abnormal liver were also sampled. Tissue samples were fixed in 10% neutral buffered formalin. Other viscera, gonads, heart and gills were inspected for gross lesions.

Age Determination

A sample of scales was removed from the dorsum of the caudal peduncle of each animal. Scales were placed in scale envelopes, labelled, and subsequently submitted to Jay Burnett, NMFS, Woods Hole, MA for age estimation by counting growth rings.

Histological Processing

Fixed specimens were returned to the laboratory and embedded in paraffin, sectioned at 5 µm and stained with hematoxylin and eosin: these standard methods are described by Luna (1968).

Histological Analysis

After an initial survey of the material, the prevalence and severity of the following lesions, which have been described and illustrated in detail elsewhere (Moore 1991), were recorded:

1) Hydropic Vacuolation, seen in three forms:

   a) Centrotubular vacuolation - isolated groups of 1-2 vacuolated cells in the center of the hepatic tubule.

   b) Tubular vacuolation - linear arrays of vacuolated cells, filling the hepatic tubule, often extending into biliary duct structures.

   c) Focal vacuolation - foci of thirty to several hundred contiguous vacuolated cells.

2) Macrophage aggregation - circular golden brown cellular masses, often associated with fibrotic tracts, bile ducts and blood vessels.

3) Biliary duct proliferation - branching ducts, often ensheathed by fibrosis.

4) Neoplasms- focal, often grossly visible areas of cells fulfilling established criteria for neoplasia in this species (Moore 1991).

Data were recorded in Excel (Microsoft Corp., Redmond WA) using a Macintosh LC II .

Severity of each lesion was scored as follows: Histological slides were examined under bright field illumination, at 25 x, 100 x, and 200 x. using a Zeiss Axioskop. For each slide, each lesion was scored by examining the whole selection at 25 x, and at least 5 views at 100 x and 200 x. Each lesion was scored at 0 - 4, 0 = absent, 1 = minor, 2 = moderate, 3 = severe and 4 = extreme.

To allow comparison of 1992 data with previous data, lesion prevalence was also calculated for each lesion from each site. These data were derived from the histopathological indices by taking each fish with a lesion score of 1 or more to be scored as having the lesion present. This was a valid approach, given the fact that the criteria used to define "minor" were the same as those used to define the low point of "present" in previous years. In making between-year and inter-station comparisons only data from one liver piece examined from each fish were considered. This was due to the fact that in 1987 to 1990, and in the 1991 Broad Sound station, only one liver piece per fish was examined. In this way comparisons were not biased by the increased sampling effort present in the majority of the 1991 and the 1992 study. Lesion data were recorded and tabulated for all 3 tissue pieces (Table 9).

Analysis of data

The histopathological indices and prevalences of lesions were compared between classes of fish defined by differences in station, age, sex, and length. Many lesions were found together: thus they were not statistically independent. Centrotubular vacuolation was regarded as the most sensitive histological indicator of exposure to chemical contaminants, and was thus tested for significant differences between groups of fish by analysis of variance using Statview (Abacus Concepts, Berkeley CA).

Quality assurance and control

The 1992 sampling intensity was similar to the 1991 study, and all raw data is reported, but to maintain comparability with earlier years, data analysis was restricted to the first liver piece examined from each fish.

The methods employed replicated previous studies, both in the field and in the basis for histopathological interpretation. The between-year consistency of histopathological interpretation was ensured by reevaluation of a subset of slides first analyzed in 1987.

At each stage of the project, protocols were defined prior to the start of work. Data sheets, tissue casettes, scale envelopes, databases, and other processing systems, were all prepared in advance to receive each sample or data unit. Omissions were obvious, in routine cross- and back-checking, and rectified. At each stage data quality was assured by back-checking with the source material or data file at the completion of the task. Sample numbers were not station specific. Thus data were generated from the entire study set before specific stations were associated with specific groups of fish, avoiding bias of interpretation on the basis of expected outcome.

RESULTS AND DISCUSSION

Fish collected

Catches are detailed in Table 1, which were caught at the stations listed in Table 2. Station positions are illustrated in Figure 1. Stations 1 to 5 equate with Stations 1 to 5 in the 1991 survey (Moore et al. 1992). Surface temperature and bottom depth are also listed in Table 2. Fish were also collected from three other stations in Boston Harbor during Fish Day 2. The small sample sizes from Quincy Bay and Dorchester Bay should be noted. The availability of winter flounder on Deer Island Flats was low at both sampling dates. These dates both coincided with regular underwater blasting for the Third Harbor Tunnel Project.

Age/ length parameters

Mean age and length of fish from each station are listed in Table 3. This data is compared with the collections made in 1991 in Table 4. It should be noted that at all stations, except the Future Outfall Site, the age of 1992 fish was less than the 1991 fish, especially so at Broad Sound and Deer Island. It is also important to notice that the average age of the Deer Island Fish in the 1992 sample (4 years old) is now one year less than the youngest age (5 years old) at which liver neoplasms have been recorded in previous studies of fish from this site (Moore 1991). Furthermore, most tumor bearers in the previous study were seven or more years old. It is therefore important to disregard recent trends for this lesion type.

Fin erosion indices

The intensity of fin erosion is shown in Table 5. Fish from Deer Island, Broad Sound and Nantasket Beach were significantly more affected than fish from the Future Outfall Site and Eastern Cape Cod Bay. This trend agrees with previous suggestions that this lesion is a useful indicator of exposure to contaminated habitats (Murchelano 1975).

Interstation comparison of lesion prevalence and severity

As described above, lesion prevalence and severity were calculated for each lesion at each station (Tables 6 and 7 and Figures 2 and 3). As in 1991 Deer Island and Broad Sound fish showed higher levels of hydropic vacuolation than did fish from Nantasket Beach, and the future outfall site. Near-zero prevalences were again observed at the Eastern Cape Cod Bay station. No neoplasms were observed in any fish. This absence of tumors should not be taken to indicate any marked improvement in the liver health of the

Broad Sound and Boston Harbor animals, as the average age of the animals was significantly lower than that necessary for the development of liver tumors. The relative prevalence of the three stages of hydropic vacuolation are illustrated in Figure 3, reflecting the progression of the disease process in these fish from centrotubular to tubular to focal vacuolation (Moore 1991). Had there been older fish in the samples from the urban stations we would probably have found tumor bearers.

Interpretation of these inter-station differences rests on the certainty with which we can conclude that winter flounder caught at one station have not spent significant amounts of time at one or more of the other stations. There is good evidence reviewed by Klein-MacPhee (Klein-MacPhee 1978) that winter flounder return to feed where they spawned. Furthermore, tagging studies showed a mean distance travelled offshore, of fish tagged in Boston Harbor, of 1-2 km (Howe and Coates 1975). However, there may have been a bias in the rate of tag returns from the inshore and offshore areas of this study. In particular, the extent to which winter flounder caught at the future outfall site may have spent part of their life feeding in Boston Harbor or other inshore sites has not been explicitly described. However, a consensus of the extant literature would suggest that such a bias is not significant. However, it would be worthwhile to conduct an appropriate acoustic tag study at Stations 1 and 4 to investigate this issue further.

Gender differences in lesion prevalence.

As in previous years, there was little significant difference in lesion prevalence, and no obvious trend favoring one gender over the other (Table 8), except at Station 11, where a small sample included no females.

Age effects on lesion prevalence (1989 to 1992 studies)

To investigate any change in histopathologic interpretation over the period of this survey, a reevaluation of a subset of the 1989 survey material revealed a 100% agreement between previous and current interpretation. Therefore, any between-year differences in lesion prevalence are unlikely to result from between-year differences in the method of study.

We have previously shown that lesion prevalence in winter flounder from Deer Island Flats increases with both length and age (Moore 1991). We now have age specific data on fish collected from 1989 to the present. We conducted a cohort specific analysis of lesion prevalence (Table 9). We assumed that 4 year old fish caught in 1989 were spawned in 1985, as were 5 year olds caught in 1990, and 6 year olds in 1991. All of these fish were regarded as belonging to the 1985 cohort. This cohort is highlighted in Table 9. The prevalence of centrotubular vacuolation for each age class in each cohort was then plotted (Figure 4). It can be seen that the rate of disease increase is comparable for the 1985, 1986 and 1987 cohorts, but it is lower for the 1984 cohort, and higher for the 1988 cohort. If significant, this suggests that the fish are getting sicker quicker in more recent cohorts. This may reflect increased exposure to toxic chemicals.

Annual lesion prevalence trends: 1984 to 1992

In the 1991 report we suggested that length specific analysis showed a reduction of lesion prevalence in recent years, as compared with 1987 to 1989. This suggestion is supported in Table 10 and Figure 5, where 1992 data has been included. The increase in the prevalence of vacuolation in the shortest length class in 1992 may reflect the trend suggested in the cohort analysis described and discussed above.

Overall prevalences are given as follows: all lesions (Table 11 and Figure 6), neoplasms (Figure 7), and centrotubular vacuolation (Figure 8)

REFERENCES

Howe, A. B. and P. G. Coates (1975). "Winter flounder movements, growth and mortality off Massachusetts." Trans. Amer. Fish. Soc. **104**: 13-29.

Johnson, L. L., C. M. Stehr, O. P. Olson, M. S. Myers, S. N. Pierce, C. A. Wigren, B. B. McCain and U. Varanasi (1992). National Status and Trends program, National Benthic Surveillance Project, Northeast Coast. Fish histopathology and relationships between lesions and chemical contamaninants (1987-9). Technical Document: In Press

Klein-MacPhee, G. (1978). Synopsis of biological data for the winter flounder, *Pseudopleuronectes americanus* (Walbaum). NOAA Technical Report NMFS Circular 414

Luna, L. G. (1968). Manual of histologic staining methods of the Armed Forces Institute of Pathology. NY, *McGraw-Hill.*

Moore, M. J. (1991). Vacuolation, proliferation and neoplasia in the liver of winter flounder *(Pseudopleuronectes americanus).* Woods Hole Oceanographic Institution. Technical Document 91 - 28

Moore, M. J., B. W. Woodin and J. J. Stegeman (1992). Liver pathology of winter flounder: Boston Harbor, Massachusetts bay, and Cape Cod bay - 1991. Massachussets Water Resources Authority. Environmental Quality Department Technical Report Series No. 92-5

Murchelano, R. A. (1975). "The histopathology of fin rot disease in winter flounder from the New York Bight." J. Wildlife Diseases **11**: 263-267.

Murchelano, R. A. and R. E. Wolke (1985). "Epizootic carcinoma in the winter flounder, *Pseudopleuronectes americanus*." Science **228**: 587-589.

TABLE 1 - Trawl Catch Data

Date	Trawl	Station	W. Fldr.	Sandab	Yell. Tl.	Eel Pt	Skate	Cod	Sculpin	S Robin	Lobster	Scallop	Smelt	Herring	Lump.	4 spot
4 6 92	1	3	95	12			65				4					
	2	1	3	1			2				0		4	4		
	3	1	11				3				6		4	4		
	4	1	2				2									
	5	1	2				1				2					
	6	1	12	2		1	7				5		3	3		
	7	1	5				7									
	8	2	45	2			37									
	9	2	35				58				5				2	
4 7 92	10	5	5				31				1					
	11	5	39	8			202		3	1	5	13	1	1		
	12	5	99	15			330				1	1				
4 8 92	13	4	84	24	66	11	2	15	40		4	2			1	
	14	4	29	34	10	10	7	45	13		4	1				1
	15	4	105		17	53		36	67	3	9					

W. Fldr. = Winter flounder, Yell. Tl. = Yellowtail flounder, Eel Pt. = Eel pout, S. Robin = Sea robin, Lump. = lumpfish, 4 spot = four spot flounder

TABLE 2 - Station positions and hydrographic conditions

Date	Trawl	Station	Start time	Loran 1	Loran 2	Stop time	Bott. time	Loran 1	Loran 2	Surf. Temp.	Bott. Temp.	Depth (ft)
4 6 92	1	3	7.00	14002.20	44306.10	7.10	20.00	14002.50	44306.10	4.00	4.00	12\24
	2	1	8.32	14027.30	25849.60	9.17	45.00	14025.70	25845.40	4.00	4.00	5\16
	3	1	9.25	14025.70	25845.60	10.15	50.00	14026.10	25849.10			5\10
	4	1	10.35	14026.80	25850.40	10.45	10.00	14025.70	25846.30			5\10
	5	1	11.10	14025.40	25846.20	11.25	15.00	14025.50	25849.30			5\10
	6	1	11.50	14025.80	24848.50	12.45	55.00	14023.80	25843.10			5\10
	7	1	13.05	14024.80	24846.60	13.50	45.00	14024.30	25845.10			5\10
	8	2	15.00	14003.00	44255.80	15.23	23.00	14002.50	44260.90	4.50	5.00	9\14
	9	2	19.31	14003.00	44260.50	15.48	15.00	14003.00	44255.00			9\14
4 7 92	10	5	9.00	13824.50	44055.60	9.10	10.00	13825.40	14053.10			35\45
	11	5	9.25	13829.20	44053.60	10.10	45.00	13818.20	44063.50	4.00	4.00	45\55
	12	5	10.35	13819.20	44061.40	1.20	45.00	13832.50	44050.50			45
4 8 92	13	4	10.40	13959.00	44280.40	11.00	20.00	13959.80	44283.80	4.00	4.00	100
	14	4	11.20	13959.00	44285.80	12.20	60.00	13953.10	44285.20			100
	15	4	12.50	13957.00	44285.40	13.15	25.00	13955.00	44283.90			100\110

TABLE 3 - SUMMARY OF COLLECTIONS OF WINTER FLOUNDER MADE IN THE SPRING OF 1992 IN MASSACHUSETTS AND CAPE COD BAYS

Station Number	Station Name	Date of collection	Sample Size	Total Length (Mean ± SD)	Age in years (Mean ± SD)	Grossly visible lesions (%)	Neoplasia (%)
1	Deer Island	4/6/92 5/16/92	56	$336 \pm 40^{3,11}$	$4.00 \pm 0.93^{2,3,10}$	2	0
2	Nantasket Beach	4/6/92	49	$337 \pm 29^{3,10}$	$4.45 \pm 0.82^{5,11}$	0	0
3	Broad Sound	4/6/92	50	$361 \pm 48^{4,5}$	$4.79 \pm 1.53^{4,5,11}$	4	0
4	Future Outfall site	4/6/92	50	330 ± 34^{10}	4.16 ± 0.77^{10}	0	0
5	Eastern Cape Cod Bay	4/7/92	49	332 ± 43^{10}	3.88 ± 1.05^{10}	0	0
10	Quincy Bay	5/16/92	11	365 ± 33	4.91 ± 1.04^{11}	2	0
11	Dorchester Bay	5/16/92	17	341 ± 25	3.71 ± 0.85	0	0

Superscript numbers relate to the station number(s) with which a significant interstation difference occured (ANOVA $p < 0.05$, using Fisher's Protected Least Significant Difference Test).

TABLE 4 - COMPARISON OF COLLECTIONS OF WINTER FLOUNDER MADE IN 1991 AND 1992 IN MASSACHUSETTS AND CAPE COD BAYS

		1992		1991	
Station Number	Station Name	Total Length (Mean ± SD)	Age (Mean ± SD)	Total length (mean ± S.D.)	Age (mean ± S.D.)
1	Deer Island	$336 \pm 40^{3,11}$	$4.0 \pm 0.9^{2,3,10}$	$360 \pm 39^{3,4,5}$	$4.8 \pm 1.3^{3,4,5}$
2	Nantasket Beach	$337 \pm 29^{3,10}$	$4.5 \pm 0.8^{5,11}$	353 ± 33^{3}	4.6 ± 1.0^{3}
3	Broad Sound	$361 \pm 48^{4,5}$	$4.8 \pm 1.5^{4,5,11}$	$396 \pm 40^{4,5}$	$6.4 \pm 1.1^{4,5}$
4	Future Outfall site	330 ± 34^{10}	4.2 ± 0.8^{10}	338 ± 45	4.2 ± 1.0
5	Eastern Cape Cod Bay (Pooled in 1991)	332 ± 43^{10}	3.9 ± 1.1^{10}	334 ± 33	4.1 ± 1.1
10	Quincy Bay	365 ± 33	4.9 ± 1.0^{11}		
11	Dorchester Bay	341 ± 25	3.7 ± 0.9		

Superscript numbers relate to the station number(s) with which a significant within-year interstation difference occured (ANOVA $p < 0.05$, using Fisher's Protected Least Significant Difference Test).

TABLE 5 - COMPARISON OF FIN EROSION INDICES FOR WINTER FLOUNDER FROM MASSACHUSETTS AND CAPE COD BAYS CAUGHT IN THE SPRING OF 1992

Station Number	Station Name	Sample Size	Intensity of Fin Erosion (Mean $\pm$ SD)
1	Deer Island	56	$0.39 \pm 0.56^{4,5}$
2	Nantasket Beach	49	0.27 ± 0.45^{3}
3	Broad Sound	50	$0.72 \pm 0.86^{4,5,10,11}$
4	Future Outfall Site	50	0.16 ± 0.37
5	Eastern Cape Cod Bay	49	0.06 ± 0.24
10	Quincy Bay	10	0.20 ± 0.42
11	Dorchester Bay	16	0.13 ± 0.50

Fin erosion scored on a scale of 0 to 4 for intensity, with 0 = absent to 4 = severe. Indices for each fish were averaged for each station. Datagiven as mean $\pm$ S.D. for each station. Significant (ANOVA $p < 0.05$,using Fisher's Protected Least Significant Difference Test) interstation differences shown as superscripts of the relevant station number(s).

TABLE 6 - 1992 HISTOPATHOLOGICAL LESION PREVALENCES (%) FOR WINTER FLOUNDER LIVERS FROM MASSACHUSETTS AND CAPE COD BAYS

SITE	DEER ISLAND 4/92 & 5/92	QUINCY BAY 4/92	DORCHESTER BAY 5/92	BROAD SOUND 4/92	NANTASKET BEACH 4/92	FUTURE OUTFALL SITE 4/92	EASTERN CAPE COD BAY 4/92
SAMPLE SIZE	56	11	17	50	49	50	50
CENTROTUBULAR HYDROPIC VACUOLATION	48[4]	18[1]	29[2]	74[4]	20[2]	34[3]	2
TUBUBULAR HYDROPIC VACUOLATION	25	9	18	44	8	18	0
FOCAL HYDROPIC VACUOLATION	4	0	0	2	0	0	0
NEOPLASM	0	0	0	0	0	0	0
MACROPHAGE AGGREGATION	46	27	59	82	55	30	14
BILIARY PROLIFERATION	11	9	0	20	4	8	0

Significance of difference (χ^2) of centrotubular hydropic vacuolation prevalence was compared between each station and the reference station, Eastern Cape Cod Bay. [1] $p \leq 0.05$, [2] $p \leq 0.01$, [3] $p \leq 0.001$, [4] $p \leq 0.0001$. Significance of differences between stations for other lesions was not determined.

TABLE 7 - COMPARISON OF HISTOPATHOLOGICAL INDICES FOR WINTER FLOUNDER FROM MASSACHUSETTS AND CAPE COD BAYS CAUGHT IN THE SPRING OF 1992

Station number	Station Name	Neoplasia	Focal hydropic vacuolation	Tubular hydropic vacuolation	Centrotubular hydropic vacuolation	Macrophage aggregation	Biliary proliferation
1	Deer Island	0.00 ± 0.00	0.055 ± 0.33	0.36 ± 0.72	0.84 ± $1.04^{2,3,5}$	0.66 ± 0.88	0.13 ± 0.38
2	Nantasket Beach	0.00 ± 0.00	0.00 ± 0.00	0.16 ± 0.59	0.39 ± $0.84^{3,5}$	0.63 ± 0.64	0.04 ± 0.20
3	Broad Sound	0.00 ± 0.00	0.04 ± 0.28	0.92 ± 1.21	1.58 ± $1.20^{4,5,10,11}$	1.36 ± 0.94	0.26 ± 0.60
4	Future Outfall site	0.00 ± 0.00	0.00 ± 0.00	0.26 ± 0.63	0.58 ± 0.91^{5}	0.38 ± 0.64	0.08 ± 0.27
5	Eastern Cape Cod Bay	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.02 ± 0.14	0.16 ± 0.42	0.00 ± 0.00
10	Quincy Bay	0.00 ± 0.00	0.00 ± 0.00	0.18± 0.60	0.27 ± 0.65	0.36 ± 0.67	0.18 ± 0.60
11	Dorchester Bay	0.00 ± 0.00	0.00 ± 0.00	0.24 ± 0.56	0.41 ± 0.71	0.65 ± 0.61	0.00 ± 0.00

Each histological condition was scored on a scale of 0 to 4 for severity, with 0 = absent to 4 = severe. Indices for each fish were averaged for each station. Data given as mean ± S.D. for each station. Significant (ANOVA $p < 0.05$, using Fisher's Protected Least Significant Difference Test) interstation differences of centrobular tubular vacuolation shown as superscripts of the relevant station number(s). Lesion co-dependence precluded testing of more than one lesion type statistically. Centrotubular vacuolation was regarded as the most sensitive indicator of exposure to chemical contaminants.

TABLE 8 - PREVALENCE OF CENTROTUBULAR VACUOLATION COMPARED BETWEEN GENDERS, FOR EACH STATION

Station (Sample size)	% of sample female	Prevalence of centrotubular hydropic vacuolation	
		Females	Males
1 (56)	59	53	37
2 (49)	45	32	11
3 (50)	24	67	76
4 (50)	82	29	56
5(49)	59	3	0
11 (11)	72	0	67*
12 (17)	47	38	25

*Significant difference between gender (χ^2 $p< 0.05$)

TABLE 9 - ANALYSIS BY AGE CLASS OF PREVALENCE OF CENTROTUBULAR VACUOLATION IN WINTER FLOUNDER FROM DEER ISLAND FLATS, BOSTON HARBOR, CAUGHT IN 1989, 1990, 1991 AND 1992

	All fish (%)	3 year olds	4 year olds	5 year olds	6 year olds	7 year olds	8 year olds	9 year olds
1989	51 (25)	0 (2)	**29 (7)**	33 (9)	100 (4)	100 (2)	0 (1)	
1990	39 (99)	0 (4)	38 (29)	**48 (31)**	35 (23)	50 (4)	50 (4)	0 (1)
1991	47 (167)	33 (12)	32 (69)	55 (40)	**67 (24)**	60 (10)	75 (4)	67 (3)
1992	48 (56)	45 (20)	55 (20)	50 (12)	*25 (4)*			

Prevalence given as a % of sample affected, with sample size in parentheses. A few fish were not analyzed for age in some years. For the purposes of plotting Figure 4 data in the boxed diagonal was taken to represent successive year classes of the cohort spawned in 1985. Other cohorts were assigned in a parralell fashion.

TABLE 10 - PREVALENCE OF CENTROTUBULAR VACUOLATION IN FEMALE WINTER FLOUNDER FROM DEER ISLAND FLATS, BOSTON, BY LENGTH CLASS, FOR 1987 TO 1992.

	TOTAL LENGTH (mm)		
YEAR	300 - 350	350 - 400	400 - 450
1987	75 (8)	79 (14)	50 (6)
1988	89 (9)	50 (14)	60 (10)
1989	0 (1)	39 (13)	100 (2)
1990	33 (21)	46 (26)	36 (22)
1991	28 (39)	53 (47)	71 (35)
1992	46 (15)	50 (14)	80 (5)

Prevalence given a % (Sample size)

TABLE 11 - SUMMARY OF AVAILABLE DATA ON DEER ISLAND FLATS WINTER FLOUNDER 1984 TO 1992

Year sampled	1984[1]	1987[2]	1988[2]	1989[2]	1990[2]	1991[3]	1992[4]
Date sampled	2 April & 6 June	21 April	18 March	13 May	30 April	12 Mar, 8 Apr, 22 May	6 April, 16 May
Sample size	200	51	52	29	100	167	56
%Female	-	57	92	66	71	73	64
Body length (Mean ± S.D)	353	364 ± 32	378 ± 38	367 ± 31	370 ± 31	358 ± 35	336 ± 40
Age (Mean ± S.D)				4.9 ± 1.4	5.1 ± 1.2	4.8 ± 1.3	4.0 ± 0.9
Gross lesion (%)		17.7	28	13.3	10	9	2
Neoplasm (%)	7.5	5.9	11.5	3.3	5	2.7	0
Centrotubular HV[5] (%)	68	77	65	40	39	46	48
Tubular HV (%)		71	48	30	29	32	25
Focal HV (%)		14	22	10	2	3	4
Macrophage (%)	68	75	63	30	43	54	46

[1]Murchelano and Wolke 1985 (Fish from Deer Island and elsewhere in Boston Harbor); [2]Moore 1991; [3]Moore et al. 1991, [4]This study; [5]HV = Hydropic vacuolation

TABLE 12 - HISTOPATHOLOGICAL DATA RECORDED FOR EACH FISH COLLECTED IN 1992

Column headings are abbreviated as follows:

ID	Individual fish identification number. In the multi-year archive, and in all sample labels these numbers are all prefaced with 92-
ST	Station number see Table 2 and Figure 1
YR	Age of fish in years
SEX	Gender: F = female, M = male
TL	Total Length (mm)
FIN	Fin-rot score 0 - 4: 0 = absent, 1 = minor, 2 = moderate, 3 = severe and 4 = extreme
GR	Gross lesions: 0 = absent, 1 = present
GS	Gross score: 0 = absent, 1 = mild, 2 = severe
LC	Y = yellow, YB = yellow brown, B = brown, DB = dark brown, G = green
GD	Gonad appearance: Female: 1= prespawning, 2 = ripe, 3 = running eggs, 4 = post spawning, 5 = regressed, 6 = Immature. Male: 1 = running milt, 2 = mature, not running, 3 = undeveloped
MN	Mean histological index for that lesion type for that fish. Each lesion was scored at 0 - 4, 0 = absent, 1 = minor, 2 = moderate, 3 = severe and 4 = extreme
P1	Prevalence score (from one tissue piece); 1 = present, 0 = absent
P3	Prevalence score(from three tissue pieces); 1 = present, 0 = absent
HV	Hydropic vacuolation
CENTRO	Centrotubular hydropic vacuolation
BILIARY PRO.	Biliary proliferation

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3
										I	II	III				I	II	III			
3/BS	92-	210	F	4	370	1	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	211	M	5	380	0	0	2	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	212	M	6	400	2	0	3	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	213	M	4	304	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	214	M	6	380	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	215	M	5	355	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	216	M		352	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	217	M	4	325	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	218	M	6	385	2	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	219	M	3	305	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	220	M	5	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	221	M	4	328	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	222	F	4	340	0	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	223	M	6	405	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	224	M	4	355	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	225	M	5	350	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	226	M	5	362	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	227	M	3	312	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	228	M	3	315	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	229	F	4	365	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	230	M	4	335	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	231	M	6	410	2	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	232	M	4	310	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	233	M	4	330	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	234	M	4	315	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	235	M	4	340	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	236	M	5	365	1	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	237	M	6	350	1	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	238	M	6	415	2	1	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	239	M	7	390	1	1	1	DB/G	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	240	M	4	320	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	241	F	6	485	3	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	242	M		360	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	243	F	4	380	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	244	F	10	470	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	245	M	3	315	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	246	M	6	370	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	247	F	10	505	0	0	2	YB	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	248	M	4	320	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	249	M	4	335	2	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	250	M	4	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	251	F	5	380	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	252	F	4	370	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	253	M	4	340	0	0	1	B	0	0	0	0	0	0	2	0	0	0.7	1	1
3/BS	92-	254	F	7	490	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	255	F	3	320	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	256	F	3	305	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	257	M	5	355	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	258	M	4	310	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	259	M	4	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	260	F	6	345	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	262	F	4	340	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	263	F	6	390	1	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	264	M	5	355	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	265	F	4	350	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3	
										I	II	III				I	II	III				
2/NBch	92-	266	M	5	315	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	267	M	5	345	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	268	M	5	340	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	269	F	5	390	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	270	M	5	325	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	271	F	4	350	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	272	F	4	345	1	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	273	M	4	320	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	274	M	4	365	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	275	M	4	335	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	276	M	5	320	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	277	M	5	310	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	278	F	5	385	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	279	M	4	360	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	280	M	4	340	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	281	M	4	310	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	282	F	3	310	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	283	M	3	310	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	284	F	3	300	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	285	F	5	380	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	286	M	5	355	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	287	M	5	325	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	288	F	5	355	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	289	F	4	340	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	290	F	4	290	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	291	F	4	320	1	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	292	M	3	290	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	293	M	4	300	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	294	M	3	295	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	295	M	4	310	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	296	M	6	345	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	297	M	4	320	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	298	M	4	340	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	299	F	5	325	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	300	F	5	380	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	301	M	5	355	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	302	F	5	400	0	0	2	YB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	303	F	3	300	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	304	M	6	380	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	305	M	5	350	1	0	2	DB	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	306	F	4	285	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	307	F	5	350	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	308	F	5	355	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
2/NBch	92-	309	M	4	335	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	310	F	5	375	2	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	311	F	5	380	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	312	F	3	285	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	313	F	4	350	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	314	M	3	270	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	315	M	3	280	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	316	M	3	275	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	317	M	3	322	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	318	F	4	345	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	319	M	4	285	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	320	F	3	300	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3	
										I	II	III				I	II	III				
1/DIF	92-	321	M	3	300	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	322	M	4	345	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	323	F	4	330	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	324	M	4	320	1	0	4	DB	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	325	F	4	350	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	326	F	5	410	1	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	327	F	3	310	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	328	M	4	310	0	1	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	329	M	3	280	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	350	F	4	310	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	351	F	6	410	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	352	M	4	290	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	353	M	5	385	1	1	1	B	0	0	0	0	0	0	2	2	2	2	1	1	
1/DIF	92-	354	F	5	350	0	0	2	YB	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	355	M	4	325	1	0	3	YB	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	356	F	6	425	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	357	F	5	375	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	358	M	3	300	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
1/DIF	92-	359	M	4	330	0	0	1	B	0	0	0	0	0	0	0	0		0	0	0	
4/FOS	92-	360	F	4	295	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	361	F		290	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	362	F	3	300	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	363	F	3	320	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	364	F	4	330	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	365	F	4	315	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	366	F	4	305	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	367	F	3	280	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	368	F	3	300	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	369	F	3	320	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	370	M	4	315	1	0	3	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	371	F	3	320	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	372	F	3	285	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	373	F	4	320	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	374	F	4	315	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	375	F	4	315	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	376	F	4	325	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	377	F	5	400	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	378	F	4	300	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	379	M	4	340	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	380	F	4	310	0	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	381	F	6	425	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	382	F	3	310	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	383	M	5	365	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	384	F	4	330	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	385	F	4	305	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	386	F	4	315	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	387	F	5	310	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	388	F	4	320	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	389	F	4	300	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	390	F	5	365	0	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	391	F	5	355	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	392	F	6	390	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	393	F	5	370	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	394	F	5	420	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	395	M	4	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3	
										I	II	III				I	II	III				
4/FOS	92-	396	F	4	330	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	397	F	4	325	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	398	F	4	335	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	399	F	3	330	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	400	F	5	400	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	401	F	5	360	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	402	M	5	300	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	403	F	4	350	1	0	5	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	404	M	4	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	405	F	5	325	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	406	M	5	345	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	407	M	4	305	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	408	M	4	300	1	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
4/FOS	92-	409	F	5	330	1	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	410	F	3	295	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	411	F	3	310	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	412	F		320	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	413	F	3	290	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	414	F	3	300	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	415	F	4	360	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	416	F	4	390	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	417	M	4	310	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	418	F	3	315	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	419	F	7	420	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	420	F	3	330	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	421	F	4	370	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	422	F	3	340	1	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	423	F	4	340	0	0	4	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	424	F	8	480	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	425	M	4	335	0	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	426	F	5	375	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	427	M	5	360	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	428	M	4	325	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	429	M	4	340	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	430	M	5	355	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	431	F	3	310	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	432	M	5	360	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	433	M	4	340	0	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	434		4						0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	435	M	4	335	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	436	M	4	335	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	437	F	5	380	0	0	4	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	438	M	4	360	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	439	F	3	315	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	440	F	4	360	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	441	M	5	365	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	442	F	3	305	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	443	F	4	330	0	0	4	DB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	444	M	4	305	0	0	1	YB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	445	M	3	280	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	446	F	4	300	0	0	6	YB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	447	F	3	280	0	0	6	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	448	F	3	290	0	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	449	M	3	290	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0	
5/ECCB	92-	450	F	5	420	0	0	4	DB	0	0	0	0	0	0	0	0	0	0	0	0	

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3
										I	II	III				I	II	III			
5/ECCB	92-	451	F	4	360	0	0	4	DB	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	452	F	3	290	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	453	M	4	350	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	454	M	4	320	1	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	455	M	4	320	0	0	1	DB	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	456	F	3	315	0	0	2	B	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	457	M	3	260	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	458	M	3	275	0	0	1	B	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	459	F	2	250	0	0			0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2126	M	4	360	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2141	M	3	303	0	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2153	M	3	300	2	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2155	M	4	362	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2159	F	4	325	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2165	M	3	316	0	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2178	F	4	330		0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2184	F	3	337	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2193	F	4	380	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2198	F	3	372	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2199	?	4	324	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2200	M	3	326	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2207	M	5	365	0	0	2	YB	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2223	F	6	351	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2227	F	4	372	0	0	4	YB	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2233	M	3	328	0	0	3	B	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2236	F	3	354	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2009	F	5	387	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2013	F	6	382	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2121	F	3	360	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2144	M	3	350	1	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2145	F	5	401	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2169	F	5	349	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2179	?	4	365	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2191	F	3	278	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2192	M	3	268	0	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2195	F	5	371	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2201	F	3	320	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2205	F	6	405	2	2	4	Y	0	0	0	0	0	0	2	1	2	1.7	1	1
DIF	92-	2212	F	4	322	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2215	F	4	370	0	0	2	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2219	F	4	334	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2220	F	3	317	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2222	F	4	335	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2226	F	3	298	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2229	F	4	364	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2231	M	3	293	0	0	3	YB	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2235	F	3	302	0	0	6	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2241	F	5	332	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2245	F	3	329	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2248	F	5	335	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2249	M	4	353	0	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2250	F	4	348	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0
HB	92-	2175	F	5	394	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0

Table 12

ST		ID	Sex	YR	TL	FIN	GR	GD	LC	Neoplasms			MN	P1	P3	Focal HV			MN	P1	P3	
										I	II	III				I	II	III				
HB	92-	2182	F	6	344	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
HB	92-	2228	F	2	233	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2123	M	4	359	0	1	3	GB	0	0	0	0	0	0	0	0	1	0.3	0	1	
QB	92-	2135	F	6	375	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2148	M	4	334		0	3	B	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2158	M	7	380	0	0	3	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2209	F	5	365	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2210	F	4	357	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2213	F	5	383	1	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2238	F	4	350	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2240	F	4	289	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2242	F	5	414	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	
QB	92-	2246	F	6	404	0	0	4	Y	0	0	0	0	0	0	0	0	0	0	0	0	

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
3/BS	92-	210	1	1	1	1	1	1	3	3	2	2.7	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	211	0	0	0	0	0	0	2	1	1	1.3	1	1	2	2	1	1.7	1	1	0	0	0	0	0	0
3/BS	92-	212	4	3	2	3	1	1	4	4	4	4	1	1	3	3	2	2.7	1	1	0	0	0	0	0	0
3/BS	92-	213	0	0	0	0	0	0	1	2	0	1	1	1	2	2	3	2.3	1	1	0	0	0	0	0	0
3/BS	92-	214	3	3	3	3	1	1	3	3	3	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	215	3	3	3	3	1	1	3	3	3	3	1	1	3	2	3	2.7	1	1	1	1	1	1	1	1
3/BS	92-	216	2	2	3	2.3	1	1	3	2	2	2.3	1	1	2	1	3	2	1	1	0	0	0	0	0	0
3/BS	92-	217	1	1	1	1	1	1	2	2	2	2	1	1	2	2	2	2	1	1	0	0	0	0	0	0
3/BS	92-	218	2	2	1	1.7	1	1	2	2	1	1.7	1	1	2	3	1	2	1	1	1	1	1	1	1	1
3/BS	92-	219	0	0	0	0	0	0	2	3	2	2.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	220	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	221	0	0	0	0	0	0	1	2	1	1.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	222	1	2	2	1.7	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	223	2	2	3	2.3	1	1	3	2	3	2.7	1	1	2	2	3	2.3	1	1	0	0	0	0	0	0
3/BS	92-	224	0	0	0	0	0	0	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	225	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	226	2	1	1	1.3	1	1	3	3	3	3	1	1	3	3	2	2.7	1	1	0	0	0	0	0	0
3/BS	92-	227	0	0	0	0	0	0	0	2	0	0.7	0	1	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	229	1	1	2	1.3	1	1	2	2	3	2.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	230	3	3	3	3	1	1	3	3	3	3	1	1	2	2	2	2	1	1	0	0	0	0	0	0
3/BS	92-	231	0	0	0	0	0	0	1	1	2	1.3	1	1	2	1	2	1.7	1	1	0	0	0	0	0	0
3/BS	92-	232	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	233	3	3	2	2.7	1	1	3	3	2	2.7	1	1	1	2	2	1.7	1	1	1	1	0	0.7	1	1
3/BS	92-	234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	235	3	3	2	2.7	1	1	3	2	2	2.3	1	1	3	3	2	2.7	1	1	1	1	1	1	1	1
3/BS	92-	236	0	0	0	0	0	0	1	1	2	1.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	0	1	0	0	0	0	0	0
3/BS	92-	238	2	1	1	1.3	1	1	2	1	1	1.3	1	1	2	2	2	2	1	1	0	0	0	0	0	0
3/BS	92-	239	3	2	3	2.7	1	1	3	2	3	2.7	1	1	3	2	3	2.7	1	1	0	0	0	0	0	0
3/BS	92-	240	0	0	0	0	0	0	0	1	0	0.3	0	1	0	1	1	0.7	0	1	1	1	0	0.7	1	1
3/BS	92-	241	0	0	0	0	0	0	1	2	1	1.3	1	1	3	1	3	2.3	1	1	0	0	0	0	0	0
3/BS	92-	242	1	2	2	1.7	1	1	1	2	2	1.7	1	1	1	2	2	1.7	1	1	1	1	2	1.3	1	1
3/BS	92-	243	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	244	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	245	0	0	0	0	0	0	1	1	2	1.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	246	1	2	2	1.7	1	1	2	2	3	2.3	1	1	1	2	2	1.7	1	1	0	0	0	0	0	0
3/BS	92-	247	2	2	1	1.7	1	1	2	2	2	2	1	1	3	3	3	3	1	1	3	3	3	3	1	1
3/BS	92-	248	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	250	0	0	0	0	0	0	1	1	0	0.7	1	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	252	0	0	0	0	0	0	3	3	2	2.7	1	1	1	1	1	1	1	1	0	0		0	0	0
3/BS	92-	253	3	3	3	3	1	1	3	3	3	3	1	1	2	2	2	2	1	1	2	1	2	1.7	1	1
3/BS	92-	254	0	0	0	0	0	0	2	2	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1
3/BS	92-	255	0	0	0	0	0	0	0	1	1	0.7	0	1	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	256	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/BS	92-	257	0	0	0	0	0	0	2	2	2	2	1	1	2	1	2	1.7	1	1	1	1	1	1	1	1
3/BS	92-	258	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
3/BS	92-	259	2	2	2	2	1	1	3	3	3	3	1	1	2	2	2	2	1	1	0	0	0	0	0	0
2/NBch	92-	260	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	262	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	263	0	0	0	0	0	0	2	2	1	1.7	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	264	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0.7	1	1
2/NBch	92-	265	1	1	1	1	1	1	2	1	1	1.3	1	1	1	1	1	1	1	1	0	0	0	0	0	0

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
2/NBch	92-	266	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	267	0	0	1	0.3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	268	0	0	0	0	0	0	2	2	1	1.7	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	269	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	270	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	271	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	272	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0.3	1	1	0	0	0	0	0	0
2/NBch	92-	273	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	274	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	1.7	1	1	0	0	0	0	0	0
2/NBch	92-	275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	276	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	277	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	278	0	0	0	0	0	0	1	1	0	0.7	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	279	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
2/NBch	92-	280	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	281	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	282	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	283	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	284	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	285	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	286	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	287	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	288	0	0	1	0.3	0	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	289	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	291	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	293	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	294	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	295	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	296	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	0	1	0	0	0	0	0	0
2/NBch	92-	297	0	0	0	0	0	0	0	1	1	0.7	0	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	298	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	299	2	2	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	300	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	301	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	302	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	303	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	305	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
2/NBch	92-	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/NBch	92-	307	2	2	2	2	1	1	3	3	3	3	1	1	2	2	2	2	1	1	0	0	0	0	0	0
2/NBch	92-	308	3	3	3	3	1	1	3	3	3	3	1	1	2	3	2	2.3	1	1	1	2	1	1.3	1	1
2/NBch	92-	309	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	310	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	312	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	313	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
1/DIF	92-	314	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	315	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	316	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	317	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0	1	1	1	1	1	1
1/DIF	92-	318	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	319	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	320	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
1/DIF	92-	321	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	322	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	323	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	324	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	325	2	2	3	2.3	1	1	2	2	2	2	1	1	3	3	3	3	1	1	1	1	1	1	1	1
1/DIF	92-	326	0	0	1	0.3	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	327	1	1	1	1	1	1	3	3	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	328	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	329	2	2	2	2	1	1	3	3	3	3	1	1	1	1	1	1	1	1	0	0	0	0	0	0
1/DIF	92-	350	1	1	1	1	1	1	3	3	3	3	1	1	1	1	1	1	1	1	1	0	1	0.7	1	1
1/DIF	92-	351	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	352	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	353	3	3	3	3	1	1	3	3	3	3	1	1	3	3	3	3	1	1	1	1	1	1	1	1
1/DIF	92-	354	1	1	1	1	1	1	3	3	3	3	1	1	2	2	2	2	1	1	1	0	1	0.7	1	1
1/DIF	92-	355	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	1.7	1	1	0	0	0	0	0	0
1/DIF	92-	356	1	1	1	1	1	1	2	2	3	2.3	1	1	3	3	3	3	1	1	0	0	0	0	0	0
1/DIF	92-	357	1	1	1	1	1	1	2	3	3	2.7	1	1	2	2	2	2	1	1	0	0	0	0	0	0
1/DIF	92-	358	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1/DIF	92-	359	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	360	0	0	0	0	0	0	1	1	0	0.7	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	362	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	363	1	1	1	1	1	1	2	2	1	1.7	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	364	0	1	1	0.7	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	365	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	366	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	367	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	368	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	369	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	370	0	0	0	0	0	0	2	2	2	2	1	1	2	2	2	2	1	1	0	0	0	0	0	0
4/FOS	92-	371	1	0	1	0.7	1	1	2	1	1	1.3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	372	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	373	2	1	1	1.3	1	1	3	2	2	2.3	1	1	2	2	2	2	1	1	1	1	1	1	1	1
4/FOS	92-	374	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	376	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	377	0	0	0	0	0	0	1	2	1	1.3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	378	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	379	0	0	0	0	0	0	1	1	2	1.3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	380	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	381	0	0	0	0	0	0	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	382	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	383	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	384	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	385	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	387	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	388	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	0	1	0	0	0	0	0	0
4/FOS	92-	389	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	1.7	1	1	0	0	0	0	0	0
4/FOS	92-	390	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	391	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4/FOS	92-	392	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	393	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	394	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
4/FOS	92-	395	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
4/FOS	92-	396	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	397	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	398	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	399	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	400	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	0	1	0	0	0	0	0	0
4/FOS	92-	401	1	1	1	1	1	1	2	2	2	2	1	1	0	0	0	0	0	0	1	1	0	0.7	1	1
4/FOS	92-	402	2	2	2	2	1	1	2	2	2	2	1	1	0	0	1	0.3	0	1	1	1	1	1	1	1
4/FOS	92-	403	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	404	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/FOS	92-	405	1	1	1	1	1	1	1	1	2	1.3	1	1	0	1	1	0.7	0	1	0	0	0	0	0	0
4/FOS	92-	406	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0.3	0	1	0	0	0	0	0	0
4/FOS	92-	407	1	1	1	1	1	1	2	2	2	2	1	1	1	1	0	0.7	1	1	0	0	0	0	0	0
4/FOS	92-	408	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.7	1	1	0	0	0	0	0	0
4/FOS	92-	409	3	3	2	2.7	1	1	3	3	3	3	1	1	2	2	2	2	1	1	0	0	0	0	0	0
5/ECCB	92-	410	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	411	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	412	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	413	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	414	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	415	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	416	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	417	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	418	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	419	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	420	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	421	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	422	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	424	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
5/ECCB	92-	425	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	426	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	427	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	1	1	0	0	0	0	0	0
5/ECCB	92-	428	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	429	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	430	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
5/ECCB	92-	431	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	432	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	435	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.7	0	1	0	0	0	0	0	0
5/ECCB	92-	436	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	437	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	439	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	0	1	0	0	0	0	0	0
5/ECCB	92-	440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	441	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
5/ECCB	92-	442	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	443	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.3	0	1	0	0	0	0	0	0
5/ECCB	92-	444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	445	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	446	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	447	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	449	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	450	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
5/ECCB	92-	451	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	452	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	453	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	454	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
5/ECCB	92-	455	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
5/ECCB	92-	456	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	457	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5/ECCB	92-	459	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2126	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2155	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2159	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2165	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2178	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2184	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2193	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2198	2	2	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2199	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2200	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2207	0	0	0	0	0	0	1	1	0	0.7	1	1	2	2	2	2	1	1	0	0	0	0	0	0
DB	92-	2223	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DB	92-	2227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DB	92-	2236	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2013	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2145	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2169	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2179	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2191	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2192	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2195	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2201	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
DIF	92-	2205	3	3	3	3	1	1	3	3	3	3	1	1	3	3	3	3	1	1	2	1	2	1.7	1	1
DIF	92-	2212	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2215	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2219	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2220	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2222	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2226	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2229	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2231	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2235	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2241	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2245	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2248	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2249	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DIF	92-	2250	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
HB	92-	2175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12

ST		ID	Tubular HV			MN	P1	P3	Centro HV			MN	P1	P3	Macrophage			MN	P1	P3	Biliary Pro			MN	P1	P3
			I	II	III				I	II	III				I	II	III				I	II	III			
HB	92-	2182	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.7	0	1	0	0	0	0	0	0
HB	92-	2228	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2123	2	2	2	2	1	1	2	2	2	2	1	1	2	2	2	2	1	1	2	2	2	2	1	1
QB	92-	2135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2148	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
QB	92-	2158	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
QB	92-	2209	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2210	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2213	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QB	92-	2246	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

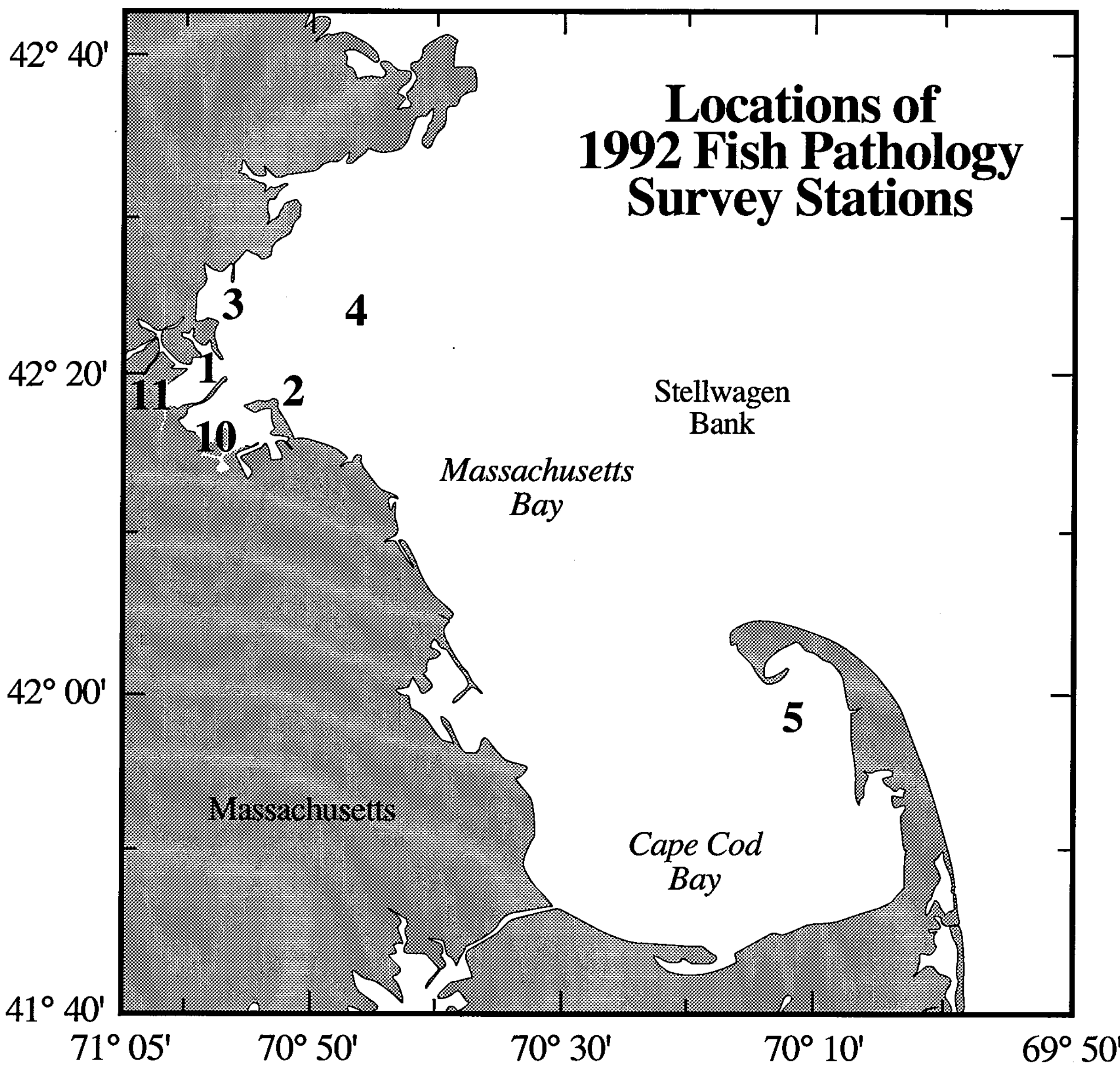

Locations of
1992 Fish Pathology
Survey Stations
42° 40'
42° 20'
42° 00'
41° 40'
71° 05'
70° 50'
70° 30'
70° 10'
69° 50'
3
4
1
11
2
10
Stellwagen
Bank
Massachusetts
Bay
5
Massachusetts
Cape Cod
Bay

FIGURE 1

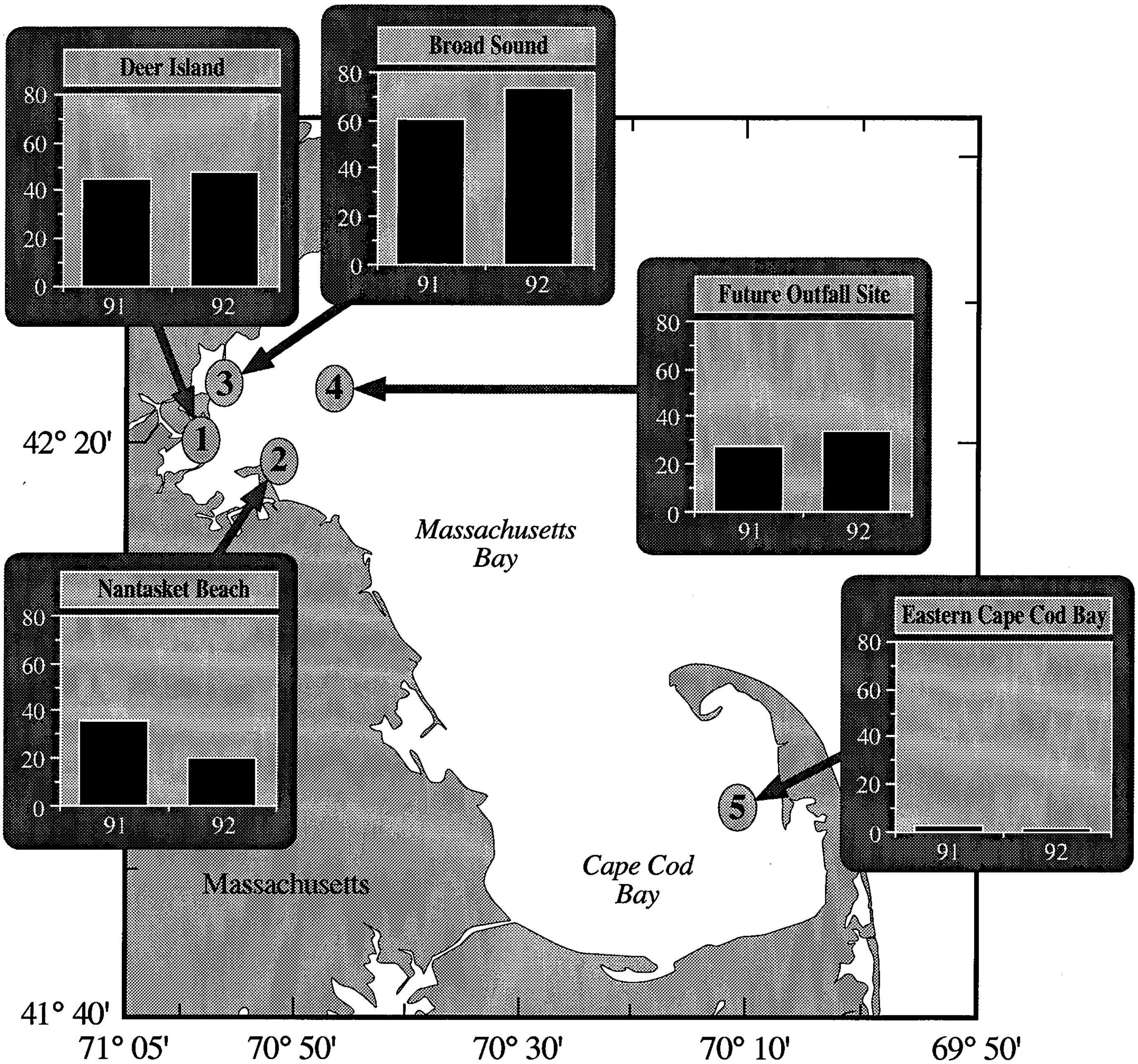


FIGURE 2 - PREVALENCE OF HYDROPIC VACUOLATION IN WINTER FLOUNDER LIVER IN 1991 AND 1992 FROM 5 STATIONS IN MASSACHUSETTS AND CAPE COD BAYS.

Figure 3 - Prevalence of centrotubular, tubular and focal hydropic vacuolation in winter flounder liver from 7 sites in Mass. and Cape Cod Bays in 1992

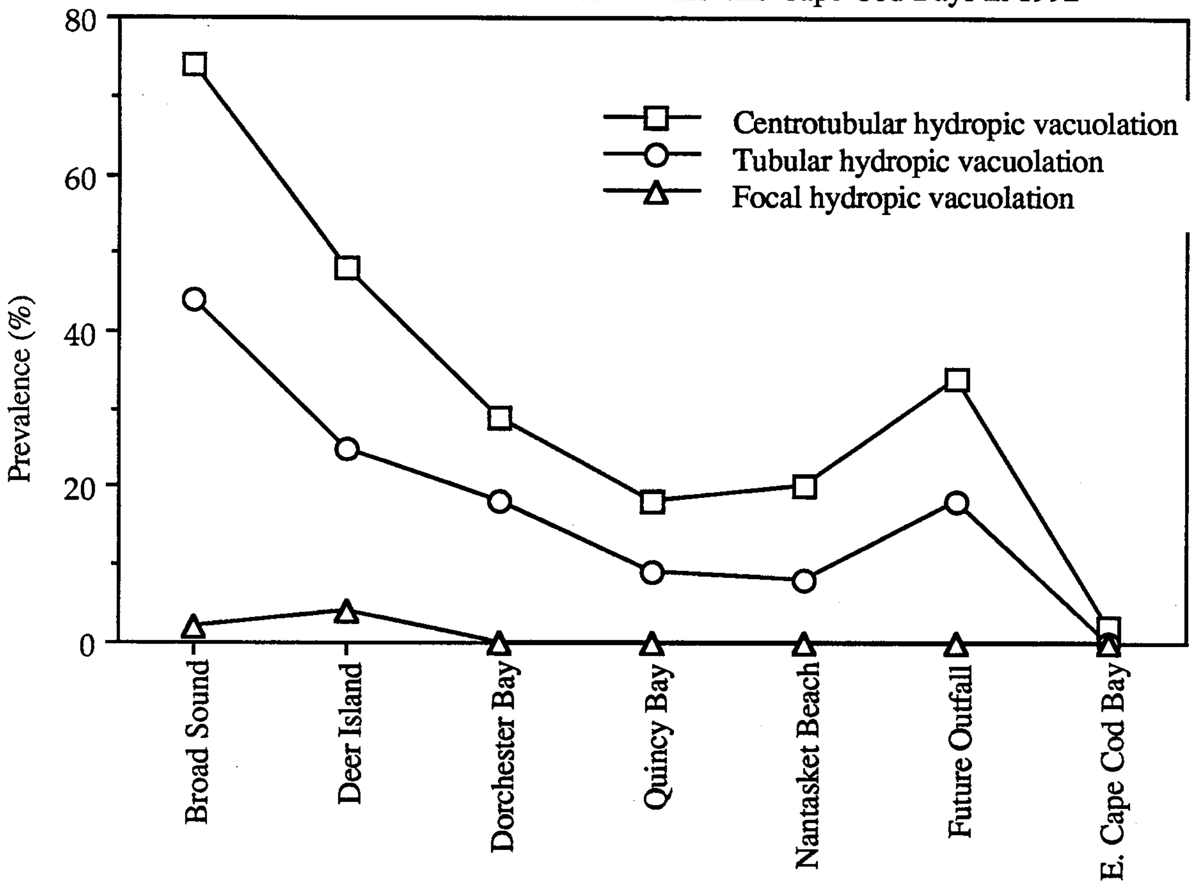
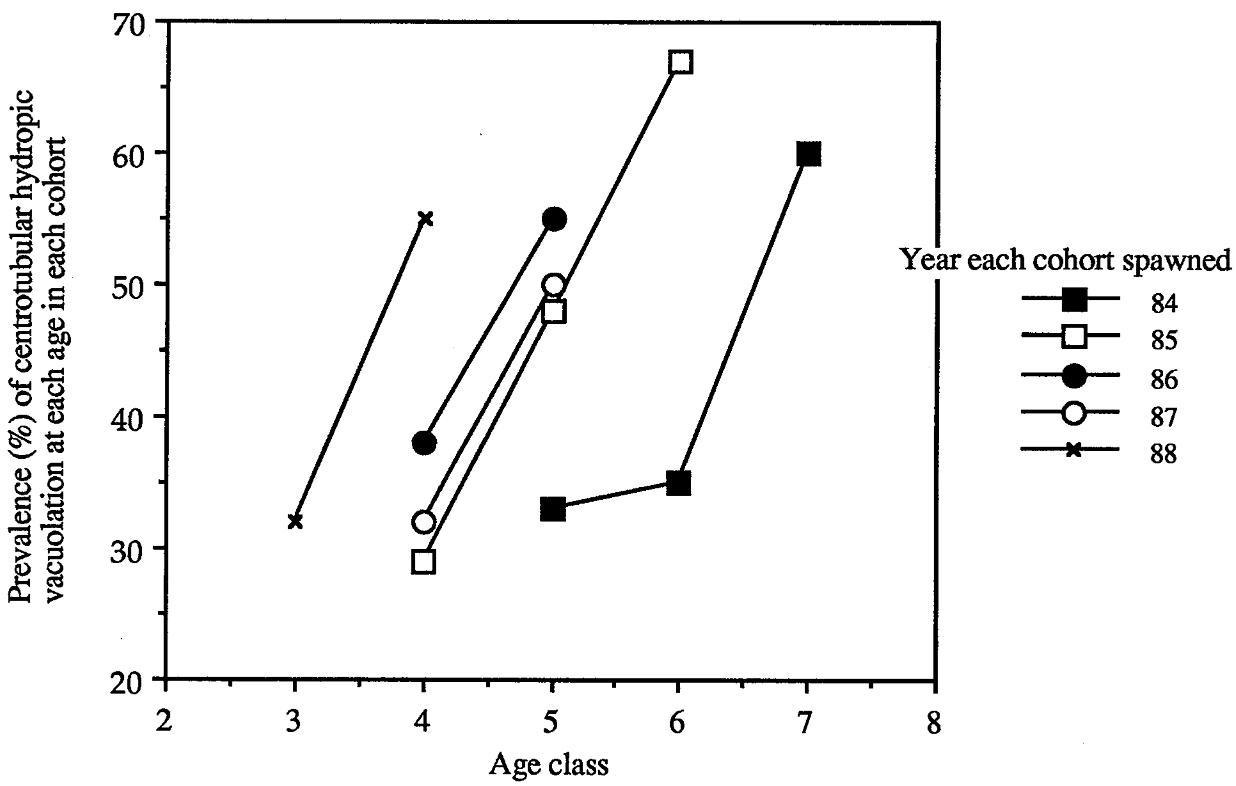


Figure 4 - Comparison of centrotubular vacuolation for cohorts of Deer Island winter flounder spawned in 1984 through 1988



Cohort specific age class sample sizes of less than 7 were omitted

Figure 5 - Prevalence of centrotubular hydropic vacuolation for two length classes of female winter flounder from Deer Island Flats, 1987 to 1992

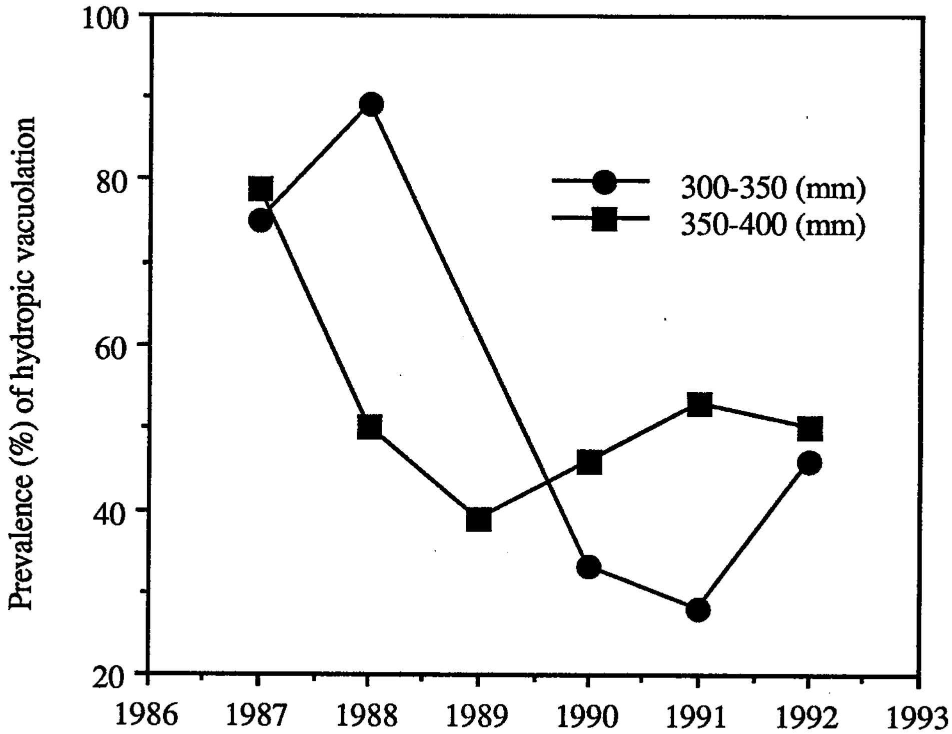


Figure 6 - Prevalence of gross and histological pathological change in the liver of winter flounder from Deer Island Flats, Boston Harbor, 1987 to 1992

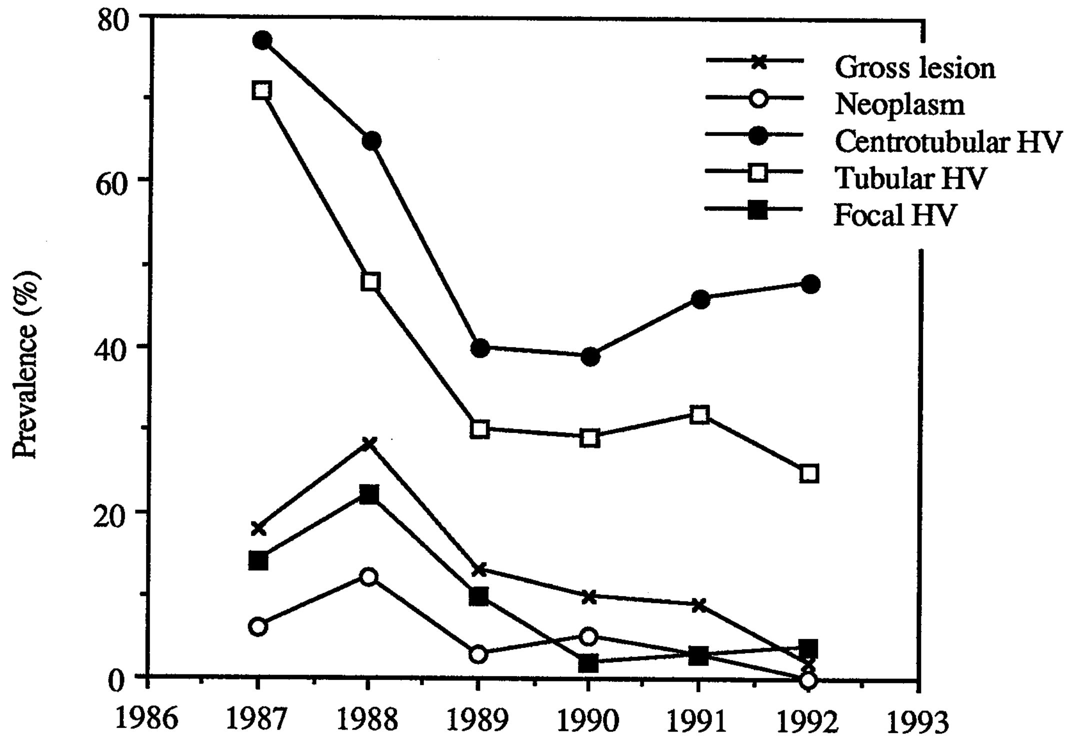
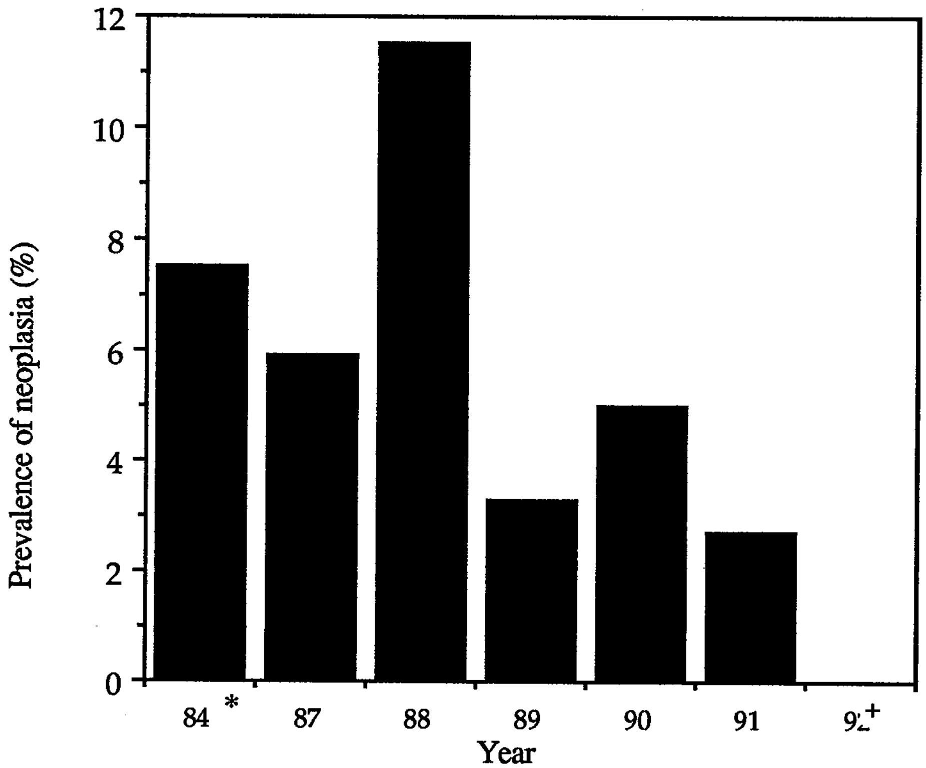
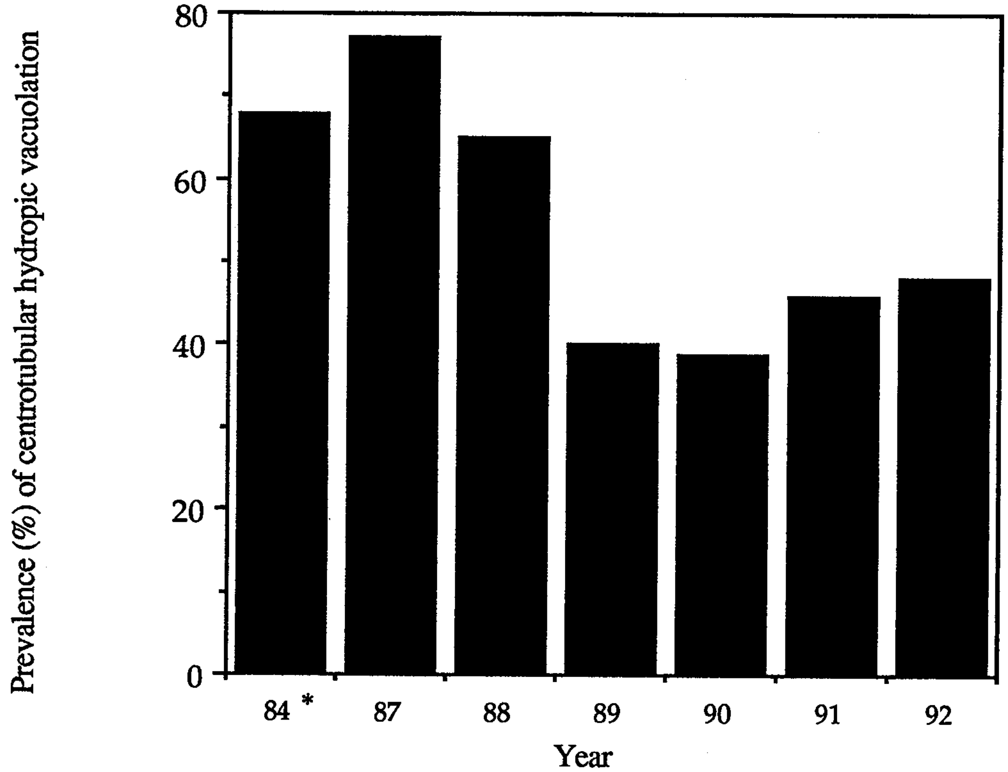


Figure 7 - Prevalence of liver neoplasia in winter flounder from Deer Island Flats, Boston Harbor, 1984 to 1992



*1984 data from Murchelano and Wolke (1984)
+1992 sample average age was significantly lower than 89-91

Figure 8 - Prevalence of centrotubular hydropic vacuolation in winter flounder liver from Deer Island Flats, Boston Harbor, 1984 to 1992



*1984 data from Murchelano and Wolke (1985)

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