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Catches Of Under 55 cm Yellowfin Tuna In The Eastern Tropical Atlantic Ocean, 1975 to 1977

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CATCHES OF UNDER 55 CM YELLOWFIN TUNA IN THE EASTERN TROPICAL ATLANTIC OCEAN, 1975 TO 1977.

by

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DATA AND PROCEDURES

Available sample catch data and sample length-frequency data by month, area, species and gear are listed in Table 1 for bait-boats and purse seiners fishing the Atlantic Ocean in 1975 to 1977 (data refered to as sample catch or sample length-frequency mean that the data are from only a portion of the country's total catch by species and gear. FIS catch data in Table 1 are assumed to represent total country catch by species and gear). Data were selected from Table 1 according to the criteria outlined in Coan et al. (1979). The selected data series were expanded to the total catch by species and gear of each country and then expanded a second time to the total Atlantic catch of all countries fishing in the Atlantic Ocean. These expanded data series were then used to calculate the percent by species and gear of the total Atlantic catch in each one-degree and 5x10-degree area and month. The percent by gear of the total eastern tropical Atlantic under 55 cm yellowfin catch in each 5x10-degree area and month was also calculated. The following procedures were used,

Catch Data

1) Sample country catches by month, one-degree area, species and gear were expanded to the total country catch by month, one degree area, species and gear with the equation,

$$TCC_{i,j,k,l} = \frac{UC_{i,j,k,l}}{UC_{*,*,k,l}} * TCL_{k,l}$$

where TCC = total country catch
TCL = total country landing
UC = unexpanded country catch, Table 1
i = month
j = one-degree area
k = species (yellowfin, skipjack, bigeye)
and l = gear

2) Total country catches (TCC) by month, area, species and gear were summed over countries to obtain total catches (C′) by month, area, species and gear for all countries with data selected from Table 1.

3) The total catches (C′) by month, area, species and gear were expanded to the total catches (C) by species and gear of all countries fishing in the Atlantic Ocean with the equation,

$$\hat{C}_{i,j,k,l} = \frac{C'_{i,j,k,l}}{C'_{*,*,k,l}} * C_{k,l}$$

where, $\hat{C}$ = estimated catch

4) The percent (P) of the total Atlantic catch by month, area, species, and gear were calculated as,

$$P_{i,j,k,l} = \frac{C_{i,j,k,l}}{C_{*,*,k,l}} * 100$$

Plots by one-degree square and month for the eastern Tropical Atlantic are shown in Appendix I-II.

5) Procedures 1-4 where repeated to find total Atlantic catches and percents by 5x10-degree areas. Results are shown in Tables 2-3.

Yellowfin Length-frequency Data

1) FIS sample length-frequency data were converted from predorsal lengths to fork lengths with the logarithmic equation of Foinsard (1969),

$$\text{Log } l_f = 0.25204 + 1.18869 \text{ Log } l_p$$

where, l_f = fork length (cm)
l_p = predorsal length (cm)

2) Sample length-frequencies (numbers at each length interval) were used to calculate sample weight at each length interval (SWLI) with the length-weight relation of Lenarz (1974),

$$W = .000021804\ l_f^{2.96989}$$

where, W = weight (kg)

3) One-degree area and month SWLI were combined to 5x10-degree areas and month for each country and gear.

4) Each country SWLI by month, 5x10-degree area, and gear was expanded to the total country catch in that month, 5x10-degree area and gear with the equation,

$$CWLI_{i,j,l,m} = \frac{SWLI_{i,j,l,m}}{SWLI_{i,j,l,\bullet}} * TCC_{i,j,k,l}$$

where, CWLI = country total catch in weight at each length
i = month
j = 5x10-degree area
l = gear
and, m = interval average length (cm)

5) CWLI by month, 5x10-degree area, and gear were summed over countries to calculate weight at each length interval (WLI) by month, 5x10-degree area and gear for all countries.

6) WLI by month, 5x10-degree area and gear were used to calculate the percent of the monthly, 5x10-degree yellowfin catch by gear under 55 cm. The following equations were used,

$$WL55_{i,j,l} = \sum_{m=1}^{55} WLI_{i,j,l,m}$$

where, WL55 = weight less than 55 cm

$$PL55_{i,j,l} = \frac{WL55_{i,j,l}}{WLI_{i,j,l,\bullet}} * 100$$

where, PL55 = percent under 55 cm

7) Percent of the annual under 55 cm catch (PAL55) for each month, 5x10-degree area and gear was calculated as follows,

$$PAL55_{i,j,l} = \frac{WL55_{i,j,l}}{WL55_{\bullet,\bullet,l}} * 100$$

8) Results were presented in Tables 2-3.

REFERENCES

Coan, A. L., N. W. Bartoo and S. M. Moore. 1979. An evaluation of the adequacy of available length-frequency and catch-effort data for determining the effectiveness of alternate management actions designed to raise the yield-per-recruit of yellowfin tuna in the eastern tropical Atlantic. Inter. Comm. for the Conserv. of Atlantic Tunas, Madrid, Spain. SCRS/79/85. 7p.

Lenarz, W. H. 1974. Length-weight relations for five eastern tropical Atlantic scombrids. Fish Bull., U.S. 71: 175-187.

Poinsard, F. 1969. Relations entre longuer predorsale, longuer a la fourche et poids des albacares Thunnus albacares (bonnaterre) peches dans le sud du golfe de Guinee. Cah. ORSTOM, Ser. Oceanogr. 7(2): 89-94.

Table 1. Available length-frequency and catch and effort data, 'x', and data used in the analysis, '■', for yellowfin tuna from the eastern Atlantic surface fishery, 1975 to 1977.

Country	Gear	Area strata	Time strata	Available Data 1975	1976	1977
Length-Frequency:						
Angola	BB	ICCAT	Month			x
Japan	PS	5x5	Month	x		
	BB	5x5	Month	x		
		ICCAT	Month	x	x	x
Korea/Panama	BB	ICCAT	Month	x	x	x
Ghana-based	BB	1x1	Month	■	■	■
FIS	PS	5x10	Month	■	■	■
	BB	5x10	Month	■	■	■
S. Africa	PS	ICCAT	Month			x
Spain	PS	1x1	Month	■	■	■
	BB	5x5	Quarter	x		
USA	PS	1x1	Month	■	■	■
Catch and Effort:						
FIS	PS	1x1	Month	■	■	■
	BB	1x1	Month	■	■	■
Ghana	PS	1x1	Month		x	x
	BB	1x1	Month		x	
Japan	PS	1x1	Month	x		
	BB	1x1	Month	■	■	■
Korea	BB	5x5	Month		x	x
Portugal	Surf	5x5	Month	x	x	
S. Africa	PS	1x1	Month	x		x
	BB	1x1	Month	x		
Spain	PS	1x1	Month	■	■	■
	BB	5x5	Month	x		x
USA	PS	1x1	Month	■	■	■

Table 2: Percent of annual catches and annual catches of undersize yellowfin tuna, total yellowfin tuna, skipjack tuna and bigeye tuna and percent of undersize yellowfin tuna in the square catch by 5x10-degree square and month for baitboats fishing in the eastern tropical Atlantic, 1975-1977.

YEAR= 1975 GEAR= BAITBOAT

MONTH	5*10-DEGREE SQUARE Q LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	% OF SQUARE YELLOWFIN CATCH UNDERSIZE
FEBRUARY	4 0	0	3.3	2.8	6.7	1.7	5.	215.	1216.	253.	2.56
APRIL	4 5	10	0.1	0.5	0.1	0.0	0.	34.	12.	0.	0.25
JUNE	4 10	10	12.9	9.9	4.0	3.9	22.	744.	723.	564.	2.93
JUNE	4 15	10	66.8	4.1	1.1	3.3	113.	312.	551.	476.	36.13
JUNE	4 15	20	1.5	0.2	0.1	0.1	3.	13.	18.	10.	20.75
JULY	4 15	10	6.1	5.9	7.1	9.9	10.	441.	1280.	1429.	2.32
JULY	4 20	10	0.5	0.6	0.8	1.7	1.	45.	142.	243.	1.85
SEPTEMBER	4 20	10	0.1	0.0	0.0	0.1	0.	2.	0.	19.	4.99
DECEMBER	4 0	0	8.9	1.3	2.8	9.2	15.	101.	514.	1324.	14.93

YEAR= 1976 GEAR= BAITBOAT

MONTH	5*10-DEGREE SQUARE Q LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	% OF SQUARE YELLOWFIN CATCH UNDERSIZE
JANUARY	1 0	0	0.1	0.6	2.5	3.0	0.	52.	750.	380.	0.45
JANUARY	4 0	0	0.1	0.5	1.9	1.3	0.	49.	577.	160.	0.23
JANUARY	4 10	20	0.6	0.0	0.0	0.5	1.	2.	9.	69.	66.27
FEBRUARY	4 0	0	1.3	0.5	2.5	1.8	2.	45.	751.	223.	5.17
MARCH	4 0	0	7.2	1.1	3.2	4.8	13.	102.	957.	608.	12.77
APRIL	4 5	10	2.1	0.6	0.0	0.0	4.	54.	2.	0.	6.92
APRIL	4 10	10	3.3	2.1	0.2	0.0	6.	192.	75.	0.	3.06
MAY	4 10	10	37.2	15.1	0.6	0.0	67.	1361.	170.	0.	4.94
MAY	4 10	20	1.9	0.5	0.0	0.0	3.	45.	0.	0.	7.60
JUNE	4 10	10	6.2	6.1	2.3	0.0	11.	551.	678.	0.	2.04
JUNE	4 15	10	2.5	3.0	0.1	0.0	5.	267.	43.	0.	1.69
JULY	4 10	10	11.3	2.3	0.4	0.1	20.	204.	118.	19.	9.98
JULY	4 15	10	13.9	12.6	2.1	4.7	25.	1133.	623.	598.	2.22
AUGUST	4 15	10	6.7	9.0	0.9	11.3	12.	808.	271.	1427.	1.49
OCTOBER	4 10	10	0.3	0.4	0.4	0.0	0.	38.	117.	3.	1.26
OCTOBER	4 15	20	1.3	2.2	1.3	0.1	2.	194.	381.	13.	1.23
NOVEMBER	4 15	10	0.0	0.2	1.0	0.0	0.	20.	292.	0.	0.27
NOVEMBER	4 15	20	0.2	0.7	0.6	0.0	0.	59.	170.	0.	0.45
DECEMBER	4 10	10	2.5	0.4	0.0	0.0	5.	38.	5.	0.	12.13
DECEMBER	4 10	20	1.2	0.2	0.0	0.0	2.	18.	14.	0.	12.26
DECEMBER	4 15	20	0.2	0.5	0.4	0.0	0.	48.	118.	0.	0.60

Table 2: Continued.

YEAR= 1977 GEAR= BAITBOAT

MONTH	5*10-DEGREE SQUARE Q	LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	% OF SQUARE YELLOWFIN CATCH UNDERSIZE
JANUARY	1	0	0	0.6	0.1	4.9	2.0	12.	12.	2110.	214.	100.00
JANUARY	4	0	0	1.2	0.7	4.1	2.7	22.	81.	1762.	293.	26.89
FEBRUARY	1	0	0	0.3	0.1	1.0	0.3	5.	7.	435.	30.	71.66
FEBRUARY	4	0	0	3.4	0.7	5.0	1.3	65.	77.	2140.	133.	84.85
FEBRUARY	4	5	0	0.4	0.1	0.1	0.0	7.	8.	25.	0.	94.81
MARCH	1	0	0	1.4	0.2	0.4	0.2	26.	26.	189.	21.	98.66
MARCH	4	0	0	3.7	1.5	1.5	0.4	70.	166.	640.	41.	42.27
MARCH	4	5	10	0.1	0.4	0.0	0.0	2.	39.	2.	0.	6.34
MARCH	4	10	10	0.0	0.1	0.0	0.0	0.	9.	0.	0.	0.25
APRIL	4	0	0	2.4	0.6	1.9	0.8	45.	62.	821.	84.	73.15
APRIL	4	5	0	0.4	0.1	0.2	0.0	8.	13.	74.	2.	57.17
APRIL	4	10	10	1.1	5.6	0.7	4.7	20.	610.	294.	496.	3.35
MAY	1	5	0	0.1	0.0	0.2	0.0	1.	2.	73.	0.	71.66
MAY	4	0	0	0.3	0.1	0.9	0.0	6.	10.	370.	2.	65.82
MAY	4	10	10	1.5	9.5	2.4	2.6	29.	1044.	1051.	280.	2.80
MAY	4	15	10	0.2	1.7	0.6	3.4	4.	190.	250.	363.	2.16
JUNE	1	0	0	2.2	0.5	1.1	0.3	42.	51.	1337.	32.	82.32
JUNE	1	5	0	0.2	0.0	0.3	0.0	4.	5.	112.	1.	95.11
JUNE	2	0	0	0.2	0.0	0.1	0.0	3.	5.	34.	0.	56.97
JUNE	4	5	0	0.2	0.0	0.1	0.0	3.	4.	49.	0.	83.56
JUNE	4	10	10	1.3	2.4	2.0	0.6	26.	258.	878.	62.	9.94
JUNE	4	15	10	1.6	8.9	1.3	2.4	31.	981.	577.	260.	3.13
JULY	1	0	0	6.7	2.9	5.2	1.0	129.	315.	2226.	110.	40.93
JULY	4	10	10	0.7	0.4	0.3	0.0	14.	39.	127.	0.	35.06
JULY	4	15	10	2.0	10.7	1.0	20.5	38.	1171.	417.	2179.	3.26
JULY	4	15	20	0.3	0.9	0.0	0.2	5.	98.	9.	24.	5.43
AUGUST	1	0	0	13.2	2.8	6.2	1.3	253.	308.	2641.	135.	81.85
AUGUST	2	0	0	10.8	2.4	1.4	0.4	207.	268.	582.	43.	77.12
AUGUST	4	15	10	2.0	11.1	1.1	27.1	38.	1221.	485.	2887.	3.13
SEPTEMBER	1	0	0	3.6	1.6	5.4	2.4	68.	179.	2301.	254.	38.34
SEPTEMBER	2	0	0	2.7	1.7	1.9	1.0	51.	183.	829.	110.	27.88
SEPTEMBER	4	10	10	0.0	0.2	0.4	0.1	0.	17.	178.	6.	0.32
SEPTEMBER	4	15	10	0.2	2.9	2.0	6.0	4.	314.	876.	635.	1.13
OCTOBER	1	0	0	2.4	0.6	2.9	2.7	46.	67.	1253.	290.	67.85
OCTOBER	4	0	0	24.0	9.4	6.5	1.7	457.	1036.	2787.	184.	44.17
OCTOBER	4	15	10	0.0	0.4	0.8	0.2	0.	41.	355.	24.	0.41
OCTOBER	4	15	20	0.1	0.5	0.1	0.0	1.	56.	42.	0.	1.69
NOVEMBER	1	0	0	0.2	0.2	1.9	1.4	3.	22.	797.	144.	12.45
NOVEMBER	4	0	0	8.4	2.3	3.1	1.1	160.	254.	1345.	112.	63.02
NOVEMBER	4	15	10	0.0	0.1	0.1	0.0	0.	8.	24.	0.	1.75
DECEMBER	4	0	0	0.1	0.1	1.8	1.0	2.	12.	764.	108.	14.92

Table 3: Percent of annual catches and annual catches of undersize yellowfin tuna, to al yellowfin tuna, skipjack tuna, and bigeye tuna and percent of undersize yellowfin tuna in the square catch by 5x10-degree square and month for purse seiners fishing in the eastern tropical Atlantic, 1975-1977.

YEAR= 1975 GEAR= PURSE SEINE

MONTH	5*10-DEGREE SQUARE Q	LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	% OF SQUARE YELLOWFIN CATC UNDERSIZE
JANUARY	2	0	0	7.2	13.7	1.5	0.0	28.	11378.	580.	0.	0.25
JANUARY	4	0	0	14.6	0.1	0.0	0.0	58.	82.	6.	0.	70.19
JANUARY	4	5	10	0.2	0.1	0.0	0.0	1.	65.	14.	0.	0.95
FEBRUARY	2	0	0	0.6	3.5	2.0	0.0	2.	2941.	771.	0.	0.08
FEBRUARY	4	5	10	0.1	0.0	0.0	0.0	0.	41.	0.	0.	0.75
MARCH	1	0	0	1.3	0.1	0.3	0.0	5.	99.	103.	0.	5.20
MARCH	2	0	0	0.2	0.2	0.0	0.0	1.	182.	9.	0.	0.32
APRIL	3	0	0	0.3	2.0	0.1	0.0	1.	1676.	32.	0.	0.06
APRIL	4	5	10	2.1	3.1	1.0	0.0	8.	2574.	397.	0.	0.32
APRIL	4	10	10	9.4	0.1	0.0	0.0	37.	65.	6.	0.	57.09
MAY	4	5	10	0.4	1.3	0.3	0.0	2.	1067.	118.	0.	0.14
MAY	4	10	10	5.8	2.2	2.5	0.0	23.	1806.	968.	0.	1.23
JUNE	1	0	0	11.5	0.5	1.3	0.0	46.	408.	517.	0.	11.21
JUNE	2	0	0	3.7	0.5	2.8	1.9	15.	376.	1108.	18.	3.87
JUNE	4	10	10	0.2	0.9	3.1	2.8	1.	762.	1194.	27.	0.10
JULY	1	0	0	5.1	2.1	1.9	9.3	20.	1727.	747.	90.	1.18
JULY	2	0	0	5.3	2.2	2.2	12.2	21.	1805.	871.	118.	1.16
AUGUST	1	0	0	1.0	2.3	1.4	4.8	4.	1928.	539.	46.	0.21
AUGUST	2	0	0	0.7	0.5	0.8	0.0	3.	406.	296.	0.	0.70
AUGUST	4	0	0	1.9	2.1	1.2	7.9	8.	1708.	483.	76.	0.45
SEPTEMBER	1	0	0	0.2	0.1	0.4	0.3	1.	107.	167.	3.	0.69
SEPTEMBER	2	0	0	6.4	2.9	2.4	2.2	25.	2387.	954.	21.	1.06
OCTOBER	4	5	10	0.6	0.5	0.4	0.0	2.	417.	167.	0.	0.52
NOVEMBER	2	0	0	16.9	5.8	1.4	1.5	67.	4779.	529.	14.	1.40
NOVEMBER	4	0	10	0.1	0.0	0.1	0.0	0.	21.	47.	0.	1.20
NOVEMBER	4	5	10	0.4	0.6	1.3	0.7	2.	468.	501.	7.	0.33
DECEMBER	1	0	0	0.1	0.0	0.0	0.0	0.	22.	0.	0.	0.83
DECEMBER	2	0	0	1.6	6.4	0.8	0.0	6.	5286.	308.	0.	0.12
DECEMBER	4	0	0	2.4	0.6	1.5	0.0	10.	532.	581.	0.	1.80
DECEMBER	4	5	10	0.0	0.0	1.0	0.0	0.	1.	2.	0.	5.38

Table 3: Continued.

YEAR= 1976 GEAR= PURSE SEINE

MONTH	5*10-DEGREE SQUARE Q	LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	% OF ANNUAL CATCH(MT) YELLOWFIN	% OF ANNUAL CATCH(MT) SKIPJACK	% OF ANNUAL CATCH(MT) BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	ANNUAL CATCH(MT) YELLOWFIN	ANNUAL CATCH(MT) SKIPJACK	ANNUAL CATCH(MT) BIGEYE	% OF SQUARE YELLOWFIN CATCH UNDERSIZE
JANUARY	1	0	0	0.9	0.8	0.8	0.0	6.	702.	300.	0.	0.80
JANUARY	2	0	0	1.8	6.5	0.9	1.5	11.	5772.	345.	13.	0.19
JANUARY	4	0	0	0.8	1.3	1.6	0.0	5.	1190.	606.	0.	0.41
FEBRUARY	2	0	0	0.1	3.3	0.6	2.6	1.	2869.	242.	22.	0.03
FEBRUARY	4	0	0	40.3	1.4	0.1	0.0	246.	1241.	49.	0.	19.82
MARCH	2	0	0	0.0	0.0	0.0	0.0	0.	16.	0.	0.	0.08
MARCH	4	0	0	1.2	6.1	0.4	3.8	8.	5351.	169.	32.	0.14
APRIL	4	5	10	2.0	3.7	0.2	1.1	12.	3230.	90.	9.	0.38
MAY	4	0	10	0.6	0.0	0.0	0.0	3.	5.	0.	0.	67.65
MAY	4	5	10	5.2	3.0	0.3	0.0	32.	2627.	120.	0.	1.21
JUNE	4	5	20	0.6	6.1	1.2	6.3	4.	5357.	458.	53.	0.07
JULY	2	0	0	2.3	1.6	4.5	20.5	14.	1395.	1702.	173.	1.01
JULY	2	5	10	2.4	0.7	1.6	0.4	15.	645.	610.	3.	2.25
JULY	4	0	0	0.0	0.0	0.0	0.0	0.	5.	5.	0.	0.56
JULY	4	10	20	2.9	10.7	0.6	0.0	18.	9398.	241.	0.	0.19
JULY	4	15	10	0.0	0.2	0.4	2.5	0.	214.	145.	21.	0.07
AUGUST	1	0	0	2.6	3.0	3.0	0.0	16.	2647.	1151.	0.	0.59
AUGUST	2	0	0	9.2	2.8	3.6	0.0	56.	2442.	1370.	0.	2.30
AUGUST	2	5	10	0.0	0.0	0.0	0.0	0.	2.	1.	0.	12.62
AUGUST	4	10	10	0.4	2.6	10.3	0.0	2.	2292.	3917.	0.	0.10
AUGUST	4	10	20	0.2	0.0	0.0	0.0	1.	42.	0.	0.	2.83
AUGUST	4	15	10	1.0	2.5	3.8	4.9	6.	2223.	1432.	41.	0.27
SEPTEMBER	1	0	0	2.2	1.8	3.3	0.7	13.	1627.	1233.	6.	0.83
SEPTEMBER	2	0	0	6.1	1.1	3.4	0.0	37.	975.	1282.	0.	3.84
SEPTEMBER	4	10	10	1.6	3.8	16.3	0.0	10.	3320.	6177.	0.	0.30
SEPTEMBER	4	15	10	0.2	2.0	1.3	1.3	1.	1741.	483.	11.	0.08
OCTOBER	1	0	0	1.8	0.8	1.9	1.5	11.	702.	708.	13.	1.57
OCTOBER	2	0	0	2.4	4.2	4.6	7.2	14.	3672.	1753.	61.	0.39
OCTOBER	2	5	10	0.8	0.0	0.1	3.3	5.	18.	22.	28.	26.56
OCTOBER	4	5	10	0.0	0.2	0.1	0.0	0.	218.	22.	0.	0.09
OCTOBER	4	10	10	0.4	0.6	9.7	0.0	3.	552.	3665.	0.	0.46
OCTOBER	4	15	10	0.1	0.8	2.4	0.0	0.	667.	908.	0.	0.05
NOVEMBER	1	0	0	1.9	0.7	0.8	0.0	11.	639.	313.	0.	1.79
NOVEMBER	2	0	0	5.7	2.8	2.5	0.5	35.	2483.	944.	4.	1.41
NOVEMBER	4	0	0	0.0	0.1	0.2	0.0	0.	110.	62.	0.	0.21
DECEMBER	1	0	0	0.0	0.6	0.0	0.0	0.	569.	18.	0.	0.04
DECEMBER	2	0	0	0.5	2.2	0.7	0.0	3.	1956.	267.	0.	0.15
DECEMBER	4	0	0	1.6	0.1	0.0	0.0	9.	81.	9.	0.	11.65

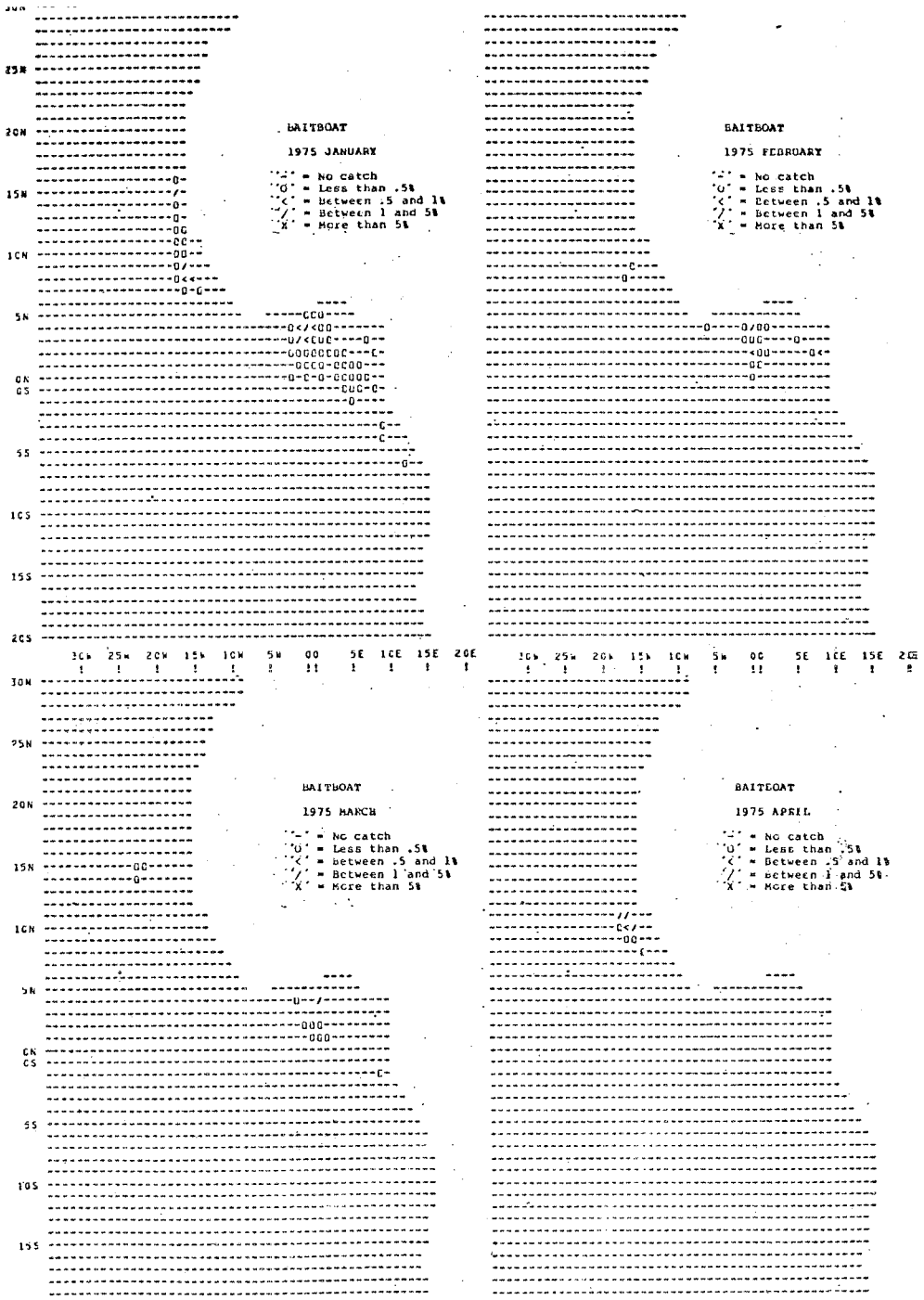
Table 3: Continued.

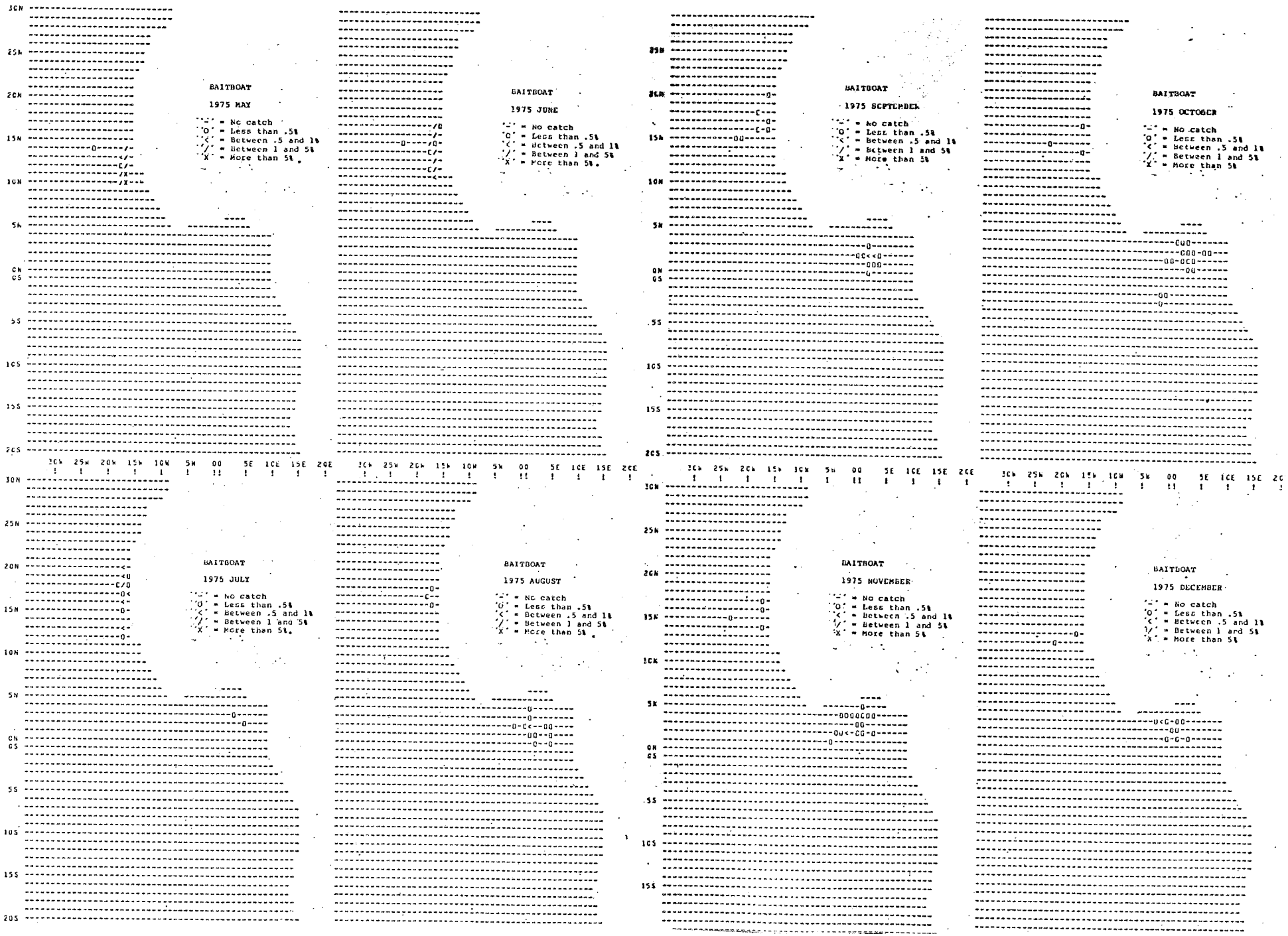
YEAR= 1977 GEAR= PURSE SEINE

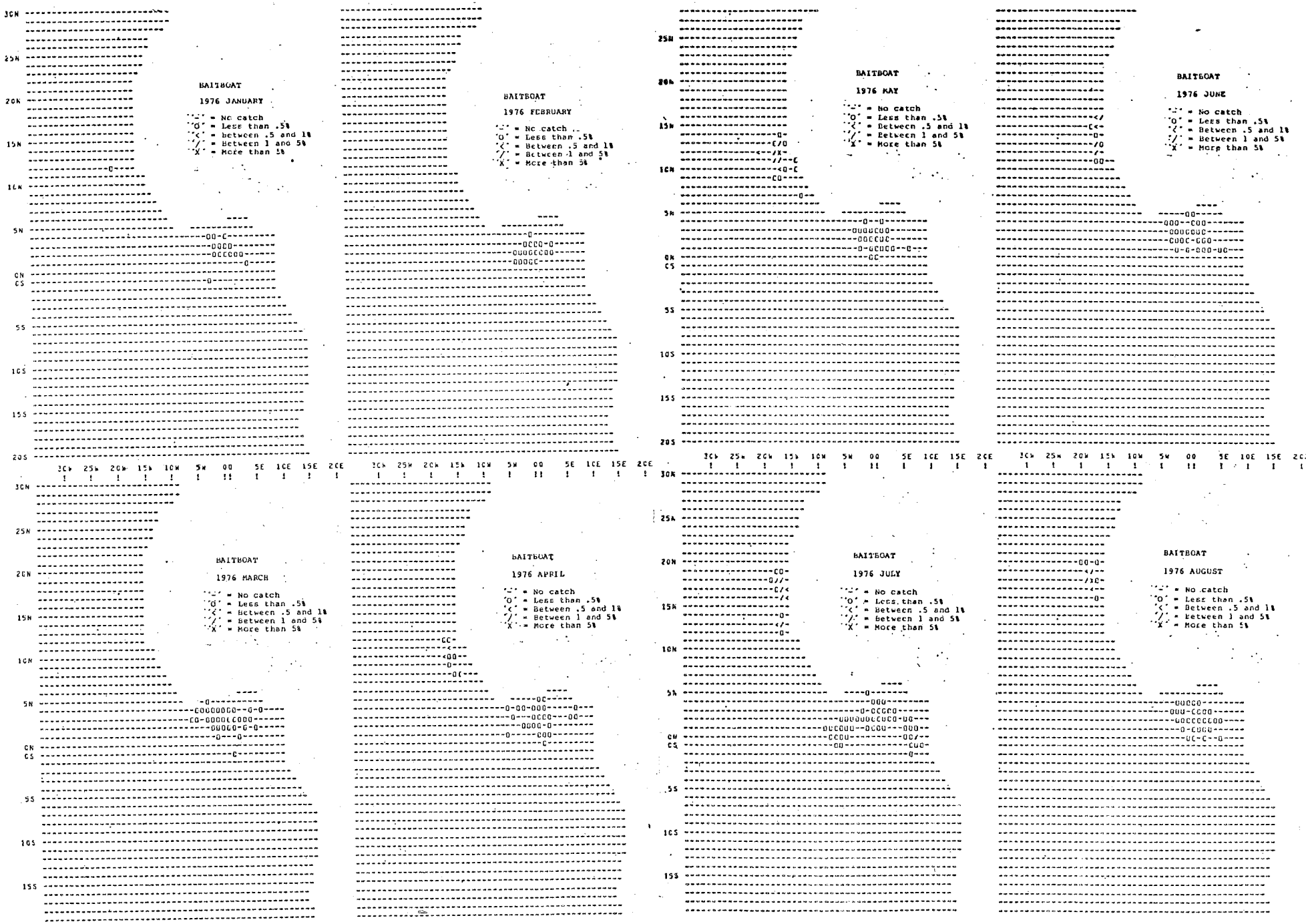
MONTH	5*10-DEGREE SQUARE Q	LAT	LON	% OF ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	ANNUAL CATCH(MT) UNDERSIZE YELLOWFIN	YELLOWFIN	SKIPJACK	BIGEYE	% OF SQUARE YELLOWFIN CATCH UNDERSIZE
JANUARY	1	0	0	0.5	0.7	C.8	1.0	3.	614.	535.	53.	0.55
JANUARY	2	0	0	0.3	0.9	C.1	0.0	2.	856.	41.	0.	C.20
JANUARY	2	5	0	0.3	1.0	C.1	0.0	2.	900.	57.	0.	C.22
JANUARY	4	0	0	0.9	0.7	C.2	0.0	6.	604.	128.	0.	0.96
FEBRUARY	1	0	0	0.6	0.5	C.6	0.1	4.	436.	421.	6.	0.93
FEBRUARY	2	5	0	0.0	0.1	C.C	0.0	C.	125.	0.	0.	C.03
FEBRUARY	3	0	0	0.8	2.0	C.2	0.9	5.	1813.	105.	48.	0.30
FEBRUARY	4	0	0	1.4	0.3	C.2	0.2	9.	268.	157.	12.	3.33
FEBRUARY	4	5	10	0.0	0.1	C.0	0.0	0.	69.	30.	0.	0.07
MARCH	1	0	0	0.0	0.0	C.C	0.0	C.	3.	14.	0.	6.73
MARCH	3	5	0	0.0	0.1	C.0	0.0	0.	60.	0.	0.	0.08
MARCH	4	0	0	0.5	0.1	C.0	0.1	3.	65.	13.	4.	5.27
MARCH	4	0	20	0.1	4.1	C.7	0.0	C.	3808.	500.	0.	0.01
MARCH	4	5	0	0.0	0.0	C.0	0.0	0.	1.	0.	0.	6.73
MARCH	4	5	10	4.0	4.7	C.1	0.0	26.	4319.	83.	0.	0.61
MARCH	4	10	10	0.0	0.9	C.0	0.0	C.	841.	0.	0.	C.01
APRIL	3	0	0	0.1	0.0	C.0	0.0	1.	7.	0.	0.	8.68
APRIL	4	0	0	4.1	0.0	C.1	0.0	27.	28.	64.	0.	95.91
APRIL	4	5	10	0.5	2.9	C.4	0.0	3.	2694.	274.	2.	0.11
APRIL	4	10	10	3.7	6.4	5.5	31.2	24.	5892.	3703.	1618.	0.41
MAY	4	5	10	2.6	3.2	1.3	0.0	17.	2979.	875.	2.	0.57
MAY	4	5	20	0.8	3.4	1.5	3.8	5.	3120.	1011.	198.	0.17
MAY	4	10	10	4.6	1.1	3.9	1.0	30.	1055.	2643.	50.	2.89
MAY	4	15	10	5.0	0.4	4.2	5.0	33.	344.	2783.	260.	9.69
JUNE	4	5	10	0.2	0.2	C.3	0.0	2.	154.	218.	0.	1.03
JUNE	4	5	20	2.0	0.8	C.5	0.3	13.	714.	351.	16.	1.83
JUNE	4	10	10	1.9	2.2	4.2	2.1	13.	2066.	2842.	107.	0.61
JUNE	4	10	20	0.1	0.0	C.0	0.0	1.	11.	0.	0.	7.79
JUNE	4	15	10	0.5	0.3	8.1	12.8	4.	316.	5432.	661.	1.11
JULY	1	0	0	7.2	3.5	2.9	2.5	48.	3261.	1915.	128.	1.46
JULY	2	0	0	9.6	2.8	5.5	3.7	64.	2588.	3661.	191.	2.46
JULY	4	0	0	0.9	2.2	C.8	0.3	6.	2077.	536.	16.	0.29
JULY	4	10	10	0.0	0.0	C.0	0.0	0.	2.	3.	0.	7.92
JULY	4	15	10	5.7	1.1	1.3	0.2	38.	1017.	886.	9.	3.70
AUGUST	1	0	0	1.3	0.4	1.9	0.3	9.	405.	1271.	16.	2.18
AUGUST	2	0	0	15.6	3.6	7.6	1.5	103.	3360.	5090.	80.	3.06
AUGUST	4	0	0	3.9	3.1	1.2	2.7	26.	2870.	806.	138.	C.90
AUGUST	4	10	10	0.1	0.7	1.7	0.0	1.	613.	1155.	0.	C.09
SEPTEMBER	1	0	0	1.0	1.1	1.4	2.7	7.	1026.	911.	139.	0.65
SEPTEMBER	2	0	0	2.6	1.3	3.4	1.1	17.	1192.	2308.	55.	1.46
SEPTEMBER	2	0	10	0.1	0.1	C.1	0.0	1.	50.	77.	0.	1.29
SEPTEMBER	2	5	0	0.8	0.1	C.1	0.0	5.	58.	83.	0.	8.70
SEPTEMBER	4	0	0	0.7	1.7	1.0	1.1	5.	1601.	652.	58.	0.29
SEPTEMBER	4	5	10	0.5	1.6	C.7	6.4	3.	1507.	451.	332.	0.22
SEPTEMBER	4	10	10	1.1	3.0	11.0	3.3	7.	2758.	7368.	169.	0.27
OCTOBER	1	0	0	0.4	0.3	C.5	0.1	2.	251.	343.	6.	0.96
OCTOBER	2	0	0	3.4	3.5	1.0	0.7	22.	3263.	684.	37.	0.69
OCTOBER	2	5	0	2.4	0.1	C.5	0.2	16.	87.	313.	11.	18.21
OCTOBER	3	0	0	1.3	0.0	C.0	0.0	9.	41.	4.	0.	20.93
OCTOBER	4	0	0	2.4	3.6	4.7	1.8	16.	3297.	3141.	91.	0.49
OCTOBER	4	10	10	0.4	0.7	4.5	1.2	2.	293.	3012.	62.	0.82
NOVEMBER	2	0	0	0.3	1.8	1.2	0.4	2.	1661.	828.	21.	0.11
NOVEMBER	3	0	0	0.8	0.1	C.0	0.0	0.	61.	0.	0.	0.47
NOVEMBER	4	0	0	0.2	0.6	0.6	0.0	2.	696.	288.	0.	0.24

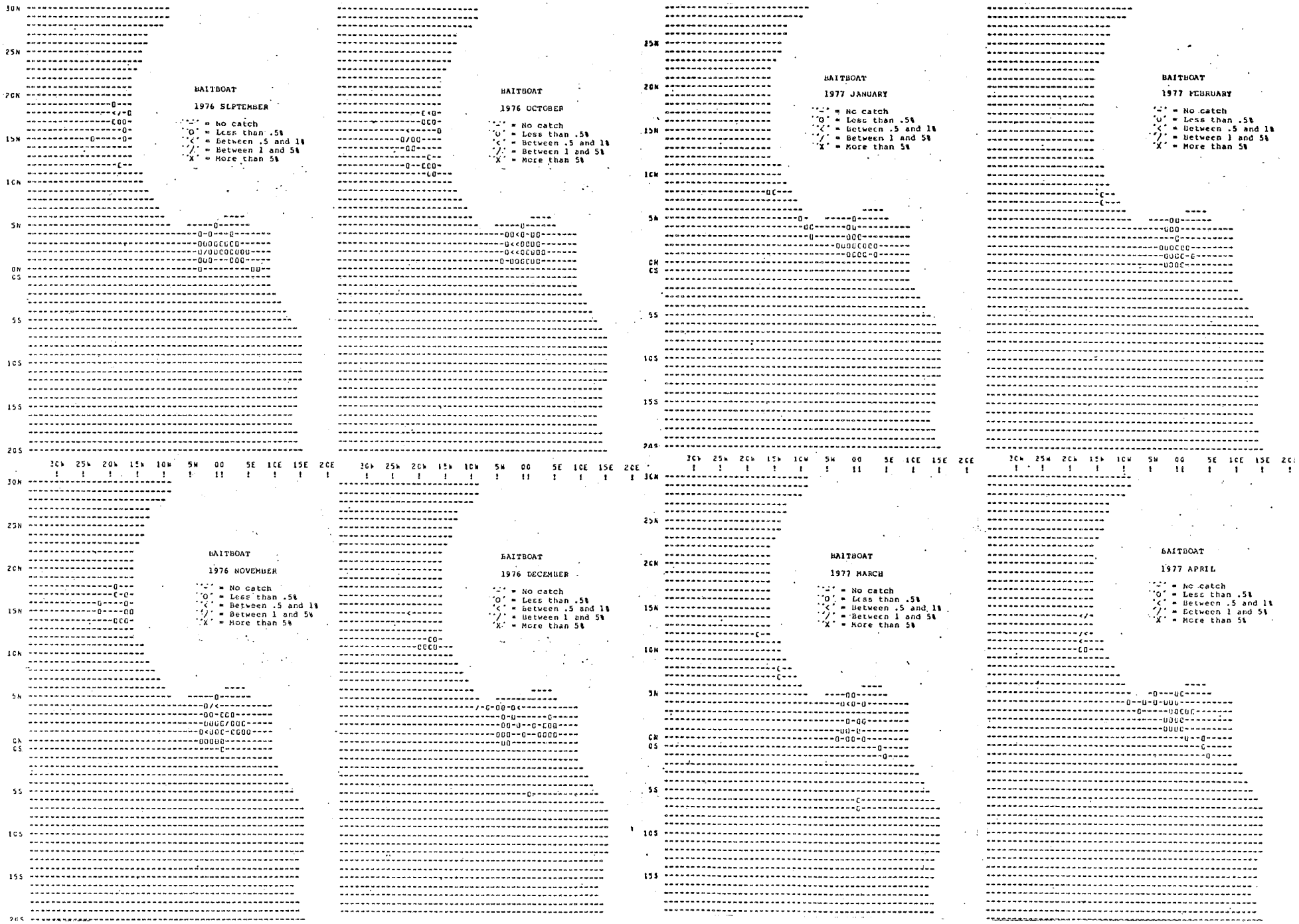
APPENDIX I

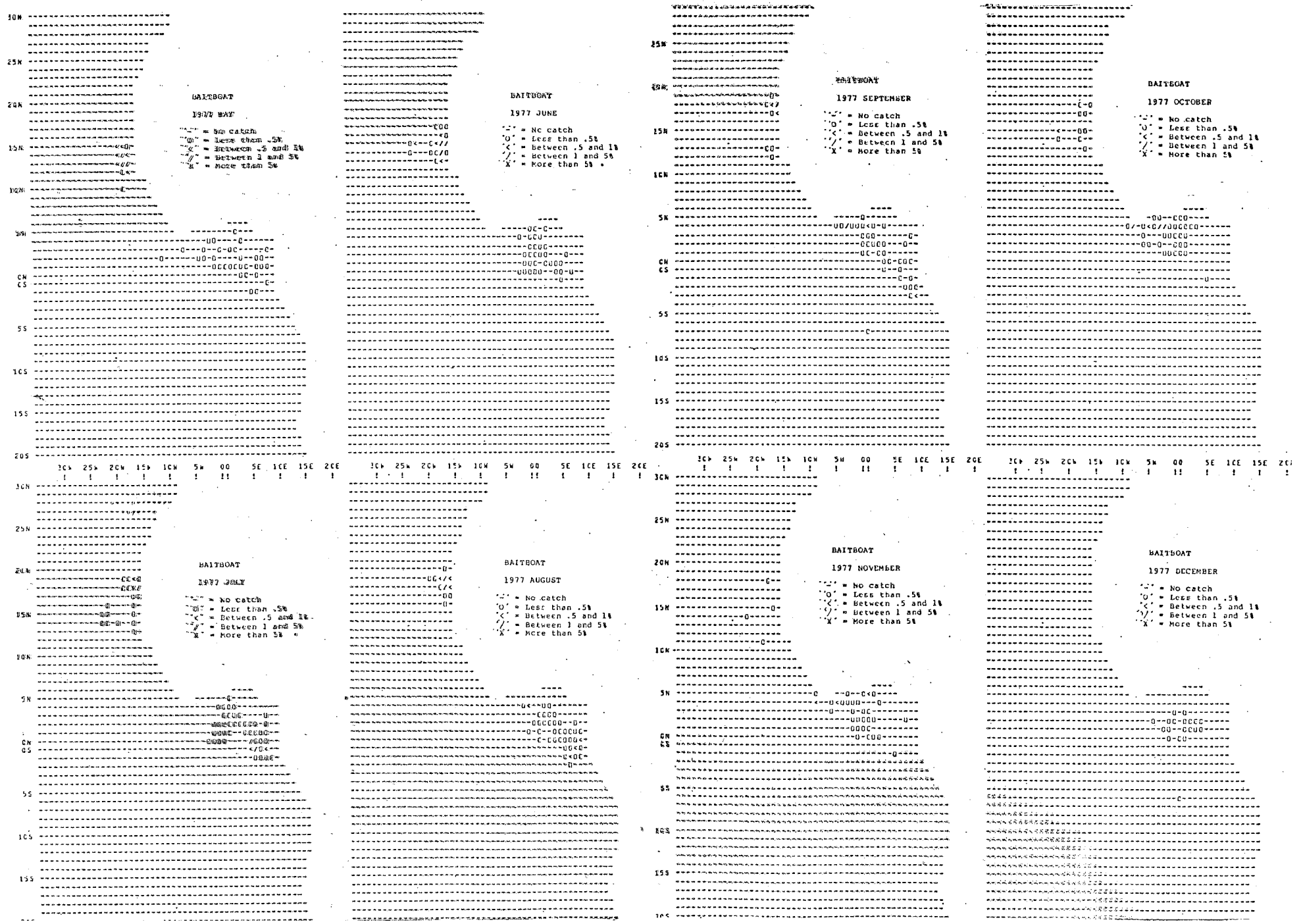
Percent of the annual yellowfin tuna catch by one-degree square and month taken by baitboats fishing in the eastern tropical Atlantic Ocean, 1975 to 1977.




BAITBOAT
1975 MAY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%.
BAITBOAT
1975 JUNE
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%.
BAITBOAT
1975 SEPTEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1975 OCTOBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1975 JULY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%.
BAITBOAT
1975 AUGUST
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%.
BAITBOAT
1975 NOVEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1975 DECEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

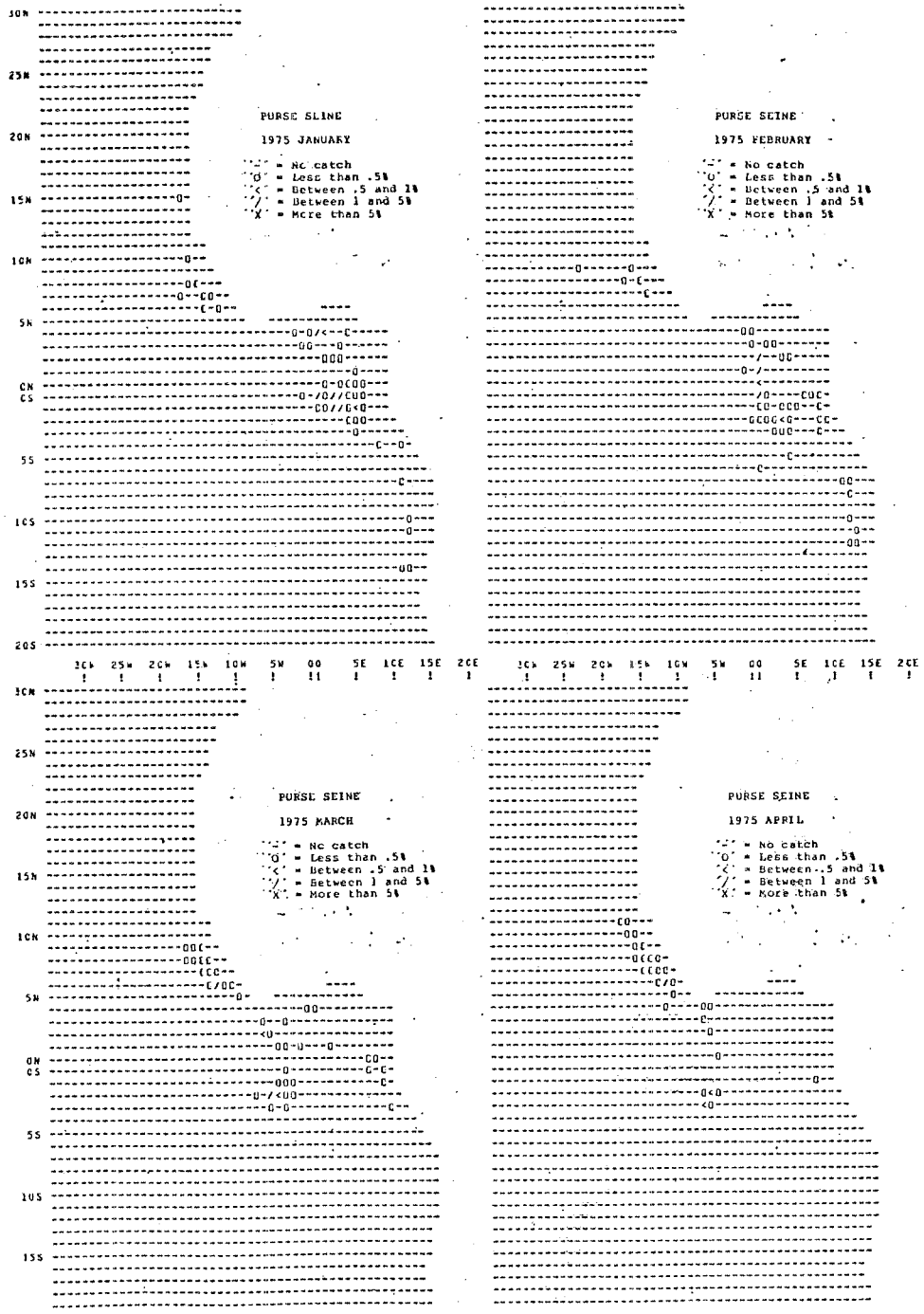

BAITBOAT
1976 JANUARY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 FEBRUARY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 MAY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 JUNE
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 MARCH
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 APRIL
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 JULY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 AUGUST
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

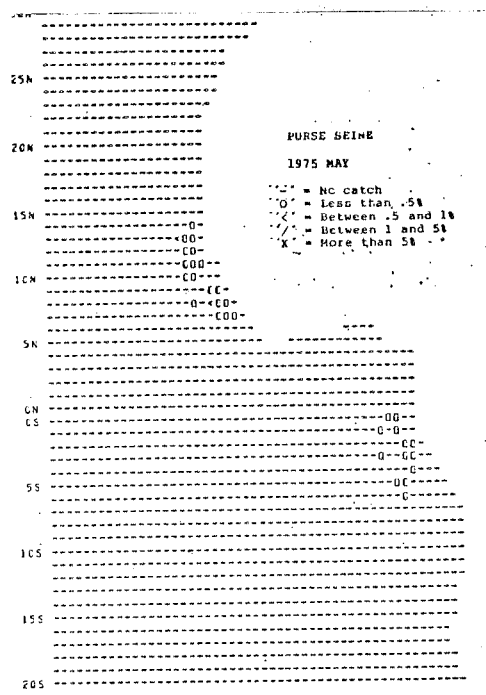

BAITBOAT
1976 SEPTEMBER
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 OCTOBER
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 JANUARY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 FEBRUARY
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 NOVEMBER
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1976 DECEMBER
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 MARCH
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 APRIL
' ' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

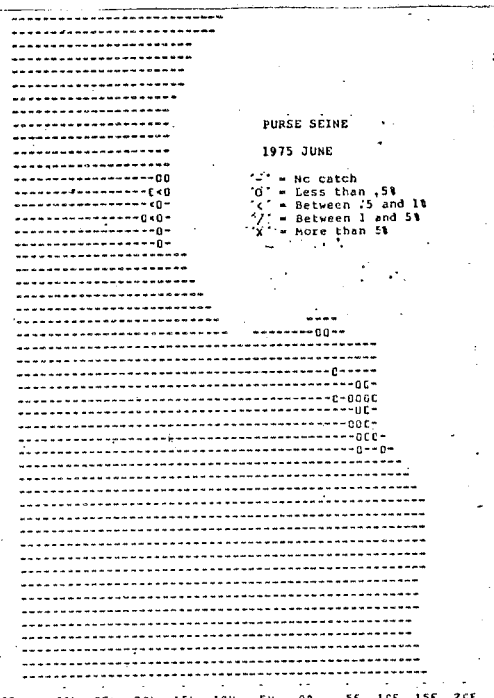

BAITBOAT
1977 MAY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 JUNE
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 SEPTEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 OCTOBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 JULY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 AUGUST
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 NOVEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
BAITBOAT
1977 DECEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30N 25N 20N 15N 10N 5N 00 5E 10E 15E 20E

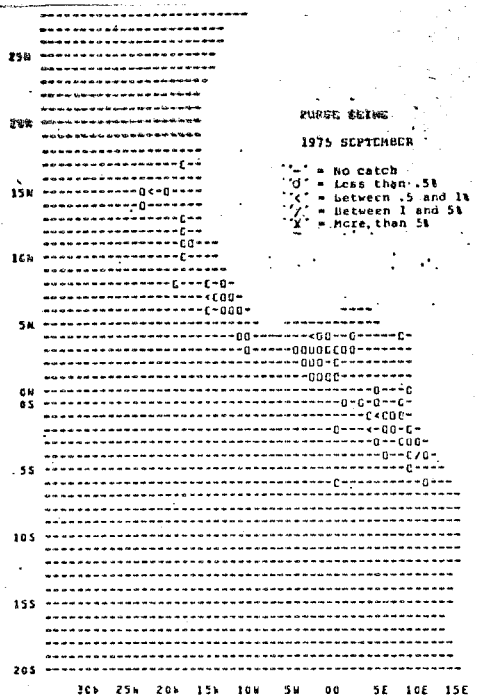
APPENDIX II

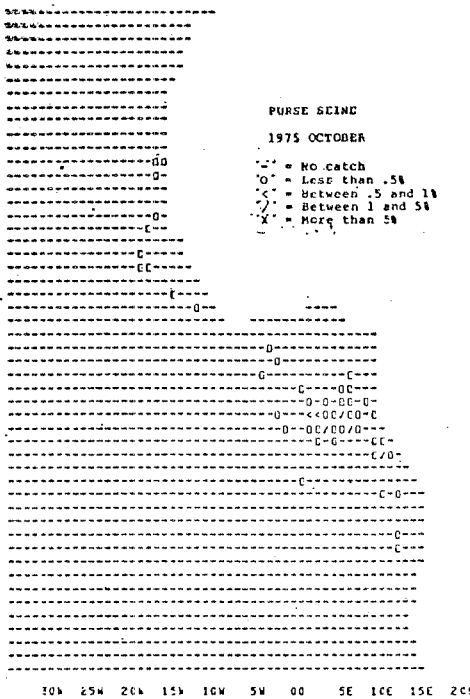
Percent of the annual yellowfin tuna catch by one-degree square and month taken by purse seiners fishing in the eastern tropical Atlantic Ocean, 1975 to 1977.

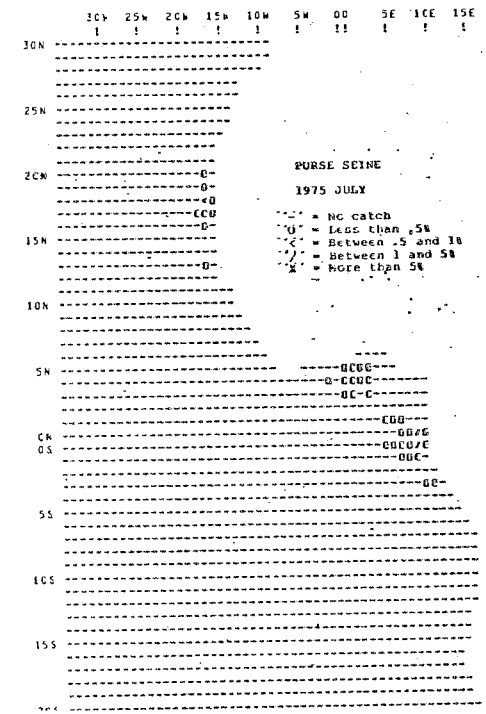


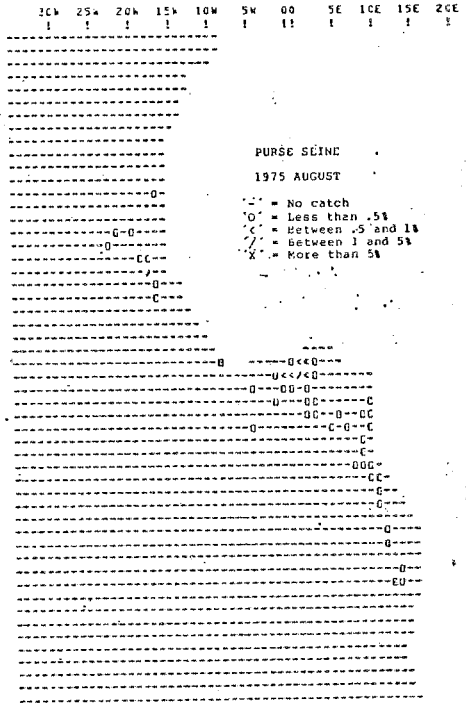

PURSE SEINE
1975 MAY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

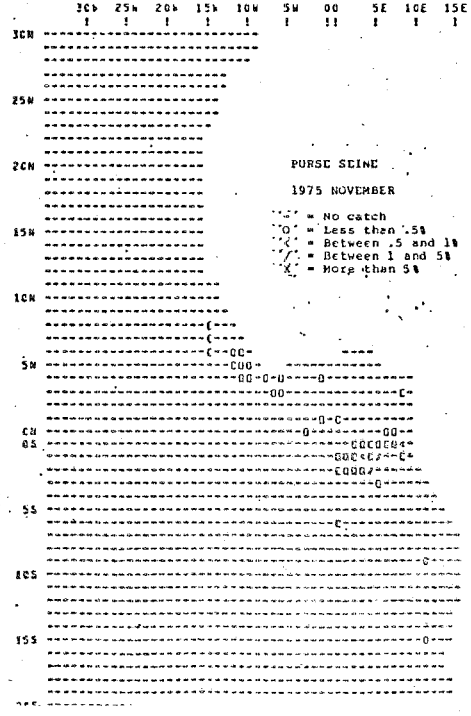

PURSE SEINE
1975 JUNE
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

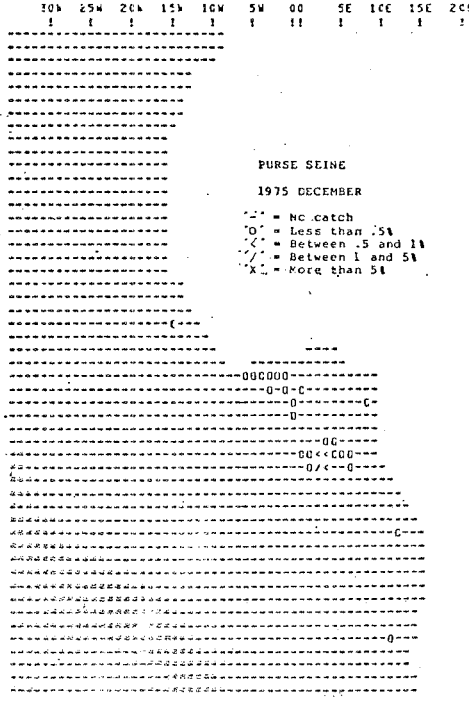

PURSE SEINE
1975 SEPTEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

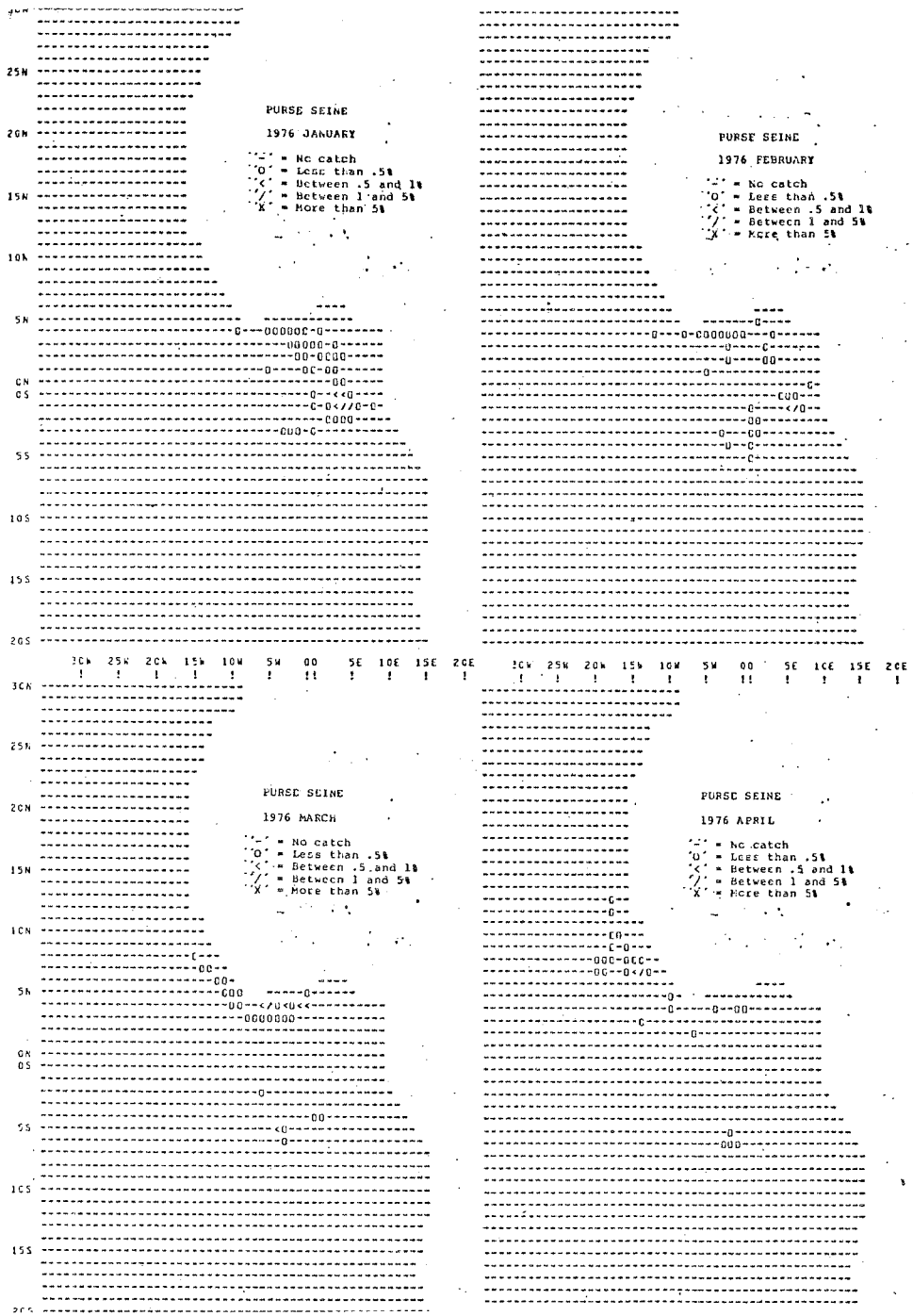

PURSE SEINE
1975 OCTOBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

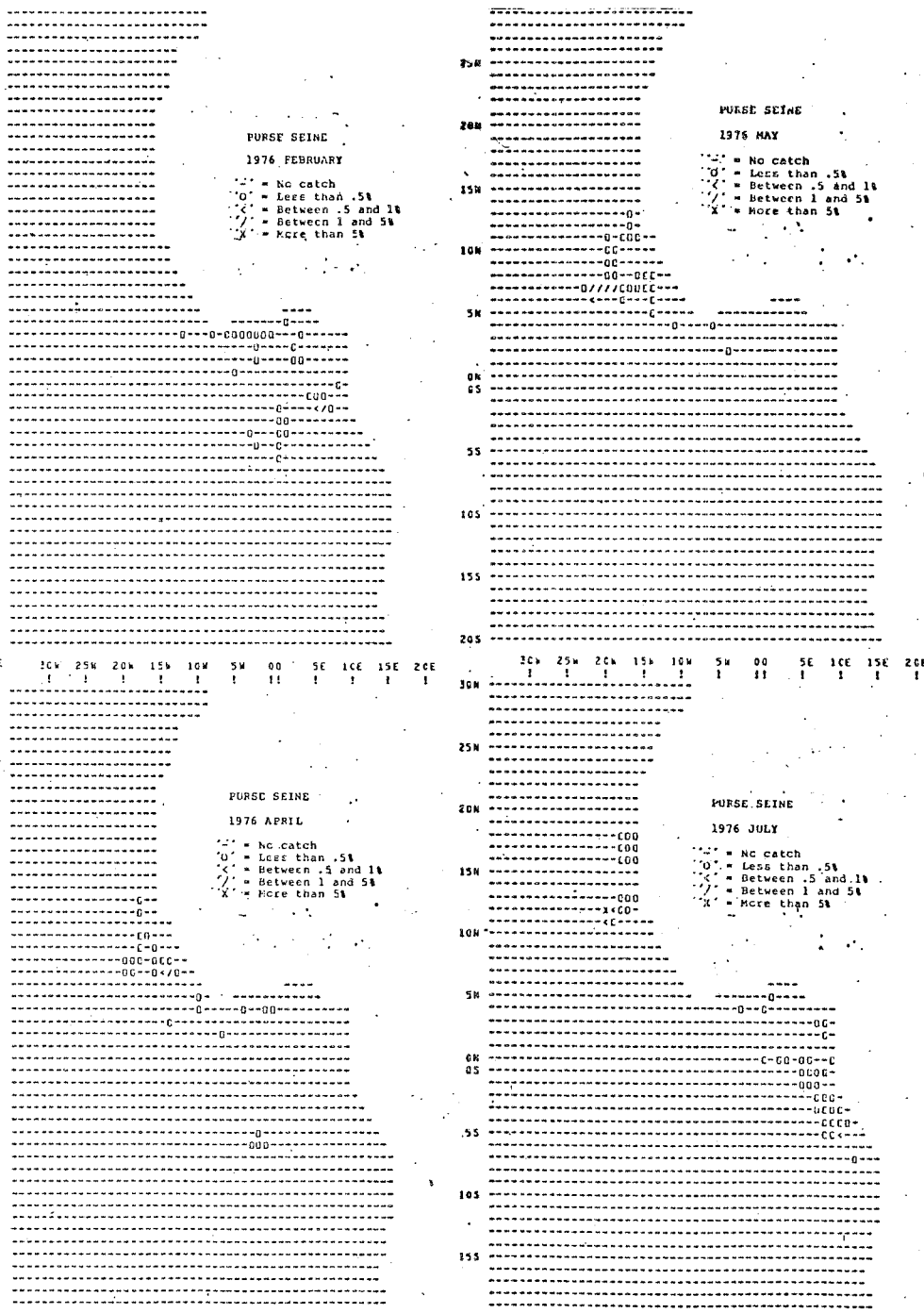

PURSE SEINE
1975 JULY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1975 AUGUST
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

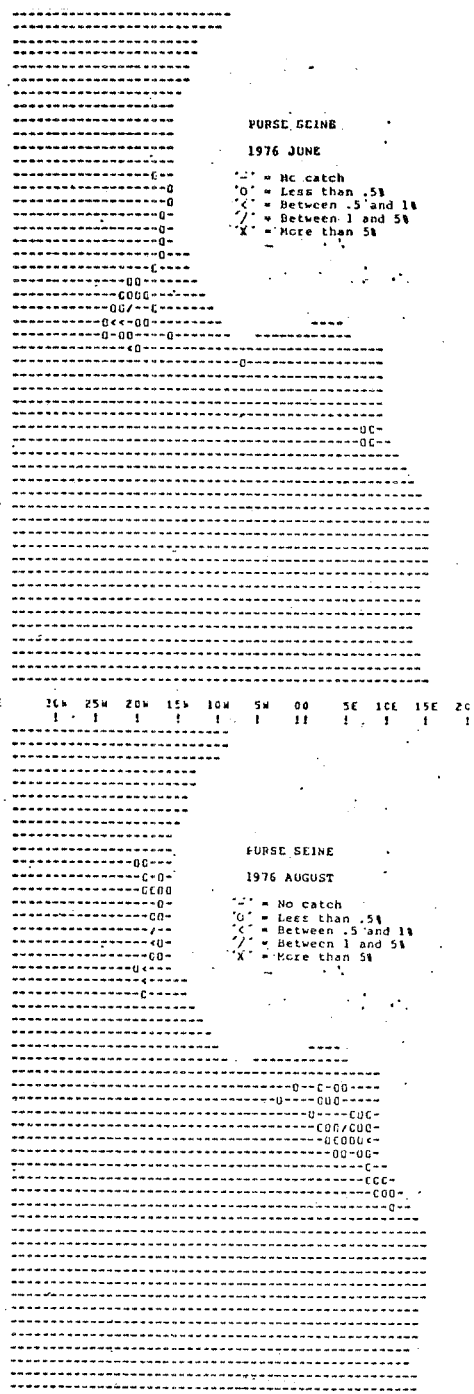

PURSE SEINE
1975 NOVEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1975 DECEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1976 JANUARY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E


PURSE SEINE
1976 FEBRUARY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

PURSE SEINE
1976 MAY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

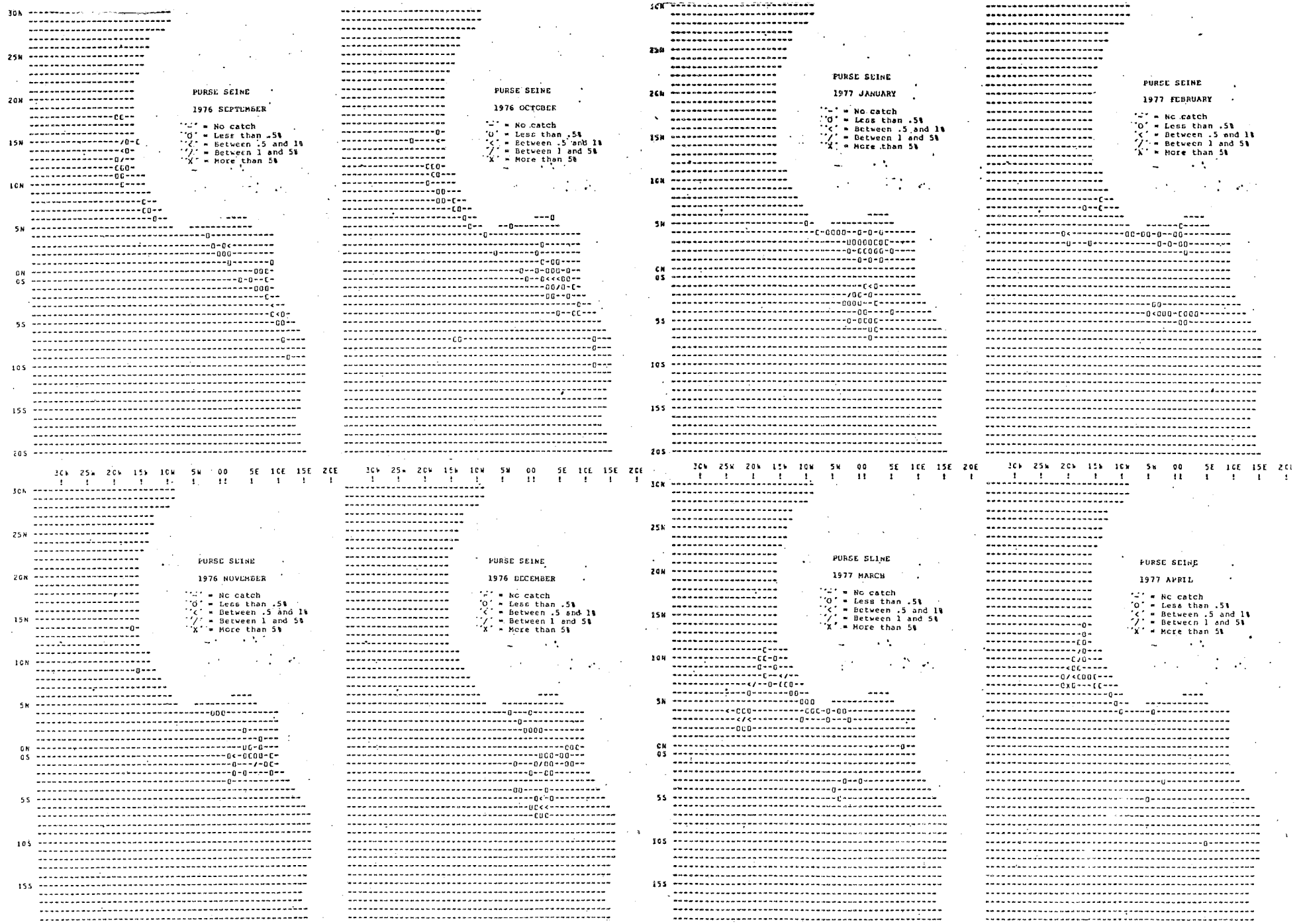

PURSE SEINE
1976 JUNE
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

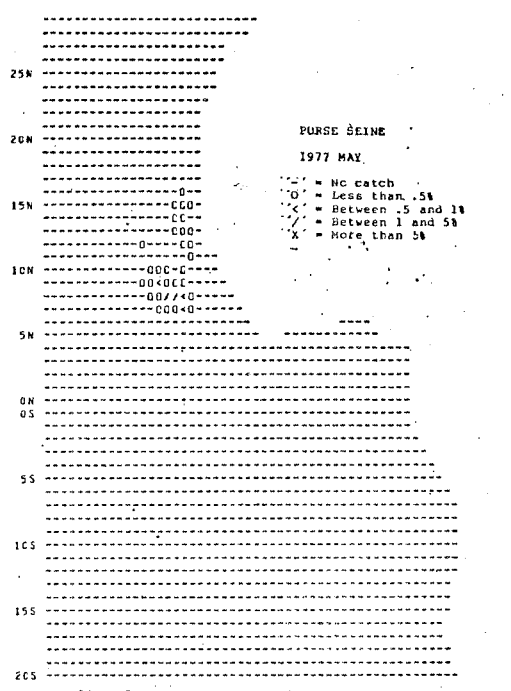
PURSE SEINE
1976 MARCH
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

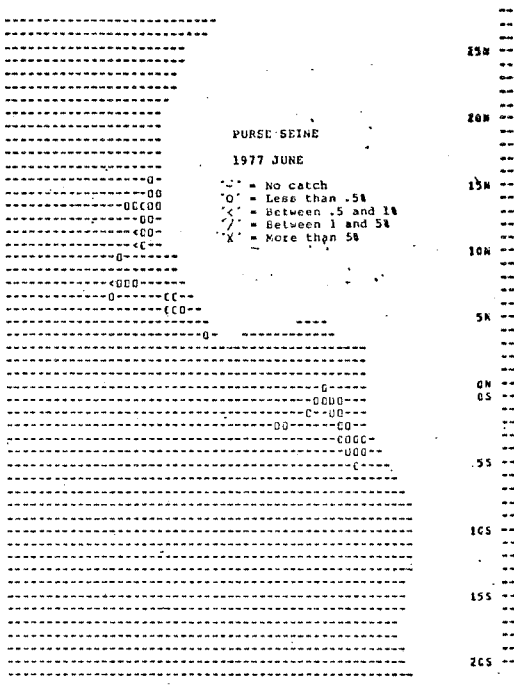
PURSE SEINE
1976 APRIL
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

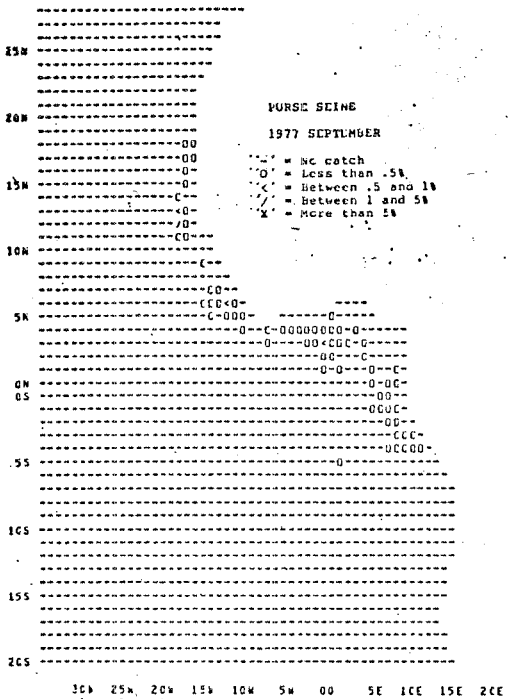
PURSE SEINE
1976 JULY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

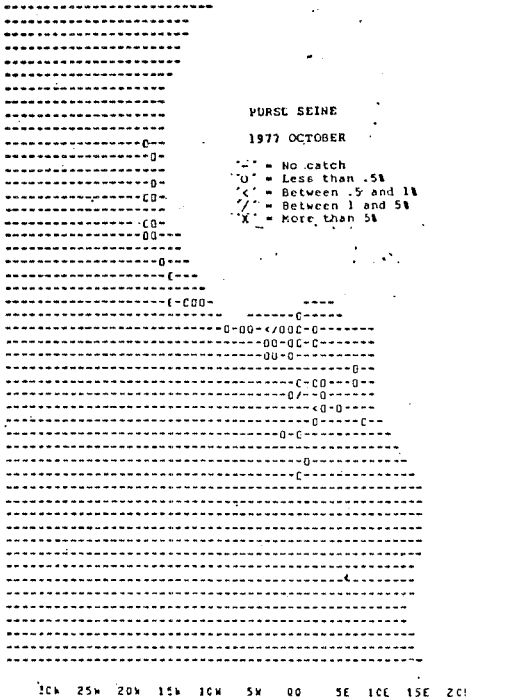
PURSE SEINE
1976 AUGUST
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
30N
25N
20N
15N
10N
5N
0N
0S
5S
10S
15S
20S
30W 25W 20W 15W 10W 5W 00 5E 10E 15E 20E

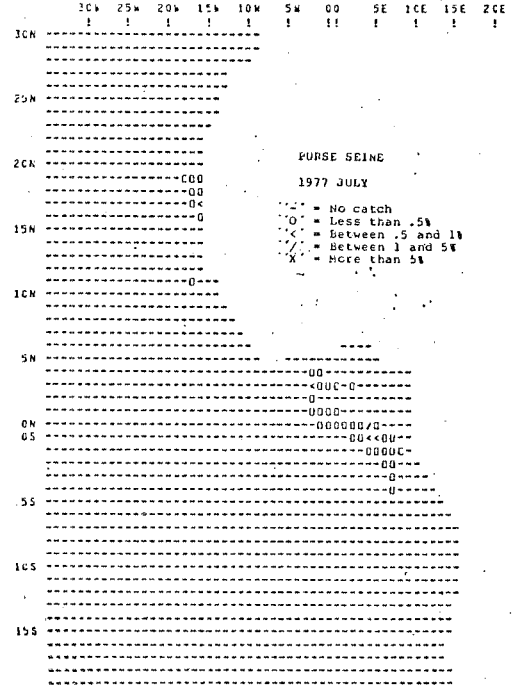

PURSE SEINE
1976 SEPTEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1976 OCTOBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1977 JANUARY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1977 FEBRUARY
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1976 NOVEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1976 DECEMBER
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1977 MARCH
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%
PURSE SEINE
1977 APRIL
'-' = No catch
'0' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

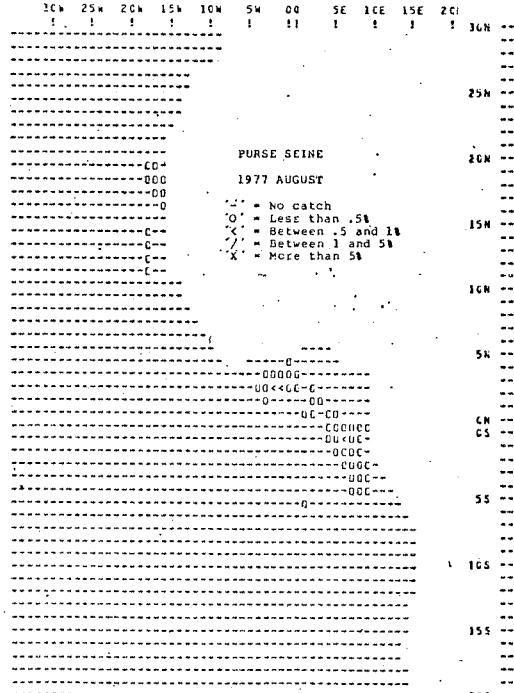

PURSE SEINE
1977 MAY
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%

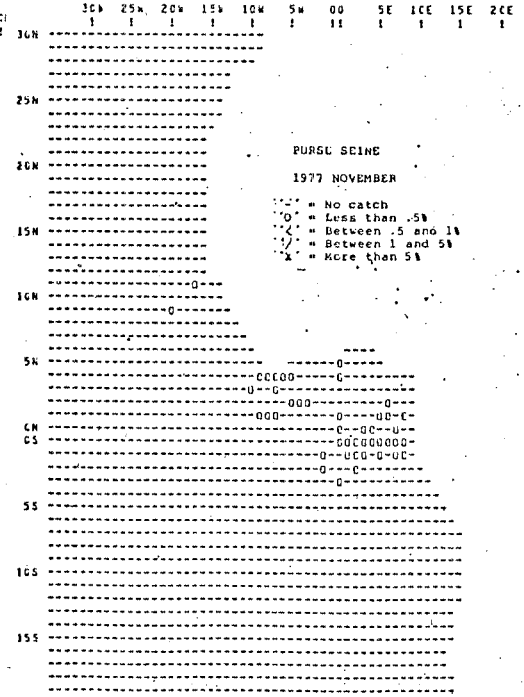

PURSE SEINE
1977 JUNE
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 SEPTEMBER
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 OCTOBER
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 JULY
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 AUGUST
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 NOVEMBER
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%


PURSE SEINE
1977 DECEMBER
' ' = No catch
'O' = Less than .5%
'<' = Between .5 and 1%
'/' = Between 1 and 5%
'X' = More than 5%