

Reports

12-1983

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Recommended Citation

Norcross, B. L., & Shaw, G. H. (1983) The VIMS Trawl Survey : Juvenile Atlantic Croaker. Data report (Virginia Institute of Marine Science) ; no. 22.. Virginia Institute of Marine Science, College of William and Mary. <https://doi.org/10.21220/V5DC7J>

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VIMS
Data
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The VIMS Trawl Survey: Juvenile Atlantic Croaker

by

Brenda L. Norcross

and

Ginny H. Shaw

Data Report No. 22

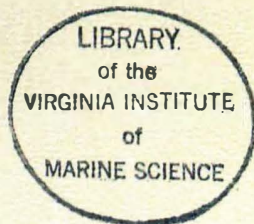
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Gloucester Point, Virginia 23062

December 1983



The VIMS Trawl Survey: Juvenile Atlantic Croaker

Introduction

An index of juvenile croaker recruitment was developed to test proposed relationships between juveniles and environmental factors. The VIMS trawl survey data base is unique on the east coast because of its duration and continuity. No other data set exists that samples the same species in the same locality with concurrent physical data over a long period of time. Austin and Ingham (1978) have noted that time series analyses of biological data are often difficult due to their poor quality and short duration. These data however are reliable and consistent for croaker because it is a demersal fish found in the deep channels of the river, where the gear samples most efficiently. It is especially fortuitous that this survey encompassed the period of the disappearance, absence and resurgence of the Atlantic croaker in the Chesapeake region.

Preliminary Analyses.

Initial efforts were directed toward transforming the VIMS trawl survey data base into an easily accessible format (see Norcross and Austin 1981 for details). The original format had one card image

observation for each species caught at each tow, but no record of zero catch. Attempts were made to reduce the data base to a workable size using SAS (Statistical Analysis System 1979) on an IBM 370 computer at the College of William and Mary. Initially only the York River collections, including the Pamunkey and Mattaponi tributaries were analyzed. These collections started in 1955 and were analyzed through 1977, which was the latest available data at that time. The original collections were not always standardized for trawling time or distance. Abundance values were standardized for croaker per ten minute tow as a measure of effort. Erroneous tow times and tow lengths were corrected, as were erroneous latitudes and longitudes.

A croaker biological year was designated as October through September. This designation was assigned because October is the peak of spawning, and, as such, considered the spawning date when aging croaker (White and Chittenden 1977). Abundance was averaged by month over all collections for the entire York River. This revealed that sampling had often not been conducted, particularly during the 1974 to 1977 period (Table 1). Therefore, the data were supplemented with additional VIMS croaker collections. Juvenile data by year, month and station were included for 1951 through 1954 for the York River (D. Haven pers. comm.) and for 1974 through 1977 from the Department of Crustaceology for the York, Rappahannock, James, and Potomac rivers (W. Van Engel pers. comm.). This expanded the data set. The result was a single index to represent the juvenile croaker abundance each year, 1951 to 1982.

SIR Database Management

After the preliminary analyses, the VIMS trawl survey data were reanalyzed using SIR (Scientific Information Retrieval) (Robinson et al. 1980) on a Prime 850 computer at the Virginia Institute of Marine Science. The SIR hierarchical system proved to be a more efficient way of managing this large, complex database by year (Figure 1). Initial SIR efforts were patterned after the previous analyses which included all the parameters on the Standard Ichthyology Trawl Format. Many of these variables were irrelevant or difficult to deal with because of format or coding and punching errors, therefore after correcting number of croaker per ten-minute tow, the following variables were excluded from the database: vessel, gear, depth, tow direction, tide, tow time, tow length, fishing depth and station. Station codes were not always indicative of area, so an attempt was made to design a river mile parameter based on latitude and longitude. Though much effort was put into this, errors in latitude and longitude made this untenable. Therefore, for this study, croaker were not analyzed according to position within the river, but only according to river in which collected.

Since SIR is a hierarchical system, only one record per tow (Table 2) and one record per collection of croaker was required (Table 3). This design included zero catch records in all calculations. Data for 1978 (Table 1) were augmented with VIMS crustaceology cruise records in addition to those already included for 1974-1977 (W. Van Engel pers. comm.) and for 1951-1954 (D. Haven pers. comm.). An index of croaker abundance (CRAVE) was calculated from the total number of croaker

captured per month (CRTOT) divided by the total number of tows per month (CRCNT) (Program 1) ($CRAVE = \frac{CRTOT}{CRCNT}$). Haven's data for 1951-54 were already in this format and did not need to be manipulated within SIR.

These calculations were performed twice, first for all the Virginia rivers of the Chesapeake Bay system combined, including collections for the Chesapeake Bay itself, the James, Mattaponi, Pamunkey, Potomac, Rappahannock and York Rivers, the second run was for just the York River system including the Mattaponi and Pamunkey Rivers. Yearly juvenile indices were calculated by adding monthly indices, from October to September, and dividing by the number of months sampled. Figure 2 shows a coherence between these yearly indices for all the rivers, and for just the York River system. This may be attributed to the fact that the York was the principal area of collection in the earlier years. The differences in the mid-70's, especially 1975, may be attributable to the site of collection (Table 1). Collections near the Bay mouth, when the larvae are being transported inward, or in the winter when the juveniles gather in the deep holes, would elevate the index for all rivers in proportion to that of the York. These results show that the York River is representative of the Virginia portion of the Chesapeake Bay system. Although many of the earlier samples contained only York River data, the index derived from all the rivers combined was used because it increased the sample sizes, number of samples, and number of months sampled, and there were some months in which no collections were made in the York but were made in the other rivers.

Year-class Analyses

Croaker captured by this survey were not just young-of-the-year. To separate year classes, length data from all the VIMS trawl surveys were obtained. These lengths, which were formatted to only include year, collection number, species, and up to thirteen individual lengths per line, were put into the SIR hierarchical system (Table 4). They could then be retrieved and length/frequencies and percents calculated by year by month using SIR (Program 2). Since 1952-54 data consisted of length/frequencies by year and month instead of individual lengths, percents were computed for these data using FORTRAN77 (Program 3) instead of SIR. SPSS (Statistical Package for the Social Sciences) (Nie et al. 1975, Hull and Nie 1981) was used to produce a single graph for each month of available length data (Program 4). Two sets of graphs were made, one for all the rivers combined and one for just the York River system. Though the data from all the Virginia rivers were used, the York River data were used to help interpret break-points between year classes when the data were particularly obscure, such as in July 1976.

There was some trouble interpreting the difference between "slow" growing previous year classes and "new" year classes. Chao and Musick (1977) discuss modal year-class sizes and interpret small croaker in the spring as new recruits. Analysis of spawning place and time however does not agree that these had been spawned in the Mid-Atlantic Bight in the spring. To analyze this, July was chosen as representative because more collections with lengths existed for that month. Modal lengths and ranges were plotted against the average January-February-March VIMS pier

temperature (Figure 3). This plot showed that when the average temperature was cold, the modal size was smaller than it was with a warm temperature. The variation in modal size appeared to be the greatest between 4.5° and 5.0 ° C. Additionally, and as would be expected, the range appeared to be related to the sample size, i.e., the range was greater with a large sample size. Generally, with a large sample size, the lower limit of the range was extended, e.g. 1975, 1976 and 1977. Some of the samples, especially in the warmer years such as 1971, 1973 and 1976, appeared to be bimodal with secondary modes at a smaller size, as indicated in Figure 3. This July investigation of age at size was used to interpret the other months.

Length data were not available for all collections in all years. Lengths were not available for 1956, 1957 and 1958, consequently those lengths published by Massman and Pacheco (1960) were used. However, it should be noted that their data did not include croaker less than 50 mm. This is because their gear was a 30 foot trawl with one-inch mesh and three-quarter-inch cod end, which did not sample smaller fish. A comparison of the two months for which both Massman and Pacheco's (1960) and VIMS's trawl survey lengths are available, August and September 1957, shows that the incoming year class is not included in the published data (Massman and Pacheco 1960). This may misrepresent the data for the other years also. For this reason, and because of the relationship between modal size and winter temperature, we have reinterpreted 1958 to include young-of-the-year recruitment in the summer. No length data were collected for the 1973-78 Crustaceology cruises that were used as supplements. Length/frequencies for 1974-1976 in Chao and Musick (1977) were used as a supplement to interpret year-

class strength when trawl survey lengths were not available. Interpretation of July 1975, which included a large size range of young-of-the-year, was aided by data from Stillpond Neck in Maryland (Kaufman et al. 1980). This shows that young-of-the-year croaker with a modal length of 30 mm did not appear until October. Therefore, the small croaker in July were considered to be slow growers from the previous year's recruitment.

To verify these analyses, modal larval, post-larval, and juvenile lengths from several sources were used: MARMAP cruises on the shelf; VIMS neuston cruises at the Chesapeake Bay mouth; VIMS SAV (Submerged Aquatic Vegetation) project on the Virginia eastern shore (Brooks et al. 1981); entrainment and impingement collections by VIMS and trawl and seine data (White 1976) at the VEPCO Surry Nuclear Power Plant on the James River; and Benedict Estuarine Laboratory collections at Calvert Cliffs Nuclear Power Plant, Maryland, in mid Chesapeake Bay (J. Hixson pers. comm). Figure 4 shows modal sizes below 60 mm at these locations in the Mid-Atlantic Bight and Chesapeake Bay, 1973-1980. Interpretation of year-class separations are depicted by vertical curved lines. This division is based on spring size of croaker and time of beginning of spawning the next fall. The space separating the year classes is larger in cold years and smaller in warm years. In the warmer years, there are smaller croaker in the spring; while in colder years, there are no croaker in the spring.

Results of these analyses are presented in length/frequency graphs for each month for 1952-82, divided by year class (Figure 5). Table 5 lists the predominant and "subordinate" modal lengths of each year class. Table 6 details, by month, the total number of croaker caught

(CROAKER), the total number of trawls made (TOWS), the resulting average (AVERAGE, from Program 1, $CRAVE = \frac{CRTOT}{CRCNT}$), and the percent composition of each year class as determined from the length/frequency graphs (Figure 5). The percent each year class comprised of the total index (AVERAGE = average number per ten-minute tow) was multiplied by that index for each year class for which monthly data were available, using FORTRAN77 (Program 5). The index is often zero for the older (II and III) year classes. Blanks indicate no croaker of a particular year class (Tables 6 & 7). Only one fish was caught that was older than III⁺, but it is not reflected in the tables. One 440 mm croaker was caught in July 1979 (Figure 5) comprising 0.58% of the catch with a year class index of 0.11.

Gear

The possibility that differences in gear may have caused variations in the abundance results was examined. The 1951-54 data used a quarter-inch mesh, but only an 8 foot trawl (Haven 1957). Though capable of capturing small fall croaker, this gear may underestimate all catches, and most likely underestimates the summer abundance when the croaker are larger and can avoid the small net.

During preliminary analyses, gear comparisons were made on croaker data for the York River system from 1971-1977. Only one gear, an unlined 30 foot otter trawl, was used from 1955 through 1970. Five different gear types were used from 1971 through 1977, with the unlined 16 foot otter trawl and unlined 30 foot semi-balloon trawl, used only in 1972 and 1973, respectively. Table 8 shows, by year and gear, the

number of tows taken, number of croaker caught per tow, percent of croaker per tow captured by each gear within a year and chi-square value of this percent.

While there is no statistically significant difference among gears used in 1971, 1972, and 1976, the chi-square values for 1973 ($\chi^2 = 25.0$), 1975 ($\chi^2 = 36.0$) and 1977 ($\chi^2 = 46.3$) indicate a significant difference ($p = 0.0005$). The unlined 16 foot otter trawl in 1972 and unlined 30 foot semi-balloon trawl in 1973 appear to have caught less croaker, but the efficiency results are contradictory for the lined 16 foot otter trawl and the lined and unlined 30 foot otter trawls. These tests were inconclusive. For example, the unlined 30 foot and lined 16 foot otter trawls appear to be equally efficient in 1971 and 1972. However, comparison of lined and unlined 16 and 30 foot trawls shows their efficiencies to be about equal in 1976, the 30 foot trawl better in 1975 and the 16 foot trawl better in 1977.

Although the absolute values of these indices can not be corrected, investigation of their values reveals quantification errors are due to gear differences. An abrupt increase in fall values is seen in 1970, the first year the lined trawl was used. No such increase is found in the summer indices. From 1955 to 1970, the unlined half-inch mesh 30 foot trawls that were used did not adequately sample the very small young-of-the-year croaker. This is verified by the decrease in fall modal size (Table 5) and fall size range (Figure 5). The values for 1970-79, while higher, still do not directly correspond to the 1980-82 samples. A lined 30 foot trawl was used in the most recent samples. A lined trawl in the earlier years was often only 16 feet, which should catch fewer croaker than the larger trawl all seasons, not just during

the fall like the unlined trawls. This, together with the fact that the supplementary 1973-78 crab tows were made with an unlined 30 foot trawl (R. E. Harris pers. comm.), underestimated those values. All other gear in 1971, 1972, and 1973 were less efficient than the 30 foot lined trawl. Table 1 shows that, in rivers other than the York (Table 8), the lined 30 foot trawl began to be used. However a 16 foot trawl was still used extensively from 1974 through 1978, and somewhat in 1979. Thus all the indices for 1974 through 1979 are probably underestimated.

The data were not numerically adjusted for gear since no VIMS gear comparison studies are currently available, but are being planned for 1983-84, (R. Dias VIMS pers. comm.). No adjustment was made for vessel (Table 1), since that is a difficult parameter to quantify and no data are available. Trawling effort was standardized in number per ten minute tow only but gear differences should be considered as a possible source in any analysis utilizing these indices. The indices derived from these data are not directly comparable. The annually increasing indices, which correspond to increased recruitment, also correspond to the increasing gear efficiency. Therefore, any discrepancies which may result when utilizing may be explained by these errors in the data due to gear.

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PROGRAMS

Program 1

```
C THIS PROCEDURE COUNTS NUMBER OF TOWS BY YEAR AND MONTH
C ADDS THE TOTAL NUMBER OF CROAKER, AND COMPUTES THE AVERAGE
RETRIEVAL
INTEGER RV,CRCNT1 TO CRCNT12,MO
INTEGER CRCNT,I,SP,CRTOT1 TO CRTOT12,CRTOT
COMPUTE RV = NREAD('River (0 for all or 3 for York)')
PROCESS CASES
.   SET CRTOT1 TO CRTOT12 (0)
.   SET CRCNT1 TO CRCNT12 (0)
.   PROCESS REC 1 FROM (RV)
.       MOVE VAR YEAR RIVER MONTH COLLNUM
.       IF (RV EQ 3 AND RIVER GT 5) EXIT RECORD
.       COMPUTE MO = MONTH
.       COMPUTE CRCNT1 TO CRCNT12(MO) = CRCNT1 TO CRCNT12(MO)
.           + 1
.       PROCESS REC 2 WITH (RIVER,MONTH,COLLNUM,5)
.           MOVE VAR TOTALN
.           COMPUTE CRTOT1 TO CRTOT12(MO)
.               = CRTOT1 TO CRTOT12(MO) + TOTALN
.       END PROCESS REC
.   END PROCESS REC
.   FOR I=1,12
.       COMPUTE CRTOT = CRTOT1 TO CRTOT12(I)
.       COMPUTE CRCNT = CRCNT1 TO CRCNT12(I)
.       IF THEN (CRCNT GT 0)
.           COMPUTE CRAVE = CRTOT / CRCNT
.       ELSE
.           COMPUTE CRAVE = 0.0
.       ENDIF
.       WRITE YEAR,IX,I(I2),CRTOT,CRCNT(I10),CRAVE(F10.2)
.   END FOR
END PROCESS CASES
END RETRIEVAL
```

Program 2

```

C THIS PROCEDURE RETRIEVES LENGTH RECORDS FOR EACH MONTH
C AND COMPUTES LENGTH FREQUENCY, RELATIVE PERCENT,
C AND CUMLATIVE PERCENT
RETRIEVAL
INTEGER LENGTH,YR,MO,SPEC,N,TOTCNT,FREQ
INTEGER LENGTH1 TO LENGTH45
COMPUTE YR = NREAD('Year')
COMPUTE SPEC = NREAD('Species')
CASE IS YR
.   FOR MO = 1,12
.       SET LENGTH1 TO LENGTH45 (0)
.       SET TOTCNT (0)
.       PROCESS REC 2
.           IF NOT (MONTH EQ MO) NEXT RECORD
.           IF NOT(SPECIES EQ SPEC) NEXT RECORD
.           MOVE VAR YEAR MONTH SPECIES COLLNUM
.           PROCESS REC 3 WITH (COLLNUM SPECIES)
.           COMPUTE N = SIZE/10 + 1
.           IF THEN (N LE 45)
.               COMPUTE LENGTH1 TO LENGTH45(N) = LENGTH1 TO LENGTH45(N)
.                   + 1
.               COMPUTE TOTCNT = TOTCNT + 1
.           ELSE
.               WRITE YEAR MONTH N
.           ENDIF
.       END PROCESS REC
.   END PROCESS REC
.   IF THEN (TOTCNT GT 0)
.       SET CUMPRCNT (0)
.       FOR N = 1,45
.           COMPUTE LENGTH = (N-1) * 10
.           COMPUTE FREQ = LENGTH1 TO LENGTH45(N)
.           COMPUTE RELPRCNT = FREQ/TOTCNT * 100.0
.           COMPUTE CUMPRCNT = CUMPRCNT + RELPRCNT
.           PERFORM PROCS
.       END FOR
.   ENDIF
. END FOR
END CASE IS
WRITE RECORDS  FILENAME=LL/
                VARIABLES=YR,MO,LENGTH,FREQ,RELPRCNT,CUMPRCNT,TOTCNT/
                FORMAT=(2I3,I4,I6,2F8.2,I8)
END RETRIEVAL

```

Program 3

```

C-----THIS PROGRAM COMPUTES RELATIVE AND CUMLATIVE PERCENTS
C-----FROM LENGTH FREQUENCIES
C
      INTEGER LENGTH, YEAR, MONTH, TOTCNT, FREQ(30)
      OPEN (5, FILE='LENGTHS.DEXTER.5254')
      OPEN(6, FILE='CROAKER.LEN.FREQ.YORK.5254')
50    TOTCNT = 0
      DO 100 I = 1, 30
          READ(5, '(I2, 1X, I2, 2I5)', END=999) YEAR, MONTH, LENGTH, FREQ(I)
          TOTCNT = TOTCNT + FREQ(I)
100   CONTINUE
      IF (TOTCNT .EQ. 0) GO TO 50
      CUMPRCNT = 0
      LENGTH = 0
      WRITE(6, 1000) YEAR, MONTH, LENGTH, 0, 0.0, CUMPRCNT, TOTCNT
      DO 200 I = 1, 30
          LENGTH = I * 10
          RELPRCNT = FREQ(I)/REAL(TOTCNT) * 100.0
          CUMPRCNT = CUMPRCNT + RELPRCNT
          WRITE(6, 1000) YEAR, MONTH, LENGTH, FREQ(I), RELPRCNT, CUMPRCNT, TOTCNT
1000  FORMAT(2I3, I4, I6, 2F8.2, I8)
200   CONTINUE
      DO 300 I = 31, 44
          LENGTH = I * 10
          WRITE(6, 1000) YEAR, MONTH, LENGTH, 0, 0.0, CUMPRCNT, TOTCNT
300   CONTINUE
      GO TO 50
999   END

```

Program 4

```

RUN NAME          PLOT BAR GRAPH OF LENGTH FREQUENCY
VARIABLE LIST    YR,MO,LENGTH,FREQ,RELPRCNT,CUMPRCNT,TOTCNT
INPUT MEDIUM     [BUNNIE.TEMP>CRLF>CROAKER.LEN.FREQ.77 ]
INPUT FORMAT     FIXED (2F3.0,F4.0,F6.0,2F8.2,F8.0)
N OF CASES       UNKNOWN
RAW OUTPUT UNIT  [CROAKER.LEN.FREQ.PLOT.77]
*SELECT IF      (MO EQ 1)
BARChart        PLOT=MEAN(RELPRCNT) WITH LENGTH/
                FORMAT=FANCY,FRAME/
                TITLE='January, 1977'
                  'N = 0'/
                BASE AXIS='LENGTH' LINEAR/
                SIDE AXIS='PERCENT'/
                ORDER=3
*SELECT IF      (MO EQ 2)
BARChart        PLOT=MEAN(RELPRCNT) WITH LENGTH/
                FORMAT=FANCY,FRAME/
                TITLE='February, 1977'
                  'N = 0'/
                BASE AXIS='LENGTH' LINEAR/
                SIDE AXIS='PERCENT'/
                ORDER=3
*SELECT IF      (MO EQ 3)
BARChart        PLOT=MEAN(RELPRCNT) WITH LENGTH/
                FORMAT=FANCY,FRAME/
                TITLE='March, 1977'
                  'N = 68'/
                BASE AXIS='LENGTH' LINEAR/
                SIDE AXIS='PERCENT'/
                ORDER=3
*SELECT IF      (MO EQ 4)
BARChart        PLOT=MEAN(RELPRCNT) WITH LENGTH/
                FORMAT=FANCY,FRAME/
                TITLE='April, 1977'
                  'N = 0'/
                BASE AXIS='LENGTH' LINEAR/
                SIDE AXIS='PERCENT'/
                ORDER=3
*SELECT IF      (MO EQ 5)
BARChart        PLOT=MEAN(RELPRCNT) WITH LENGTH/
                FORMAT=FANCY,FRAME/
                TITLE='May, 1977'
                  'N = 0'/
                BASE AXIS='LENGTH' LINEAR/
                SIDE AXIS='PERCENT'/
                ORDER=3

```


Program 4 (cont.)

```

*SELECT IF      (MO EQ 6)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='June, 1977'
                ' ' 'N = 0'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

*SELECT IF      (MO EQ 7)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='July, 1977'
                ' ' 'N = 1024'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

*SELECT IF      (MO EQ 8)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='August, 1977'
                ' ' 'N = 240'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

*SELECT IF      (MO EQ 9)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='September, 1977'
                ' ' 'N = 0'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

*SELECT IF      (MO EQ 10)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='October, 1977'
                ' ' 'N = 0'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

*SELECT IF      (MO EQ 11)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='November, 1977'
                ' ' 'N = 0'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3

```

Program 4 (cont.)

```
*SELECT IF      (MO EQ 12)
BARChart      PLOT=MEAN(RELPRCNT) WITH LENGTH/
              FORMAT=FANCY,FRAME/
              TITLE='December; 1977'
                '      'N = 0'/
              BASE AXIS='LENGTH' LINEAR/
              SIDE AXIS='PERCENT'/
              ORDER=3
```

Program 5

```
C---- THIS PROGRAM READS A FILE FOR EACH YEAR CONTAINING
C---- THE PERCENTAGES FOR EACH year class AND CREATES A FILE OF
C---- THE NUMBERS OF EACH year class AS A PERCENTAGE OF AVERAGE
CHARACTER*25 FILE1,FILE2
INTEGER YEAR,MONTH,TOWS
REAL AVERAGE,PER_CLASS(6),CLASS(6)
PRINT*,`ENTER INPUT FILE NAME`
READ(*,`(A)`) FILE1
FILE2 = FILE1(: INDEX(FILE1,` `)-1) // ` .CLASS `
OPEN(5,FILE=FILE1)
OPEN(6,FILE=FILE2)
10  READ(5,1000,END=99) YEAR,MONTH,TOWS,AVERAGE,PER_CLASS
1000 FORMAT(1X,I2,2X,I2,8X,I6,F10.2,6F8.2)
    IF (TOWS .GT. 0) THEN
        DO 100 I = 1,6
            CLASS(I) = PER_CLASS(I) / 100.0 * AVERAGE
100    CONTINUE
        WRITE(6,2000) YEAR,MONTH,CLASS
2000    FORMAT(2(I2,1X),6F8.2)
    ENDIF
    GO TO 10
99  CLOSE(5)
    CLOSE(6)
    END
```

TABLES

Table 1

NUMBER OF TRAWL COLLECTIONS

YEAR	PER MONTH												PER RIVER						PER VESSEL						PER GEAR											
	1	2	3	4	5	6	7	8	9	10	11	12	CB	Y	PA	MA	J	R	PO	MB	VL	PA	LA	IN	BR	SK	RE	JS	TD	9	10	33	35	43	68	70
1955	32	0	3	1	3	2	5	4	1	3	0	0	6	22	4	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0
1956	135	0	0	0	6	7	0	7	0	7	6	6	43	52	39	0	0	0	1	0	135	0	0	0	0	0	0	0	0	0	135	0	0	0	0	0
1957	142	12	16	16	0	12	0	5	16	17	16	16	47	55	40	0	0	0	0	0	56	86	0	0	0	0	0	0	0	0	142	0	0	0	0	0
1958	193	16	16	13	16	19	16	16	17	16	16	16	55	77	60	0	1	0	0	0	0	193	0	0	0	0	0	0	0	0	193	0	0	0	0	0
1959	114	0	0	0	13	3	16	18	16	16	16	0	32	48	34	0	0	0	0	0	0	114	0	0	0	0	0	0	0	0	114	0	0	0	0	0
1960	57	0	0	0	0	16	14	14	13	0	0	0	19	23	15	0	0	0	0	0	0	57	0	0	0	0	0	0	0	0	57	0	0	0	0	0
1961	73	6	0	0	4	8	8	8	8	7	8	8	15	32	26	0	0	0	0	0	0	73	0	0	0	0	0	0	0	73	0	0	0	0	0	
1962	81	8	8	8	5	8	8	8	8	3	7	7	18	34	28	0	0	0	0	0	0	71	10	0	0	0	0	0	0	81	0	0	0	0	0	
1963	97	6	8	9	9	7	7	9	9	9	9	6	19	44	34	0	0	0	0	0	0	75	22	0	0	0	0	0	0	97	0	0	0	0	0	
1964	150	18	9	9	8	9	18	16	14	14	14	9	25	52	35	0	38	0	0	0	0	103	47	0	0	0	0	0	0	150	0	0	0	0	0	
1965	160	12	13	12	14	13	12	13	19	14	15	11	0	91	0	0	69	0	0	0	0	117	43	0	0	0	0	0	0	160	0	0	0	0	0	
1966	193	14	13	13	18	17	17	16	21	13	18	15	18	18	53	55	0	67	0	0	0	22	171	0	0	0	0	0	0	193	0	0	0	0	0	
1967	259	15	17	31	17	17	24	23	23	23	23	23	22	107	0	0	69	61	0	0	0	251	8	0	0	0	0	0	0	259	0	0	0	0	0	
1968	260	13	15	16	23	23	23	21	31	23	23	26	26	60	43	0	66	65	0	0	0	256	4	0	0	0	0	0	0	257	3	0	0	0	0	
1969	284	23	22	24	24	24	24	24	24	24	24	24	23	60	48	0	71	82	0	0	0	284	0	0	0	0	0	0	0	284	0	0	0	0	0	
1970	358	16	24	24	24	24	24	51	24	51	23	22	50	59	45	0	70	95	0	39	0	304	0	28	14	12	0	0	0	304	0	53	0	0	0	
1971	748	51	18	51	47	53	63	95	75	74	74	74	101	335	47	0	73	105	0	87	0	321	26	14	140	12	235	0	0	347	0	401	0	0	0	
1972	757	74	73	73	48	48	67	64	77	27	86	66	79	436	32	0	69	70	0	71	0	143	109	0	73	0	432	0	0	19	251	1	486	0	0	
1973	900	54	53	12	56	80	202	65	65	77	84	73	167	574	30	62	107	28	0	30	0	144	30	0	126	0	600	0	0	0	122	725	52	0	0	
1974	384	79	79	75	0	0	0	140	11	0	0	0	109	180	37	33	12	13	0	0	0	0	151	0	0	0	233	0	0	0	151	233	0	0	0	
1975	669	194	128	16	0	0	0	331	0	0	0	0	189	142	22	16	131	129	26	0	0	124	411	0	60	0	74	0	0	0	535	134	0	0	0	
1976	830	184	138	23	0	0	0	485	0	0	0	0	221	121	21	15	211	29	40	0	0	0	423	0	210	0	197	0	0	0	423	407	0	0	0	
1977	699	0	0	175	0	0	0	467	57	0	0	0	158	129	22	22	178	190	0	0	0	0	232	0	172	0	294	0	0	0	232	466	0	0	0	
1978	938	94	214	79	0	0	64	370	41	0	0	5	273	160	25	28	262	142	48	0	0	10	542	0	22	0	179	44	141	0	572	366	0	0	0	
1979	815	284	71	124	0	36	42	47	48	37	43	44	144	229	20	6	218	139	59	0	0	346	363	0	0	0	63	43	0	2	463	63	0	287	0	
1980	448	28	48	45	18	51	51	47	50	69	41	0	123	16	25	0	93	82	9	0	0	143	0	0	0	0	303	0	0	0	144	8	0	0	296	

Table 1 (cont.)

TRAWL COLLECTIONS

<u>River Codes</u> ^X	<u>Vessel Codes</u> ^X	
CB - Chesapeake Bay	VL - Virginia Lee	35'
Y - York	PA(or PF) - Pathfinder	55'
PA - Pamunkey	LA - Langley	80'
MA - Mattaponi	IN - Investigator	28'
J - James	BR(or BK) - Brooks	30'
R - Rappahannock	SK - Skiff (Institute Outboard)	
PO - Potomac	RE - Restless	36'
MB - Mobjack Bay	JS - Capt. John Smith	42'
	TD - Three Daughter	42'

Gear Codes^X

- 9 - Unlined 16 foot otter trawl
- 10 - Unlined 30 foot otter trawl
- 33 - Lined 30 foot otter trawl, 1/2" mesh
- 35 - Lined 16 foot otter trawl, 1/4" mesh
- 43 - Unlined 30 foot semi-balloon trawl with tickler chain
- 68 - Lined 30 foot semi-balloon trawl with tickler chain, 1/2" bag, 30' bridle
- 70 - Lined 30 foot semi-balloon trawl with tickler chain, 1/2" bag, 60' bridle

X See also: Norcross, B. L. and H. M. Austin. 1981. Climate-scale environmental factors affecting year class fluctuations of Chesapeake Bay croaker, Micropogonias undulatus. Appendices. VIMS Spec. Sci. Rept. No. 110, 38 p.

Table 2

*** RECORD 1 (TRAWLS) DEFINITION ***

VIMS TRAWL SURVEY-1955-1982-----
STANDARD ICHTHYOLOGY FORMAT-----
JAMES, YORK, RAPPAHANNOCK AND POTOMAC RIVER
CHESAPEAKE AND MOBJACK BAYS.
DATA PREVIOUS TO 1955 ARE FROM DEXTER
HAVEN'S COLLECTIONS.
INCLUDES ALL PHYSICAL DATA PER TOW.

MAXIMUM RECS/CASE		1500	
NUMBER OF THIS TYPE IN FILE		11822	
LINES IN EACH INPUT RECORD		1	
ENTRY USE COUNT		5	
SEQUENCE CHECK		OFF	
CASE IDENTIFIER:		YEAR	(A)
SORT IDENTIFIERS:	(1)	RIVER	(A)
	(2)	MONTH	(A)
	(3)	COLLNUM	(A)

*** INPUT VARIABLE DEFINITIONS ***

C1. YEAR

INPUT	ON LINE:	1
	COLUMNS:	12 - 13
	FORMAT:	I2
DATA TYPE:		I*1
RANGE:		52/82
MISSING VALUES:		(BLANK)
		(99)

Table 2 (cont.)

R1. RIVER

INPUT ON LINE: 1
 COLUMN: 67
 FORMAT: I1

DATA TYPE: I*1
 RANGE: 0/9
 MISSING VALUES: (BLANK)
 (-999)

VALUE LABELS: (0) MARYLAND
 (1) JAMES
 (2) CHICKAHOMINY
 (3) YORK
 (4) MATTAPONI
 (5) PAMUNKEY
 (6) RAPPAHANNOCK
 (7) POTOMAC
 (8) CHESAPEAKE BAY
 (9) MOBJACK BAY

R2. MONTH

INPUT ON LINE: 1
 COLUMNS: 10 - 11
 FORMAT: I2

DATA TYPE: I*1
 RANGE: 1/12

R3. DAY

INPUT ON LINE: 1
 COLUMNS: 8 - 9
 FORMAT: I2

DATA TYPE: I*1
 RANGE: 1/31

R4. COLLNUM , COLLECTION NUMBER

INPUT ON LINE: 1
 COLUMNS: 1 - 4
 FORMAT: A4

DATA TYPE: A*6
 MISSING VALUE: (BLANK)

Table 2 (cont.)

R5. TEMP , TEMPERATURE(C)

INPUT ON LINE: 1
 COLUMNS: 34 - 35
 FORMAT: I2

DATA TYPE: I*1
 RANGE: 0/35
 MISSING VALUES: (BLANK)
 (-999)

R6. SALT , SALINITY(PPT)

INPUT ON LINE: 1
 COLUMNS: 36 - 37
 FORMAT: I2

DATA TYPE: I*1
 RANGE: 0/33
 MISSING VALUES: (BLANK)
 (-999)

R7. LAT , LATITUDE

INPUT ON LINE: 1
 COLUMNS: 21 - 25
 FORMAT: F5.3

DATA TYPE: R*4
 RANGE: 36.4000/39
 MISSING VALUES: (BLANK)
 (-999)

R8. LONG , LONGITUDE

INPUT ON LINE: 1
 COLUMNS: 26 - 30
 FORMAT: F5.3

DATA TYPE: R*4
 RANGE: 75.2990/77.3000
 MISSING VALUES: (BLANK)
 (-999)

Table 3

*** RECORD 2 (SPECIES) DEFINITION ***

INCLUDES CROAKER, STRIPED BASS,
 BY TOTAL ABUNDANCE AND
 TOTAL WEIGHT PER TOW. PLUS COMPUTED VALUES
 FOR ABUNDANCE OF YOUNG-OF-YEAR, AND ONE AND
 TWO YEAR OLDS, ALSO COMPUTED AVERAGE WEIGHT
 PER FISH.

MAXIMUM RECS/CASE		3000	
NUMBER OF THIS TYPE IN FILE		6242	
LINES IN EACH INPUT RECORD		1	
ENTRY USE COUNT		16	
SEQUENCE CHECK		OFF	
CASE IDENTIFIER:		YEAR	(A)
SORT IDENTIFIERS:	(1)	RIVER	(A)
	(2)	MONTH	(A)
	(3)	COLLNUM	(A)
	(4)	SPECIES	(A)

*** INPUT VARIABLE DEFINITIONS ***

C1. YEAR

INPUT ON LINE: 1
 COLUMNS: 12 - 13
 FORMAT: I2

DATA TYPE: I*1
 RANGE: 52/82
 MISSING VALUES: (BLANK)
 (99)

Table 3 (cont.)

R1. RIVER

INPUT ON LINE: 1
COLUMN: 67
FORMAT: I1

DATA TYPE: I*1
RANGE: 0/9
MISSING VALUES: (BLANK)
(99)

VALUE LABELS: (0) MARYLAND
(1) JAMES
(2) CHICKAHOMINY
(3) YORK
(4) MATTAPONI
(5) PAMUNKEY
(6) RAPPAHANNOCK
(7) POTOMAC
(8) CHESAPEAKE BAY
(9) MOBJACK BAY

R2. MONTH

INPUT ON LINE: 1
COLUMNS: 10 - 11
FORMAT: I2

DATA TYPE: I*1
RANGE: 1/12
MISSING VALUES: (BLANK)
(99)

R3. SPECIES

INPUT ON LINE: 1
COLUMNS: 5 - 7
FORMAT: I3

DATA TYPE: I*2
MISSING VALUES: (BLANK)
(999)

VALUE LABELS: (5) CROAKER
(31) STRIPED BASS

Table 3 (cont.)

R4. COLLNUM , COLLECTION NUMBER

INPUT ON LINE: 1
COLUMNS: 1 - 4
FORMAT: A4

DATA TYPE: A*6
MISSING VALUE: (BLANK)

R5. TOTALN , TOTAL NUMBER CAUGHT

INPUT ON LINE: 1
COLUMNS: 44 - 49
FORMAT: I6

DATA TYPE: I*4

R6. TOTALWT , TOTAL WEIGHT OF ALL CAUGHT

INPUT ON LINE: 1
COLUMNS: 53 - 58
FORMAT: I6

DATA TYPE: I*4
MISSING VALUES: (BLANK)
(-999)

*** COMPUTE/RECODE VARIABLE DEFINITIONS ***

R7. AVGWT , AVERAGE WEIGHT OF EACH FISH

COMPUTE AVGWT=TOTALWT/TOTALN;

DATA TYPE: R*4
MISSING VALUES: (BLANK)
(-999)

*** RECORD SELECTION CRITERIA ***

REJECT REC IF (TOTALN EQ 0)

Table 4

*** RECORD 3 (SIZES) DEFINITION ***

INDIVIDUAL SIZES BY TOW,
FOR CROAKER, AND STRIPED BASS,
FOR WHENEVER
THEY ARE AVAILABLE

MAXIMUM RECS/CASE	10000
NUMBER OF THIS TYPE IN FILE	57042
LINES IN EACH INPUT RECORD	1
ENTRY USE COUNT	1
SEQUENCE CHECK	OFF
CASE IDENTIFIER:	YEAR (A)
SORT IDENTIFIERS:	(1) COLLNUM (A)
	(2) SPECIES (A)
	(3) SIZEID (A)

*** INPUT VARIABLE DEFINITIONS ***

C1. YEAR

INPUT ON LINE: 1
COLUMNS: 1 - 2
FORMAT: I2

DATA TYPE: I*1
RANGE: 52/82
MISSING VALUES: (BLANK)
(99)

R1. COLLNUM , COLLECTION NUMBER
SIZEID INDIVIDUAL SIZE IDENTIFIER

INPUT ON LINE: 1
COLUMNS: 5 - 8
FORMAT: A4

DATA TYPE: A*6

Table 4 (cont.)

R2. SPECIES

INPUT ON LINE: 1
COLUMNS: 11 - 13
FORMAT: I3

DATA TYPE: I*2
MISSING VALUE: (BLANK)

VALUE LABELS: (5) CROAKER
(31) STRIPED BASS

R3. SIZEID

INPUT ON LINE: 1
COLUMNS: 16 - 18
FORMAT: I3

DATA TYPE: I*2
MISSING VALUE: (BLANK)

R4. SIZE

INPUT ON LINE: 1
COLUMNS: 21 - 23
FORMAT: I3

DATA TYPE: I*2
MISSING VALUE: (BLANK)

Table 5

YEAR	MONTH	MODAL SIZE			
		NEW	YOY	ONEYR	TWOYR
1951-52	10-2	- - - - - No lengths- - - - -			
1952	3		30(70)		
1952	4		20(60)		
1952	5		40	160	
1952	6		60(80)	190	
1952	7		120	210	300
1952	8		150	250	
1952	9		180	220	
1952	10		30(70)		
1952	11		40(70)		
1952	12		40(80)		
1953	1		40(70)		
1953	2		30(60)		
1953	3		40(90)		
1953	4		40	200	260
1953	5		60(90)	210	
1953	6		80	200	270
1953	7		110(130)	220	
1953	8		150		
1953	9	20(50)	180		
1953	10		50(80)	185	
1953	11		30(60)		
1953	12		20(70)		
1954	1	- - - - - No collections- - - - -			
1954	2		30		
1954	3		40		
1954	4		70	200	
1954	5		110	210	
1954-56	6-4	- - - - - No data - - - - -			
1956	5		130		
1956	6	- - - - - No croaker- - - - -			
1956*	7		90	110	
1956*	8		120	160	
1956*	9		150	130	
1956-57	10-3	- - - - - No lengths- - - - -			

* Massman and Pacheco (1960)

#(#)= Primary mode(Sub-mode)

No lengths- = croaker- caught, but no lengths- available.

No croaker- = collections- done, but no croaker- caught.

No collections- = No collections- done.

Table 5 (cont.)

YEAR	MONTH	MODAL SIZE				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1957	4			No croaker		
1957	5		50		250	
1957	6			No croaker		
1957	7		125	200		
1957	8	50	140	250	300	
1957	9	60	160		360	
1957	10		70	180		
1957	11		70	170		
1957-58	12-2					
1958	3			No croaker		
1958	4-5			No data		
1958*	6			240	280	
1958*	7			260		
1958*	8-12			No lengths		
1959	1-3			No collections		
1959	4			No croaker		
1959	5				280	
1959-62	6-4			No data		
1962	5		60			
1962	6		(40)120			
1962	7		(80)150			
1962	8		140(180)			
1962	9	70	180(220)	280		
1962	10			No croaker		
1962	11		(50)80	120		
1962	12		55(100)			
1963	1		30			
1963	2-6			No croaker		
1963	7		110			
1963	8			No lengths		
1963	9			200		
1963	10			No croaker		
1963	11-12			No lengths		
1964	1		30			
1964	2-5			No croaker		
1964	6		70	170	255	
1964	7			210		
1964	8	30	70			
1964	9	50	100			
1964	10		55	120		
1964	11		70	125		
1964	12		50	140		

Table 5 (cont.)

YEAR	MONTH	MODAL SIZE				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1965	1		40			
1965	2		50			
1965	3		70			
1965	4		60			
1965	5		80	160		
1965	6		120	190		
1965	7		160	200		
1965	8		180	210		
1965	9			220		
1965	10		65			
1965	11		70			
1965	12		80			
1966	1		70			
1966	2					
1966	3-4					
1966	5		155	210		
1966	6			215		
1966	7			210		
1966	8			200	250	
1966	9					
1966	10		50	120		
1966	11		50(100)			
1966	12		60			
1967	1		60			
1967	2		55			
1967	3		80			
1967	4		60(120)	160		
1967	5		50(70)	175		
1967	6		65(110)	180		
1967	7		(50)120(160)	260		
1967	8		170	250	310	
1967	9		190			
1967	10-11					
1967	12		20,60			
1968	1		60			
1968	2-3					
1968	4		100			
1968	5					
1968	6		30			
1968	7		70(90)			
1968	8		(30)135	250		
1968	9		180			
1968	10		30	180		
1968	11		40	160		
1968	12		50			

Table 5 (cont.)

YEAR	MONTH	MODAL SIZE				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1969	1		(20)70			
1969	2-4					
1969	5			No croaker		
1969	6			150		
1969	7		75	170		
1969	8		120	190		
1969	9	30	160	280		
1969	10		60	170		
1969	11		(50)80	170		
1969	12		80			
1970	1		(40)80			
1970	2-3			No croaker		
1970	4		100			
1970	5		105	170		
1970	6			170		
1970	7			190		
1970	8			240		
1970	9		90(110)			
1970	10		40	(90)120		
1970	11		60	120		
1970	12		70			
1971	1		60			
1971	2		60			
1971	3			No croaker		
1971	4		80	140		
1971	5		(30)90	150		
1971	6		120	160(185)		
1971	7		130	215		
1971	8		(140)180	(210)250	310	
1971	9	30	100(180)	215(240)		
1971	10		20(60)			
1971	11		40(70)			
1971	12		50			
1972	1		(40)80			
1972	2		40(70)			
1972	3		55(90)			
1972	4		50(80,120)			
1972	5		60(100)			
1972	6		100(140)	215		
1972	7	40	130	270		
1972	8	(30)60	150(200)			
1972	9	30(80)	120(170)			
1972	10		60	135		
1972	11		30(70)	120(140)		
1972	12		30			

Table 5 (cont.)

YEAR	MONTH	MODAL SIZE				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1973	1		30(80)			
1973	2		30(70)			
1973	3		30			
1973	4		30(70)	170		
1973	5		(20)60			
1973	6		30(110)	220		
1973	7		70(130)	250		
1973	8	35	100(160)	270		
1973	9	10	150			
1973	10		30	170		
1973	11		20(60)	180		
1973	12		20(50,100)			
1974	1		20(60)	160		
1974	2		20(60)			
1974	3		20(50)	160		
1974x	4		60			
1974x	5		70(110)	160(220)		
1974	6			No lengths		
1974	7		(20)140	260	290	360
1974	8		(130)150(170)			
1974	9			No lengths		
1974x	10		20(90)	(130)200		
1974x	11		20	180		
1974x	12		20(50)			
1975	1		(20)40	130		
1975	2		20(60)	240		
1975	3,5-6			No lengths		
1975	7		110	230	290	
1975	8	20	120	250	290	
1975	9	(40)80	130(150)	230		
1975	10,12			No collections		
1975	11			No lengths		
1976	1		30			
1976	2		40			
1976	3		40	140		
1976	4-6			No lengths		
1976	7		(100)150	230	330	
1976-77	8-11,4,6			No lengths		
1977	3		20			
1976-77	12,1-2,5			No collections		
1977	7		110	260	360	
1977	8		110	300		
1977	9-11			No lengths		
1977	12			No collections		

x Chao and Musick (1977)

Table 5 (cont.)

YEAR	MONTH	MODAL SIZE				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1978	1			No lengths-		
1978	2		20			
1978	3,5-6			No lengths-		
1978	4			No collections-		
1978	7		80			
1978	8				280	
1978	9-10			No lengths-		
1978	11		60	120		
1978	12		30	130		
1979	1		30			
1979	2		30			
1979	3		30			
1979	4			No collections-		
1979	5			No lengths-		
1979	6		30	190	270	
1979	7		60(130)	210	290	380
1979	8		(120)140	240		
1979	9	20	120(180)	200		
1979	10		40	150	210	290
1979	11		60	145	220	
1979	12		(40)70	120	240	340
1980	1		(30)50			
1980	2		20(60)			
1980	3		20			
1980	4		20			
1980	5		40	145	270	
1980	6		30(70)	220	300	
1980	7		(80)110(150)	220	300	
1980	8		140	225		
1980	9	(20,50)80	180			
1980	10		20	180	280	
1980	11		30(110)	180		
1980	12		30(80)	160		
1981	1		30			
1981	2-4			No croaker-		
1981	5			230		
1981	6		30(100)	235		
1981	7		90	210	265	
1981	8		135	230	270	
1981	9		(85)190	280		
1981	10		20	200		
1981	11		30			
1981	12		30	140		

Table 5 (cont.)

YEAR	MONTH	----- MODAL SIZE -----				
		NEW	YOY	ONEYR	TWOYR	THREEYR
1982	1		30			
1982	2		30			
1982	3					
1982	4					
1982	5					
1982	6		(20)40(120)	180		
1982	7		90(150)	220	340	
1982	8		130	280		
1982	9		150	280		
1982	10		20(70)	150(170)		
1982	11		30(90)	140		
1982	12		40(90,110)	160		

Table 6

YEAR	MONTH	CROAKER	TOWS	AVERAGE	-----		PERCENT		-----	
					NEW	YOY	ONEYR	TWOYR	THREEYR	
51	10	1.0	2	0.50			100.00			
51	11	1.5	1	1.50			100.00			
51	12	14.7	3	4.90		100.00				
52	1	16.2	3	5.40		100.00				
52	2	39.7	3	13.23		100.00				
52	3	43.5	8	5.44		100.00				
52	4	110.4	7	15.77		100.00				
52	5	108.0	8	13.50		89.80	10.20			
52	6	139.2	8	17.40		96.51	3.49			
52	7	203.9	9	22.66		87.30	12.30	0.40		
52	8	20.0	9	2.22		68.75	31.25			
52	9	3.8	8	0.48		90.91	9.09			
52	10	65.0	6	10.83		100.00				
52	11	149.7	9	16.63		100.00				
52	12	206.0	9	22.89		100.00				
53	1	23.0	9	2.56		100.00				
53	2	237.4	9	26.38		100.00				
53	3	480.5	9	53.39		100.00				
53	4	227.0	7	32.43		98.75	0.93	0.31		
53	5	548.6	9	60.96		99.80	0.20			
53	6	268.9	9	29.88		98.73	1.02	0.25		
53	7	62.4	9	6.93		98.54	1.46			
53	8	5.9	9	0.66		100.00				
53	9	22.1	9	2.46	88.89	11.11				
53	10	477.5	9	53.06		98.47	1.53			
53	11	820.9	9	91.21		100.00				
53	12	274.7	9	30.52		100.00				
54	1	0	0							
54	2	273.5	9	30.39		100.00				
54	3	103.9	8	12.99		100.00				
54	4	224.4	9	24.93		90.07	9.93			
54	5	66.9	9	7.43		79.03	20.97			
54	6	0	0							
54	7	0	0							
54	8	0	0							
54	9	0	0							
54	10	0	0							
54	11	0	0							
55	1	0	0							
55	2	0	3	0.00		0.00				
55	3	1	1	1.00		100.00				
55	4	1	3	.33		100.00				
55	5	0	2	0.00		0.00				
55	6	114	5	22.80		50.00	50.00			
55	7	161	14	11.50		75.00	25.00			
55	8	0	1	0.00		0.00				
55	9	5	3	1.67		100.00				
55	10	0	0							
55	11	0	0							
55	12	0	0							

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	PERCENT			
					NEW	YOY	ONEYR	TWOYR
56	1	0	0					
56	2	0	0					
56	3	0	0					
56	4	1	16	.06			100.00	
56	5	236	17	13.88			100.00	
56	6	0	0					
56	7	40	17	2.35		25.00	75.00	
56	8	28	20	1.40		25.00	75.00	
56	9	16	17	.94		77.00	23.00	
56	10	42	16	2.62		100.00		
56	11	89	16	5.56		100.00		
56	12	351	16	21.94		100.00		
57	1	141	12	11.75		100.00		
57	2	39	16	2.44		100.00		
57	3	108	16	6.75		100.00		
57	4	0	0					
57	5	1448	12	120.67		84.00	16.00	
57	6	0	0					
57	7	174	5	34.80		100.00		
57	8	576	16	36.00	33.50	63.00	3.33	0.67
57	9	567	17	33.35	30.98	68.77		0.25
57	10	119	16	7.44		76.11	23.89	
57	11	163	16	10.19		99.32	0.68	
57	12	238	16	14.87		100.00		
58	1	17	16	1.06		100.00		
58	2	4	16	.25		100.00		
58	3	0	13	0.00		0.00		
58	4	10	16	.62		100.00		
58	5	9	19	.47		100.00		
58	6	42	16	2.62			100.00	
58	7	45	16	2.81			100.00	
58	8	1	17	.06		100.00		
58	9	55	16	3.44		100.00		
58	10	171	16	10.69		70.00	30.00	
58	11	114	16	7.12		95.00	5.00	
58	12	42	16	2.62		100.00		
59	1	0	0					
59	2	0	0					
59	3	0	0					
59	4	0	13	0.00		0.00		
59	5	6	3	2.00				100.00
59	6	20	16	1.25		75.00		25.00
59	7	33	18	1.83		80.00	10.00	10.00
59	8	4	16	.25		100.00		
59	9	1	16	.06		100.00		
59	10	277	16	17.31		100.00		
59	11	14	16	.87		100.00		
59	12	0	0					

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	PERCENT		
					NEW	YOY	ONEYR TWOYR THREEYR
60	1	0	0				
60	2	0	0				
60	3	0	0				
60	4	0	0				
60	5	217	16	13.56		75.00	25.00
60	6	5	14	.36		75.00	25.00
60	7	156	14	11.14		75.00	25.00
60	8	24	13	1.85		100.00	
60	9	0	0				
60	10	0	0				
60	11	0	0				
60	12	0	0				
61	1	88	6	14.67			
61	2	0	0				
61	3	0	0				
61	4	0	4	0.00		0.00	
61	5	1	8	.12			100.00
61	6	1	8	.12			100.00
61	7	2	8	.25			100.00
61	8	18	8	2.25		50.00	50.00
61	9	1	7	.14		100.00	
61	10	8	8	1.00		75.00	25.00
61	11	3	8	.37		100.00	
61	12	17	8	2.12		100.00	
62	1	8	8	1.00		100.00	
62	2	5	8	.62		100.00	
62	3	1	8	.12		100.00	
62	4	0	5	0.00		0.00	
62	5	70	8	8.75		100.00	
62	6	79	8	9.87		100.00	
62	7	192	8	24.00		100.00	
62	8	55	8	6.87		100.00	
62	9	27	3	9.00	2.50	95.00	2.50
62	10	0	3	0.00		0.00	
62	11	14	7	2.00		95.21	4.76
62	12	2	7	.29		100.00	
63	1	1	6	.17		100.00	
63	2	0	8	0.00		0.00	
63	3	0	9	0.00		0.00	
63	4	0	9	0.00		0.00	
63	5	0	7	0.00		0.00	
63	6	0	7	0.00		0.00	
63	7	3	9	.33		100.00	
63	8	1	9	.11		100.00	
63	9	1	9	.11			100.00
63	10	0	9	0.00		0.00	
63	11	45	9	5.00		100.00	
63	12	28	6	4.67		100.00	

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	-----		PERCENT		-----	
					NEW	YOY	ONEYR	TWOYR	THREEYR	
64	1	11	18	.61		100.00				
64	2	0	9	0.00		0.00				
64	3	0	9	0.00		0.00				
64	4	0	8	0.00		0.00				
64	5	0	9	0.00		0.00				
64	6	138	18	7.67		100.00				
64	7	46	16	2.87			100.00			
64	8	15	14	1.07	12.50	87.50				
64	9	41	14	2.93	2.38	97.62				
64	10	47	14	3.36		6.06	93.94			
64	11	126	9	14.00		54.08	45.92			
64	12	319	12	26.58		99.76	0.24			
65	1	221	22	10.05		100.00				
65	2	24	13	1.85		100.00				
65	3	89	17	5.24		100.00				
65	4	32	14	2.29		100.00				
65	5	475	13	36.54		13.73	86.27			
65	6	313	17	18.41		26.35	73.65			
65	7	299	15	19.93		53.06	46.94			
65	8	88	19	4.63		59.26	40.74			
65	9	8	14	.57			100.00			
65	10	79	15	5.27		100.00				
65	11	377	11	34.27		100.00				
65	12	356	21	16.95		100.00				
66	1	76	14	5.43		100.00				
66	2	2	21	.10						
66	3	0	26	0.00		0.00				
66	4	0	16	0.00		0.00				
66	5	13	17	.76		10.53	89.47			
66	6	3	19	.16			100.00			
66	7	2	16	.12			100.00			
66	8	10	22	.45			13.35	86.67		
66	9	8	13	.62			100.00			
66	10	75	18	4.17		98.31	1.69			
66	11	144	15	9.60		100.00				
66	12	162	17	9.53		100.00				
67	1	33	15	2.20		100.00				
67	2	9	17	.53		100.00				
67	3	2	31	.06		100.00				
67	4	3	17	.18		50.00	50.00			
67	5	34	17	2.00		45.16	54.84			
67	6	139	24	5.79		90.43	9.57			
67	7	74	23	3.22		90.43	9.28			
67	8	63	23	2.74		83.70	15.21	1.09		
67	9	4	23	.17		100.00				
67	10	0	23	0.00		0.00				
67	11	0	23	0.00		0.00				
67	12	1	23	.04		100.00				

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	PERCENT			
					NEW	YOY	ONEYR	TWOYR
68	1	3	13	.23		100.00		
68	2	0	15	0.00		0.00		
68	3	0	16	0.00		0.00		
68	4	1	23	.04		100.00		
68	5	0	23	0.00		0.00		
68	6	34	23	1.48		100.00		
68	7	5	21	.24		100.00		
68	8	16	31	.52		94.44	5.56	
68	9	6	23	.26		100.00		
68	10	4	23	.17		40.00	60.00	
68	11	413	23	17.96		97.84	2.16	
68	12	430	26	16.54		100.00		
69	1	8	23	.35		100.00		
69	2	0	22	0.00		0.00		
69	3	0	24	0.00		0.00		
69	4	0	24	0.00		0.00		
69	5	6	24	.25			100.00	
69	6	12	24	.50			100.00	
69	7	50	24	2.08		76.92	23.08	
69	8	82	23	3.57		100.00		
69	9	48	24	2.00	46.94	51.02	2.04	
69	10	1096	24	45.67		97.25	2.75	
69	11	1134	24	47.25		99.63	0.37	
69	12	766	24	31.92		100.00		
70	1	23	16	1.35		100.00		
70	2	0	24	0.00		0.00		
70	3	0	24	0.00		0.00		
70	4	2	24	.08		100.00		
70	5	8	24	.33		85.71	14.29	
70	6	4	24	.17			100.00	
70	7	40	51	.78			100.00	
70	8	1	24	.04			100.00	
70	9	446	51	8.75		100.00		
70	10	502	23	21.83		10.95	89.05	
70	11	614	51	12.04		19.44	80.56	
70	12	1292	22	58.73		100.00		
71	1	76	51	1.49		100.00		
71	2	5	18	.28		100.00		
71	3	0	51	0.00		0.00		
71	4	20	47	.43		60.00	40.00	
71	5	16	53	.30		21.05	78.95	
71	6	22	63	.35		37.50	62.50	
71	7	138	95	1.45		33.33	66.67	
71	8	153	75	2.04		50.00	48.44	1.56
71	9	42	74	.57	25.93	3.70	70.37	
71	10	175	74	2.36		100.00		
71	11	1385	73	18.97		100.00		
71	12	3503	74	47.34		100.00		

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	-----		PERCENT		
					NEW	YOY	ONEYR	TWOYR	THREEYR
72	1	3979	74	53.77		100.00			
72	2	5873	73	80.45		100.00			
72	3	1052	73	14.41		100.00			
72	4	781	48	16.27		100.00			
72	5	428	48	8.92		100.00			
72	6	2782	67	41.52		93.98	6.02		
72	7	1510	64	23.59	0.23	00.54	0.23		
72	8	1708	77	21.90	4.64	95.36			
72	9	173	27	6.41	71.79	29.21			
72	10	1146	86	13.33		60.26	39.74		
72	11	1773	66	26.86		84.56	15.44		
72	12	1015	54	18.80		100.00			
73	1	426	54	7.89		100.00			
73	2	397	53	7.49		100.00			
73	3	263	12	21.92		100.00			
73	4	453	56	8.09		98.78	1.22		
73	5	634	80	7.92		100.00			
73	6	921	202	4.56		35.44	64.56		
73	7	918	65	14.12		98.74	1.26		
73	8	273	65	4.20	0.76	98.09	1.15		
73	9	2141	77	27.81	81.38	18.62			
73	10	7301	84	86.92		95.86	4.14		
73	11	429	73	5.88		89.87	10.13		
73	12	164	79	2.08		96.08	3.92		
74	1	2383	235	10.14		99.87	0.13		
74	2	25580	216	118.43		100.00			
74	3	6092	75	81.23		95.49	4.51		
74	4	0	0						
74	5	1123	8	140.37		95.00	5.00		
74	6	1467	4	366.75		90.00	10.00		
74	7	3414	148	23.07		87.17	11.00	1.50	0.33
74	8	520	19	27.37		100.00			
74	9	465	8	58.12		100.00			
74	10	238	8	29.75		35.00	63.00	2.00	
74	11	155	8	19.37		50.00	49.00	1.00	
74	12	0	0						
75	1	23557	194	121.43		99.94	0.06		
75	2	7351	131	56.11		99.91	0.09		
75	3	18725	16	170.31		100.00			
75	4	0	0						
75	5	351	8	39.00		90.00	10.00		
75	6	623	8	77.87		90.00	10.00		
75	7	24745	339	72.99		85.20	14.12	0.68	
75	8	2325	55	42.82	8.77	80.51	18.71	0.78	
75	9	1139	76	14.99	8.42	88.32	5.26		
75	10	0	0						
75	11	849	8	106.12		100.00			
75	12	0	0						

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	PERCENT				
					NEW	YOY	ONEYR	TWOYR	THREEYR
76	1	11561	184	62.83		100.00			
76	2	39	138	.28		100.00			
76	3	13071	23	568.30		99.33	0.67		
76	4	369	12	30.75		95.00	5.00		
76	5	227	12	18.92		92.00	8.00		
76	6	2264	16	141.50		89.00	11.00		
76	7	17219	493	34.93	2.27	85.47	8.76	3.40	0.09
76	8	1127	12	93.92	5.00	85.00	10.00		
76	9	346	12	28.83	10.00	85.00	5.00		
76	10	1445	13	111.15		90.00	10.00		
76	11	2196	12	183.00		95.00	5.00		
76	12	0	0						
77	1	0	0						
77	2	0	0						
77	3	84	174	.48		100.00			
77	4	11	8	1.37		100.00			
77	5	0	0						
77	6	643	43	14.95		20.00	80.00		
77	7	3278	497	6.60		22.27	76.75	0.88	0.10
77	8	495	70	7.07		99.58	0.42		
77	9	30	7	4.29		100.00			
77	10	309	8	38.62		50.00	50.00		
77	11	848	8	106.00		100.00			
77	12	0	0						
78	1	14	94	.15		100.00			
78	2	1626	214	7.60		100.00			
78	3	0	79	0.00		0.00			
78	4	0	0						
78	5	3	8	.37		100.00			
78	6	207	151	1.37		100.00			
78	7	430	410	1.05		100.00			
78	8	218	50	4.36		80.00	20.00		
78	9	125	8	15.62	75.00	25.00			
78	10	166	8	20.75		90.00	10.00		
78	11	1140	13	87.69		99.31	0.69		
78	12	11435	79	144.75		99.96	0.04		
79	1	39629	284	139.54		99.97	0.03		
79	2	14108	67	210.57		100.00			
79	3	164	124	1.32		100.00			
79	4	0	0						
79	5	250	36	6.94		60.00	40.00		
79	6	606	42	14.43		96.55	2.96	0.49	
79	7	884	47	18.81		39.18	52.63	7.02	0.58
79	8	780	48	16.25		89.40	10.60		
79	9	596	37	16.11	20.77	76.92	2.31		
79	10	964	43	22.42		70.66	21.59	7.28	0.47
79	11	2654	44	60.32		83.20	13.34	4.46	
79	12	2978	39	76.36		87.45	12.15	0.13	0.13

Table 6 (cont.)

YEAR	MONTH	CROAKER	TOWS	AVERAGE	PERCENT				
					NEW	YOY	ONEYR	TWOYR	THREEYR
80	1	3473	28	124.04		100.00			
80	2	427	48	8.90		100.00			
80	3	152	45	3.38		100.00			
80	4	137	18	7.61		100.00			
80	5	1690	51	33.14		58.67	39.48	10.85	
80	6	1480	51	29.02		83.33	14.29	2.38	
80	7	670	50	13.40		81.25	15.00	3.75	
80	8	356	50	7.12		76.92	23.08		
80	9	816	69	11.83	11.96	98.04			
80	10	601	41	14.66		57.68	41.91	0.41	
80	11	6042	43	140.51		97.77	2.23		
80	12	3255	49	66.43		99.65	0.35		
81	1	762	43	17.72		100.00			
81	2	0	33	0.00		0.00			
81	3	0	52	0.00		0.00			
81	4	0	17	0.00		0.00			
81	5	61	53	1.15			100.00		
81	6	89	35	2.54		12.20	87.80		
81	7	111	38	2.92		56.86	23.53	19.61	
81	8	86	24	3.58		75.68	16.21	8.11	
81	9	46	37	1.24		94.44	5.56		
81	10	332	38	8.74		85.71	14.29		
81	11	3091	39	79.26		100.00			
81	12	1455	49	29.69		99.03	0.97		
82	1	44	11	4.00		100.00			
82	2	1	50	.02		100.00			
82	3	0	65	0.00		0.00			
82	4	12	39	.31			100.00		
82	5	22	54	.41			100.00		
82	6	51	40	1.27		81.82	8.18		
82	7	735	57	12.67		92.20	7.34	0.46	
82	8	515	39	13.21		98.43	1.57		
82	9	339	39	8.69		99.20	0.80		
82	10	515	41	12.56		35.33	64.67		
82	11	2577	39	66.08		96.19	3.81		
82	12	13123	38	345.34		99.66	0.34		

Table 7

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
51	10			0.50		
51	11			1.50		
51	12		4.90			
52	1		5.40			
52	2		13.23			
52	3		5.44			
52	4		15.77			
52	5		12.12	1.38		
52	6		16.79	0.61		
52	7		19.78	2.79	0.09	
52	8		1.53	0.69		
52	9		0.44	0.04		
52	10		10.83			
52	11		16.63			
52	12		22.89			
53	1		2.56			
53	2		26.38			
53	3		53.39			
53	4		32.02	0.30	0.10	
53	5		60.84	0.12		
53	6		29.50	0.30	0.07	
53	7		6.83	0.10		
53	8		0.66			
53	9	2.19	0.27			
53	10		52.25	0.81		
53	11		91.21			
53	12		30.52			
54	2		30.39			
54	3		12.99			
54	4		22.45	2.48		
54	5		5.87	1.56		
55	2					
55	3		1.00			
55	4		0.33			
55	5					
55	6		11.40	11.40		
55	7		8.63	2.88		
55	8					
55	9		1.67			
56	4			0.06		
56	5			13.88		
56	7		0.59	1.76		
56	8		0.35	1.05		
56	9		0.72	0.22		
56	10		2.62			
56	11		5.56			
56	12		21.94			

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
57	1		11.75			
57	2		2.44			
57	3		6.75			
57	5		101.36	19.31		
57	7		34.80			
57	8	12.06	22.68	1.20	0.24	
57	9	10.33	22.93		0.08	
57	10		5.66	1.78		
57	11		10.12	0.07		
57	12		14.87			
58	1		1.06			
58	2		0.25			
58	3					
58	4		0.62			
58	5		0.47			
58	6			2.62		
58	7			2.81		
58	8		0.06			
58	9		3.44			
58	10		7.48	3.21		
58	11		6.76	0.36		
58	12		2.62			
59	4					
59	5				2.00	
59	6		0.94		0.31	
59	7		1.46	0.18	0.18	
59	8		0.25			
59	9		0.06			
59	10		17.31			
59	11		0.87			
60	5		10.17	3.39		
60	6		0.27	0.09		
60	7		8.35	2.78		
60	8		1.85			
61	1		7.33	7.33		
61	4					
61	5			0.12		
61	6			0.12		
61	7			0.25		
61	8		1.13	1.13		
61	9		0.14			
61	10		0.75	0.25		
61	11		0.37			
61	12		2.12			

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
62	1		1.00			
62	2		0.62			
62	3		0.12			
62	4					
62	5		8.75			
62	6		9.87			
62	7		24.00			
62	8		6.87			
62	9	0.22	8.55	0.22		
62	10					
62	11		1.90	0.10		
62	12		0.29			
63	1		0.17			
63	2					
63	3					
63	4					
63	5					
63	6					
63	7		0.33			
63	8		0.11			
63	9			0.11		
63	10					
63	11		5.00			
63	12		4.67			
64	1		0.61			
64	2					
64	3					
64	4					
64	5					
64	6			7.67		
64	7			2.87		
64	8	0.13	0.94			
64	9	0.07	2.86			
64	10		0.20	3.16		
64	11		7.57	6.43		
64	12		26.52	0.06		
65	1		10.05			
65	2		1.85			
65	3		5.24			
65	4		2.29			
65	5		5.02	31.52		
65	6		4.85	13.56		
65	7		10.57	9.36		
65	8		2.74	1.89		
65	9			0.57		
65	10		5.27			
65	11		34.27			
65	12		16.95			

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
66	1		5.43			
66	2		0.10			
66	3					
66	4					
66	5		0.08	0.68		
66	6			0.16		
66	7			0.12		
66	8			0.06	0.39	
66	9			0.62		
66	10		4.10	0.07		
66	11		9.60			
66	12		9.53			
67	1		2.20			
67	2		0.53			
67	3		0.06			
67	4		0.09	0.09		
67	5		0.90	1.10		
67	6		5.24	0.55		
67	7		2.92	0.30		
67	8		2.29	0.42	0.03	
67	9		0.17			
67	10					
67	11					
67	12		0.04			
68	1		0.23			
68	2					
68	3					
68	4		0.04			
68	5					
68	6		1.48			
68	7		0.24			
68	8		0.49	0.03		
68	9		0.26			
68	10		0.07	0.10		
68	11		17.57	0.39		
68	12		16.54			
69	1		0.35			
69	2					
69	3					
69	4					
69	5			0.25		
69	6			0.50		
69	7		1.60	0.48		
69	8		3.57			
69	9	0.94	1.02	0.04		
69	10		44.41	1.26		
69	11		47.08	0.17		
69	12		31.92			

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
70	1		1.35			
70	2					
70	3					
70	4		0.08			
70	5		0.28	0.05		
70	6			0.17		
70	7			0.78		
70	8			0.04		
70	9		8.75			
70	10		2.39	19.44		
70	11		2.34	9.70		
70	12		58.73			
71	1		1.49			
71	2		0.28			
71	3					
71	4		0.26	0.17		
71	5		0.06	0.24		
71	6		0.13	0.22		
71	7		0.48	0.97		
71	8		1.02	0.99	0.03	
71	9	0.15	0.02	0.40		
71	10		2.36			
71	11		18.97			
71	12		47.34			
72	1		53.77			
72	2		80.45			
72	3		14.41			
72	4		16.27			
72	5		8.92			
72	6		39.02	2.50		
72	7	0.05	0.13	0.05		
72	8	1.02	20.88			
72	9	4.60	1.87			
72	10		8.03	5.30		
72	11		22.71	4.15		
72	12		18.80			
73	1		7.89			
73	2		7.49			
73	3		21.92			
73	4		7.99	0.10		
73	5		7.92			
73	6		1.62	2.94		
73	7		13.94	0.18		
73	8	0.03	4.12	0.05		
73	9	22.63	5.18			
73	10		83.32	3.60		
73	11		5.28	0.60		
73	12		2.00	0.08		

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
74	1		10.13	0.01		
74	2		118.43			
74	3		77.57	3.66		
74	5		133.35	7.02		
74	6		330.07	36.67		
74	7		20.11	2.54	0.35	0.08
74	8		27.37			
74	9		58.12			
74	10		10.41	18.74	0.59	
74	11		9.68	9.49	0.19	
75	1		121.36	0.07		
75	2		56.06	0.05		
75	3		170.31			
75	5		35.10	3.90		
75	6		70.08	7.79		
75	7		62.19	10.31	0.50	
75	8	3.76	34.47	8.01	0.33	
75	9	1.26	13.24	0.79		
75	11		106.12			
76	1		62.83			
76	2		0.28			
76	3		564.49	3.81		
76	4		29.21	1.54		
76	5		17.41	1.51		
76	6		125.93	15.56		
76	7	0.79	29.85	3.06	1.19	0.03
76	8	4.70	79.83	9.39		
76	9	2.88	24.51	1.44		
76	10		100.03	11.11		
76	11		173.85	9.15		
77	3		0.48			
77	4		1.37			
77	6		2.99	11.96		
77	7		1.47	5.07	0.06	0.01
77	8		7.04	0.03		
77	9		4.29			
77	10		19.31	19.31		
77	11		106.00			
78	1		0.15			
78	2		7.60			
78	3					
78	5		0.37			
78	6		1.37			
78	7		1.05			
78	8		3.49	0.87		
78	9	11.71	3.90			
78	10		18.67	2.07		
78	11		87.08	0.61		
78	12		144.69	0.06		

Table 7 (cont.)

YEAR	MONTH	INDICES				
		NEW	YOY	ONEYR	TWOYR	THREEYR
79	1		139.50	0.04		
79	2		210.57			
79	3		1.32			
79	5		4.16	2.78		
79	6		13.93	0.43	0.07	
79	7		7.37	9.90	1.32	0.11
79	8		14.53	1.72		0.11
79	9	3.35	12.39	0.37		
79	10		15.84	4.84	1.63	0.11
79	11		50.19	8.05	2.69	
79	12		66.78	9.28	0.10	0.10
80	1		124.04			
80	2		8.90			
80	3		3.38			
80	4		7.61			
80	5		19.44	13.08	3.60	
80	6		24.18	4.15	0.69	
80	7		10.89	2.01	0.50	
80	8		5.48	1.64		
80	9	1.41	11.60			
80	10		8.46	6.14	0.06	
80	11		137.38	3.13		
80	12		66.20	0.23		
81	1		17.72			
81	2					
81	3					
81	4					
81	5			1.15		
81	6		0.31	2.23		
81	7		1.66	0.69	0.57	
81	8		2.71	0.58	0.29	
81	9		1.17	0.07		
81	10		7.49	1.25		
81	11		79.26			
81	12		29.40	0.29		
82	1		4.00			
82	2		0.02			
82	3					
82	4			0.31		
82	5			0.41		
82	6		1.04	0.10		
82	7		11.68	0.93	0.06	
82	8		13.00	0.21		
82	9		8.62	0.07		
82	10		4.44	8.12		
82	11		63.56	2.52		
82	12		344.17	1.17		

TABLE 8

TABLE 8. YORK RIVER TRAWL SURVEY GEAR EFFICIENCY FOR CROAKER (1971-1977)*

Year	Gear	# Tows	# Croaker/Tow	% C/T by Gear/year	X ²	df	Probability
71	Unlined 16 foot otter trawl	112	12.43	54%	0.32		
	Lined 16 foot otter trawl	264	10.38	46%	<u>0.32</u> 0.64	1	NS
72	Unlined 16 foot otter trawl**	8	20.25	20%	5.31		
	Unlined 30 foot otter trawl	82	41.65	41%	1.78		
	Lined 16 foot otter trawl	373	39.54	39%	<u>0.98</u> 8.07	2	NS
73	Lined 16 foot otter trawl	600	28.08	75%	12.5		
	Unlined 30 foot semi-balloon trawl**	16	9.25	25%	<u>12.5</u> 25.0	1	<0.0005
74	Lined 16 foot otter trawl			100%			
75	Lined 16 foot otter trawl	79	73.14	20%	18.0		
	Lined 30 foot otter trawl	94	301.51	80%	<u>18.0</u> 36.0	1	<0.0005
76	Lined 16 foot otter trawl	98	59.88	52%	0.08		
	Lined 30 foot otter trawl	25	55.49	48%	<u>0.08</u> 0.16	1	NS
77	Lined 16 foot otter trawl	95	4.29	84%	23.12		
	Lined 30 foot otter trawl	76	0.82	16%	<u>23.12</u> 46.24	1	<0.0005
					116.11	12	<0.0005

* 1955-1970: Only 1 gear used - unlined 30 foot otter trawl

** Indicates gear used during one year only.

FIGURES

Figure 1

Record layout of the SIR hierarchical system.

CASE: YEAR

RECORD TYPE 1: YEAR | RIVER | MONTH | COLLNUM | DAY | TEMP | SALT | LAT | LONG

RECORD TYPE 2: YEAR | RIVER | MONTH | COLLNUM | SPECIES | TOTALN | TOTALWT | AVGWT

RECORD TYPE 3: YEAR | COLLNUM | SPECIES | SIZEID | SIZE

Figure 2

Yearly juvenile indices for all rivers
compared to those for just the York River system.

Young-of-the-Year Croaker Chesapeake Bay and York River

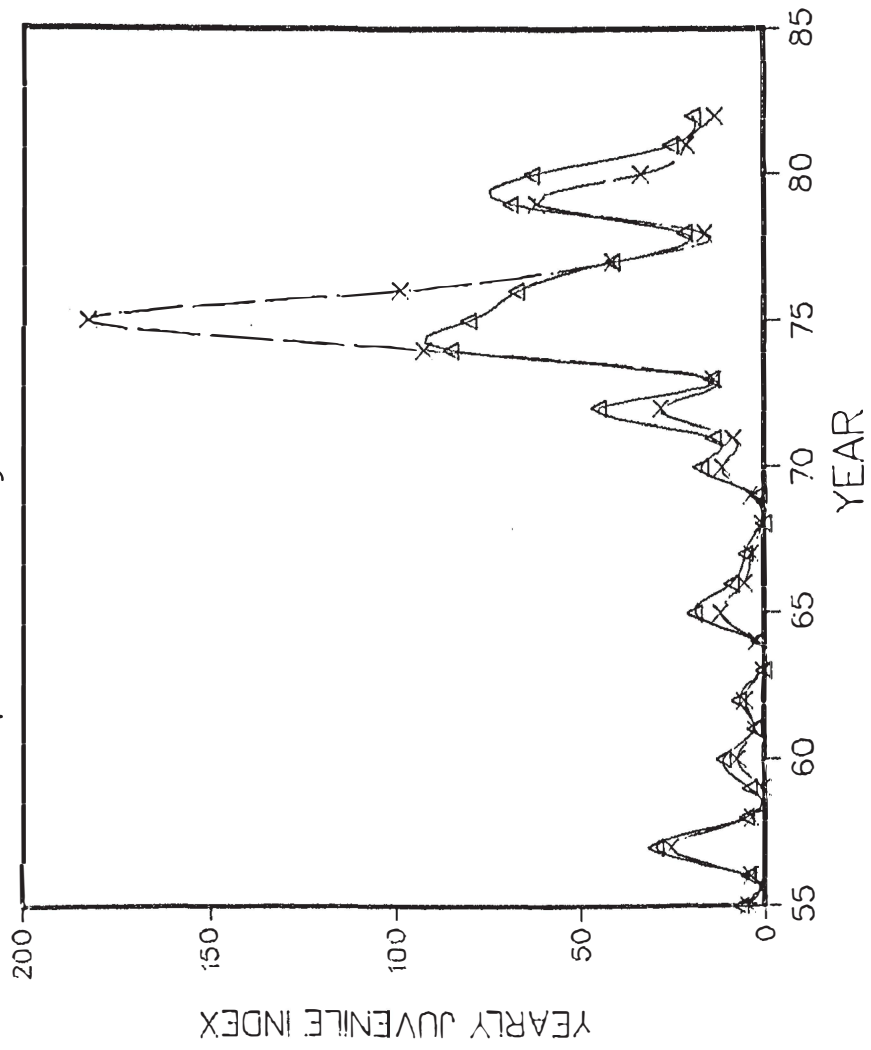


Figure 3

Modal lengths and ranges for croaker in July
versus the average January-February-March VIMS pier temperature.

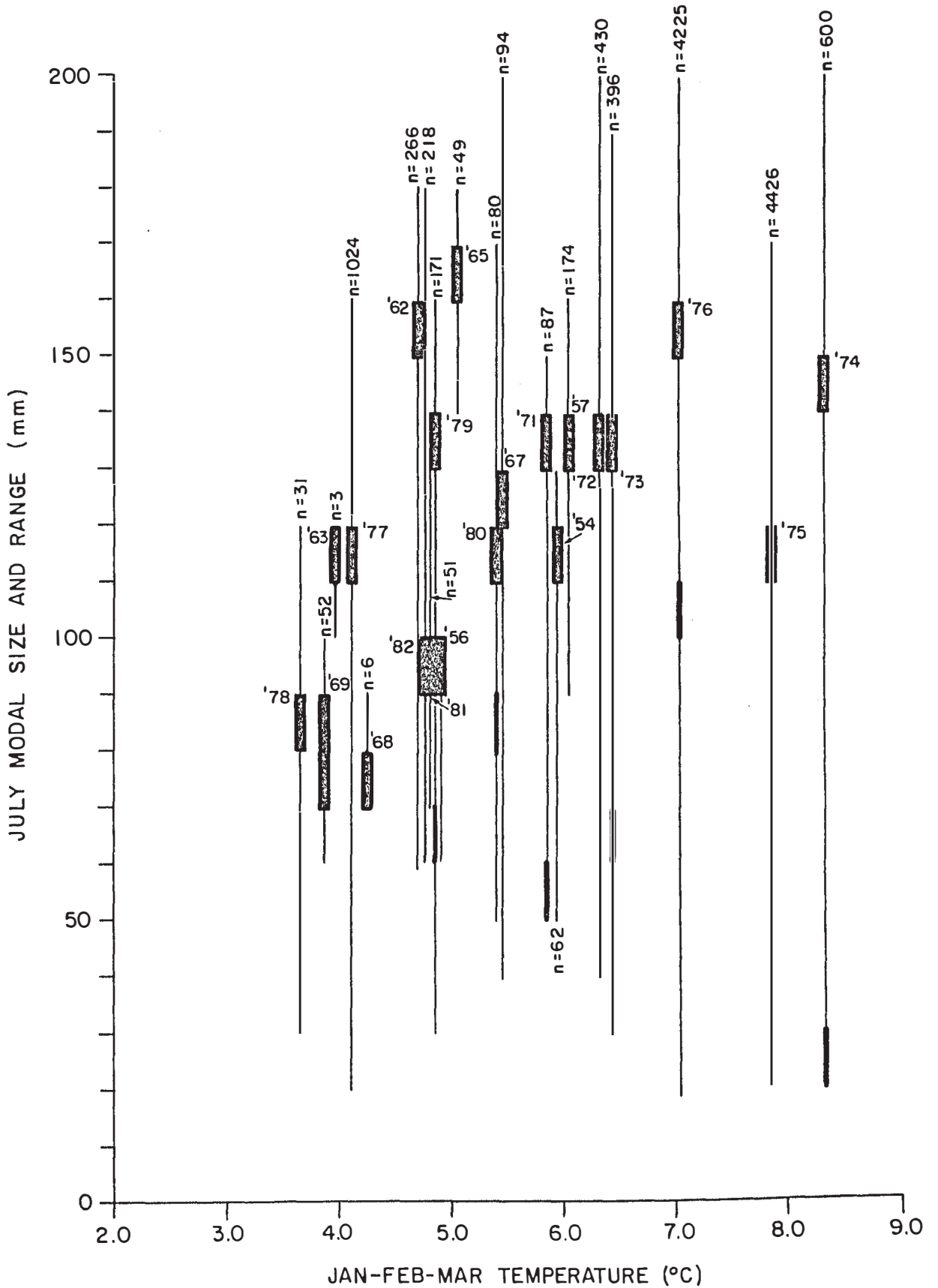


Figure 4

Time series (1973-1980) of modal sizes of croaker in the Chesapeake Bay and nearshore region. Year classes are separated by curved vertical lines. Average January-February-March temperatures ($^{\circ}\text{C}$) are designated between these separations. Cessation of summer wind is indicated by bars in the time scale at the bottom.

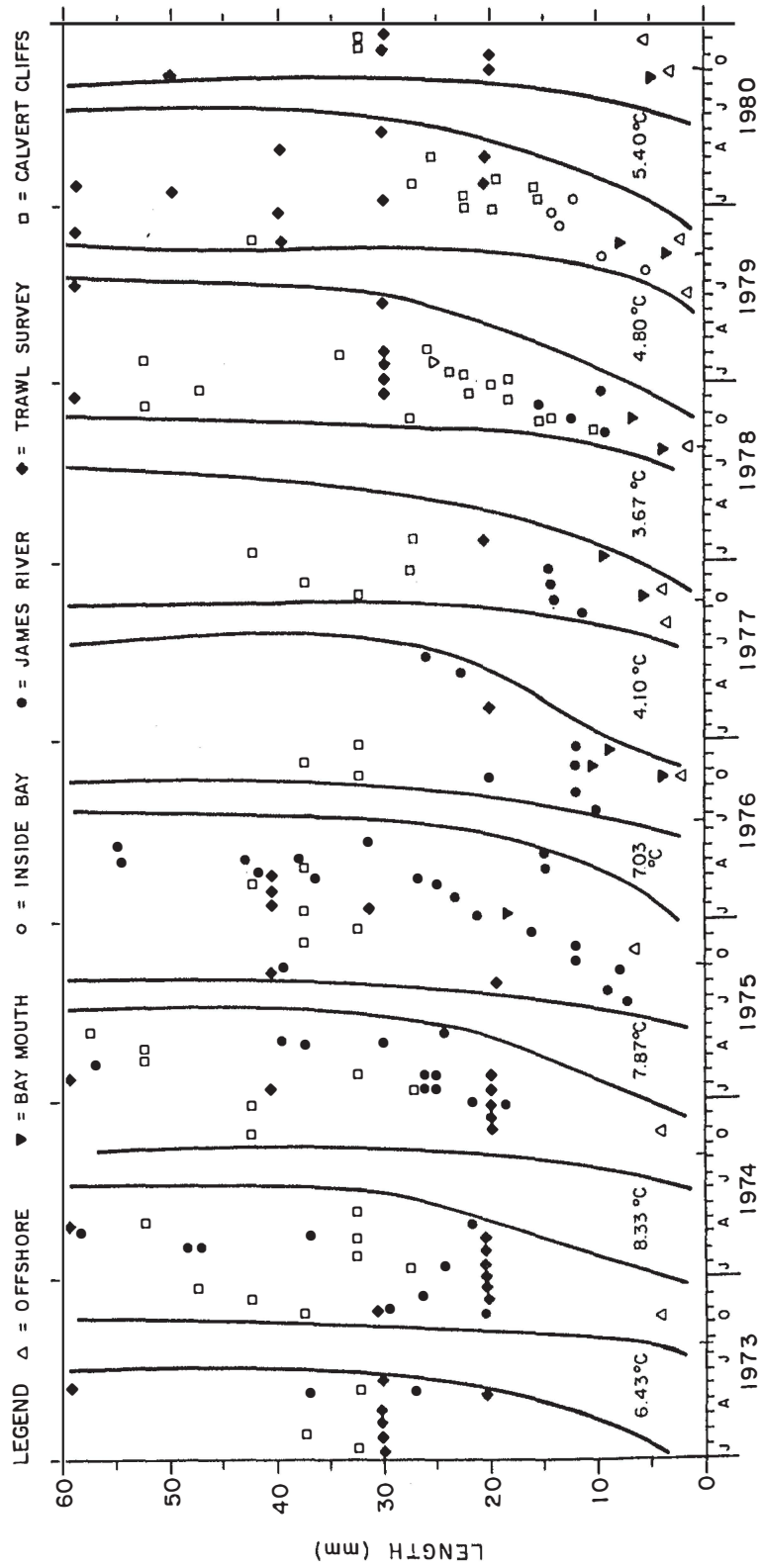
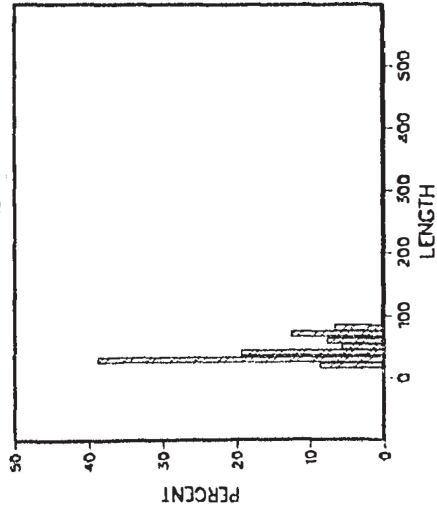


Figure 5

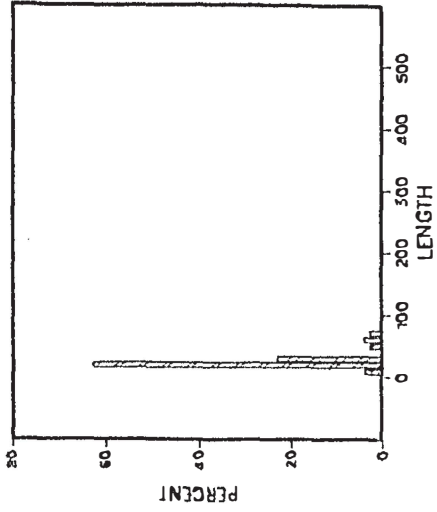
Length/frequency graphs for each month for 1952-82,
divided by year class.

Length Frequency for Croaker

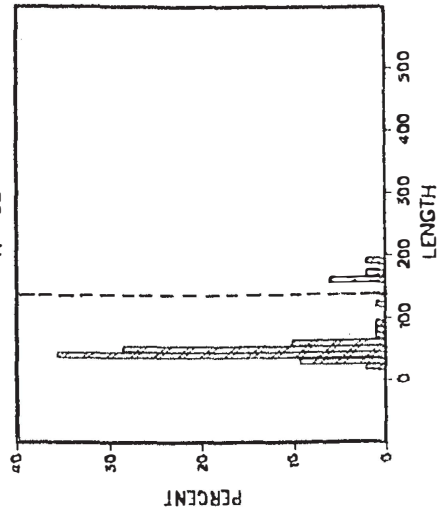
March, 1952
N = 103



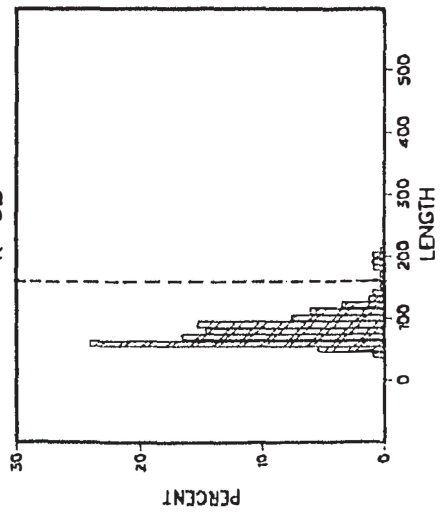
April, 1952
N = 73



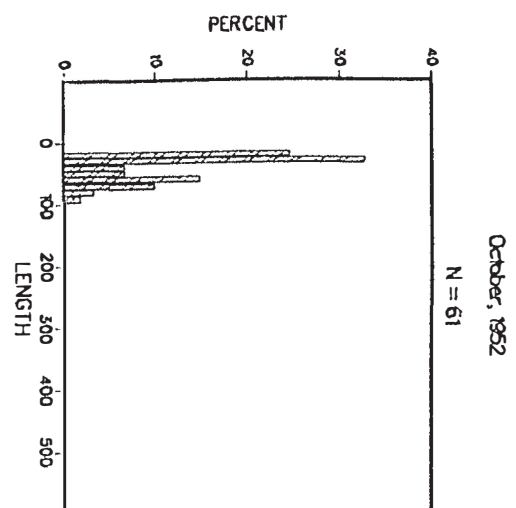
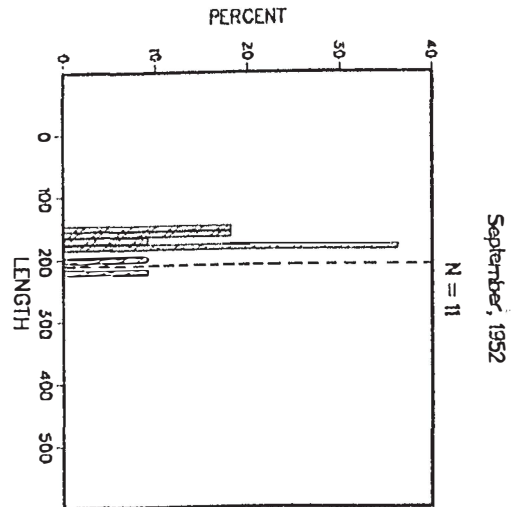
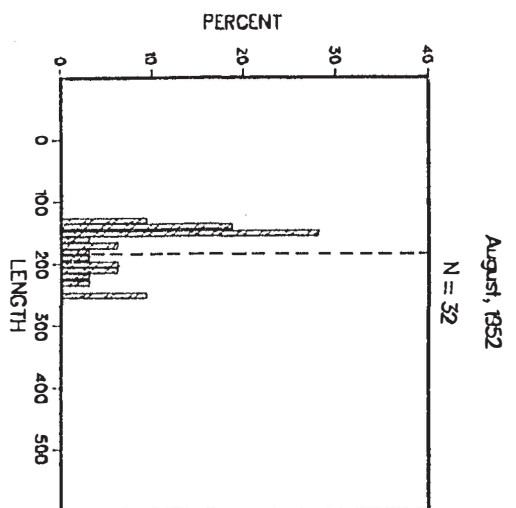
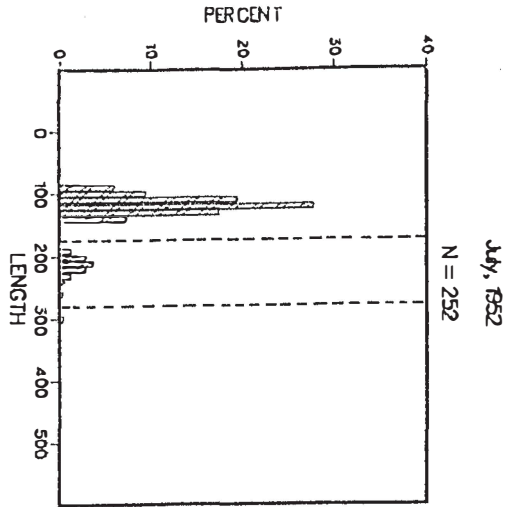
May, 1952
N = 92



June, 1952
N = 315

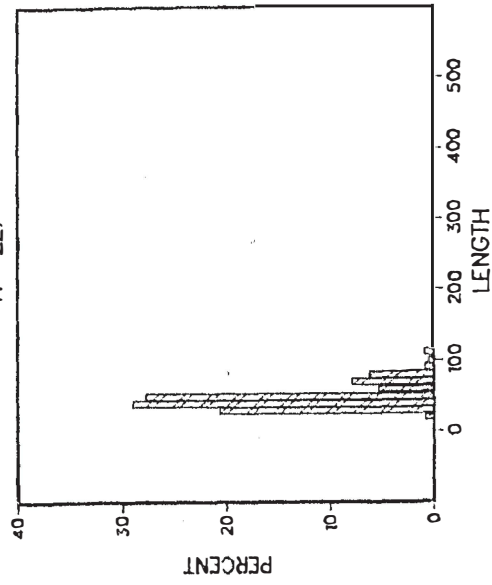


Length Frequency for Crocker

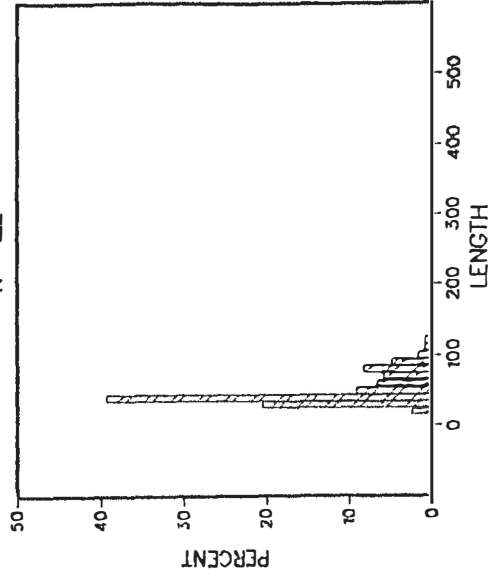


Length Frequency for Croaker

November, 1952
N = 227



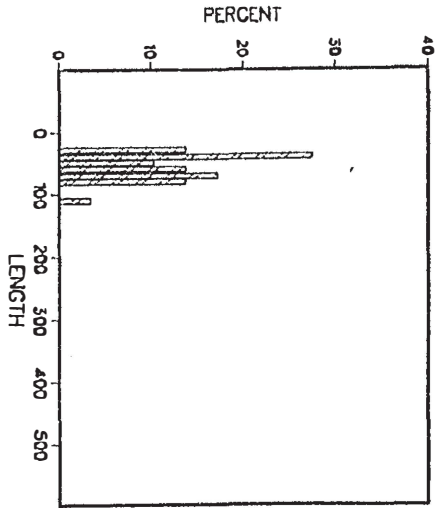
December, 1952
N = 122



Length Frequency for Crocker

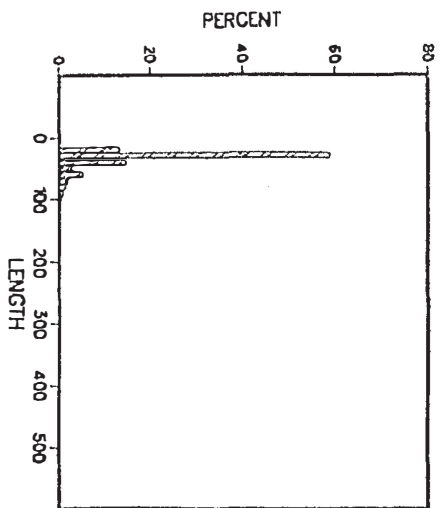
January, 1953

N = 29



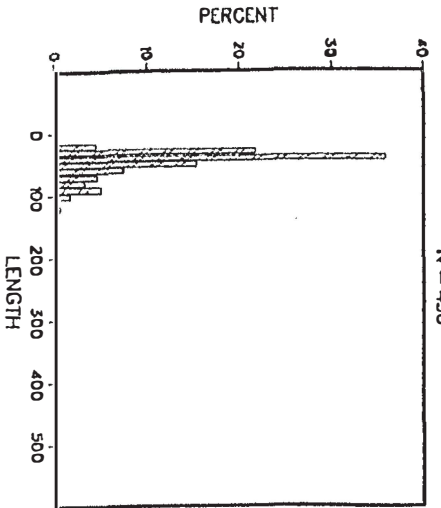
February, 1953

N = 209



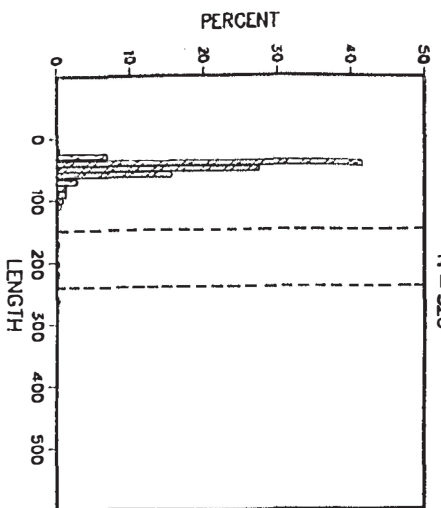
March, 1953

N = 496



April, 1953

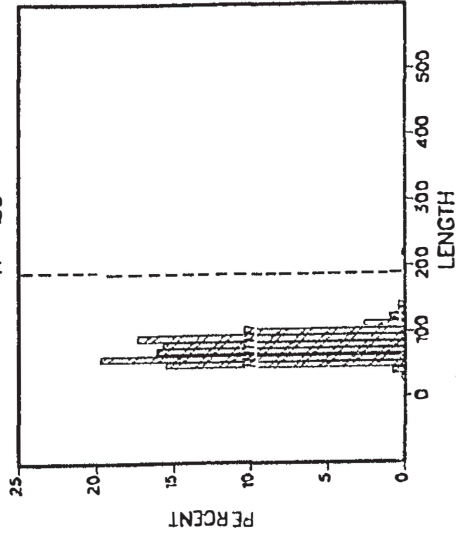
N = 320



Length Frequency for Croaker

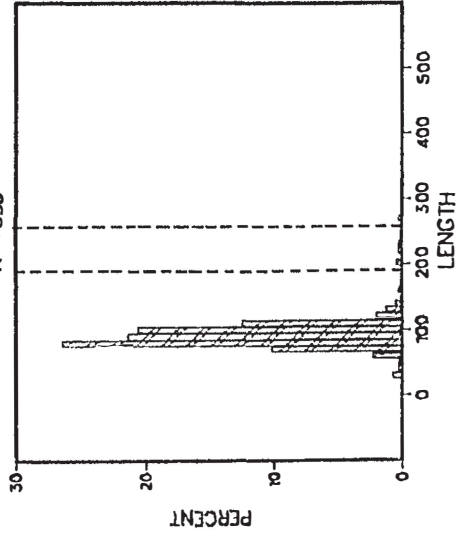
May, 1953

N = 496



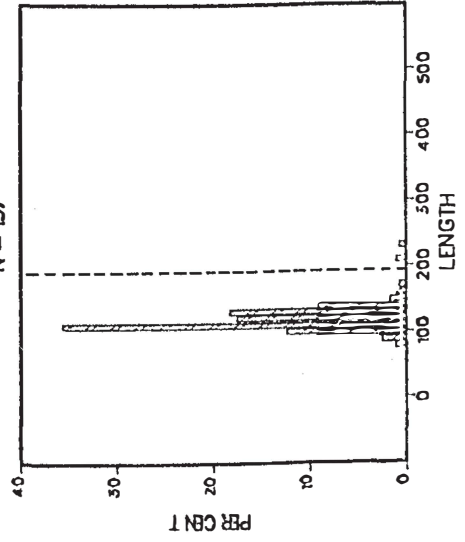
June, 1953

N = 393



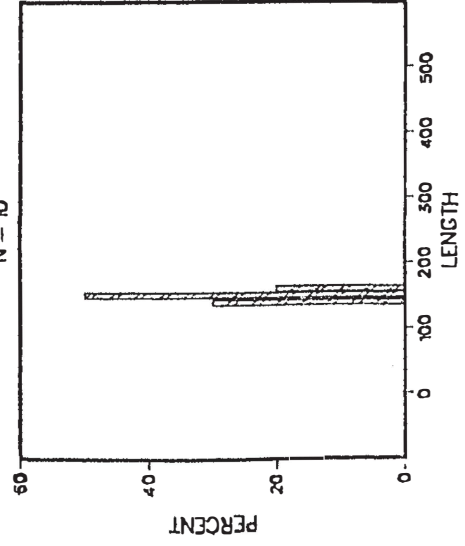
July, 1953

N = 137



August, 1953

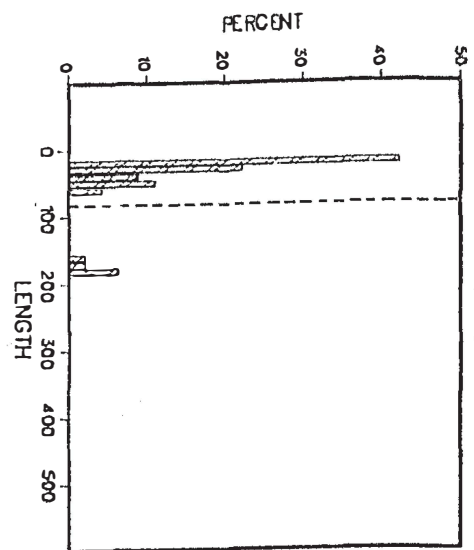
N = 10



Length Frequency for Crocker

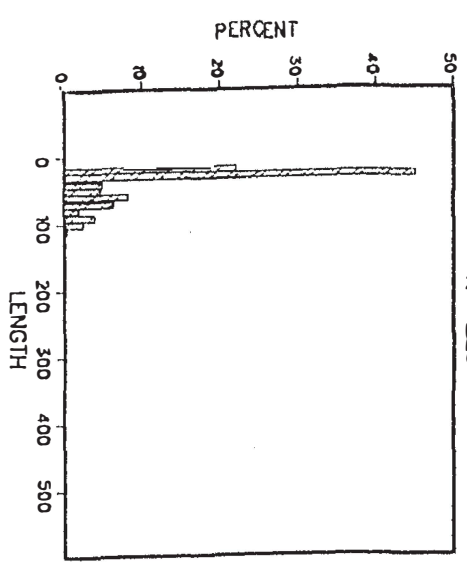
September, 1953

N = 45



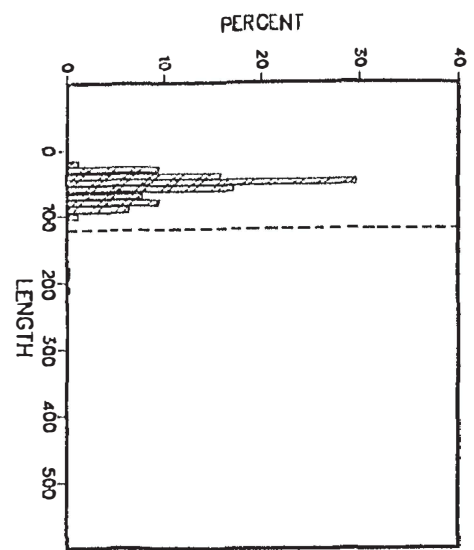
November, 1953

N = 1226



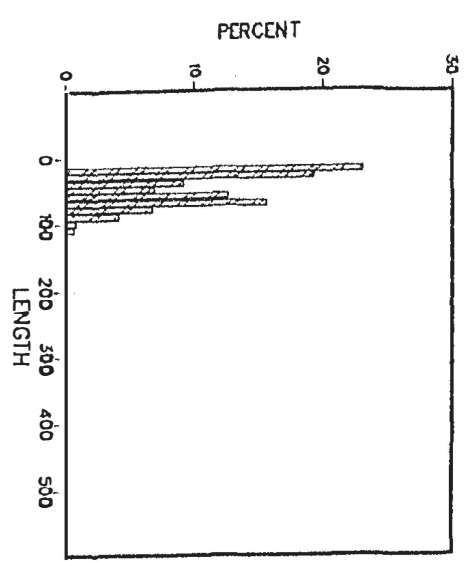
October, 1953

N = 590



December, 1953

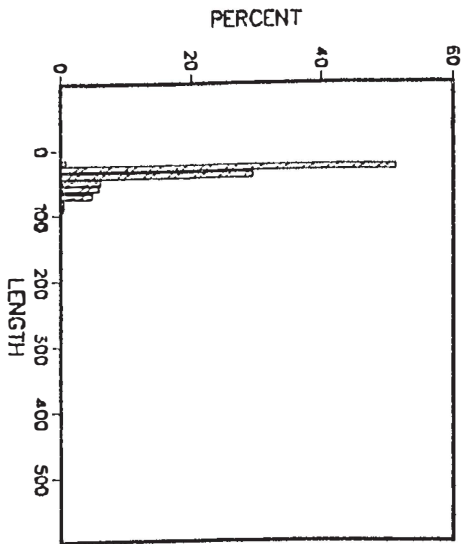
N = 656



Length Frequency for Crocker

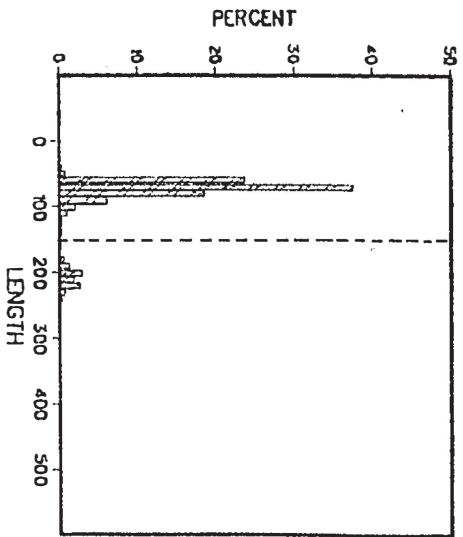
February, 1954

N = 527



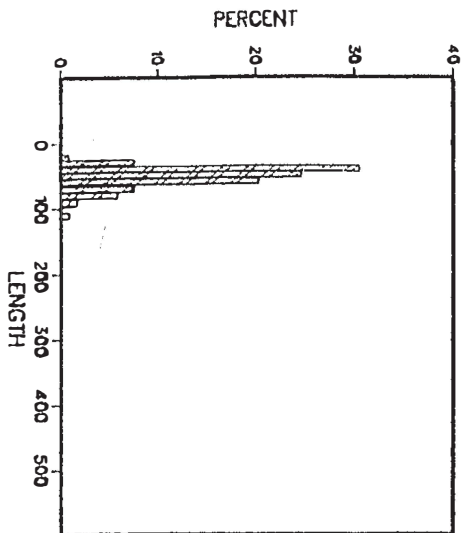
April, 1954

N = 453



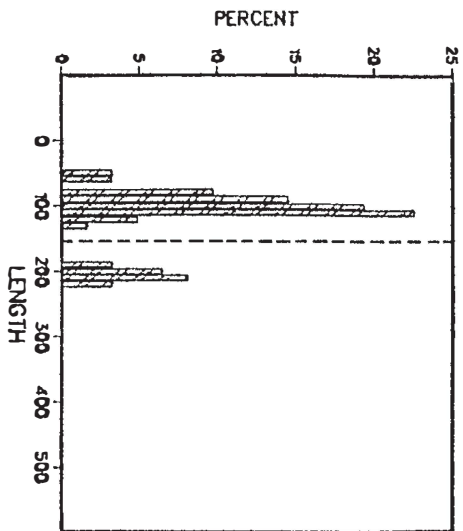
March, 1954

N = 118



May, 1954

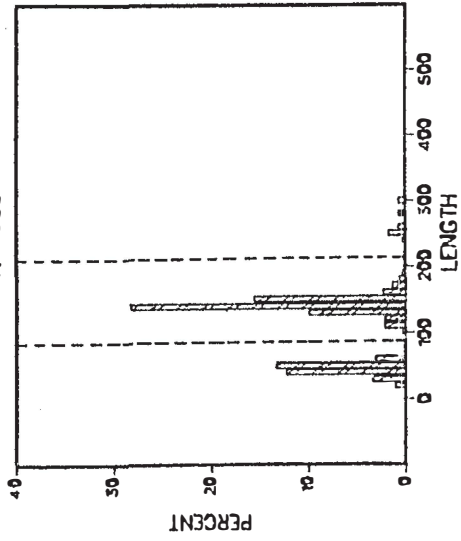
N = 62



Length Frequency for Croaker

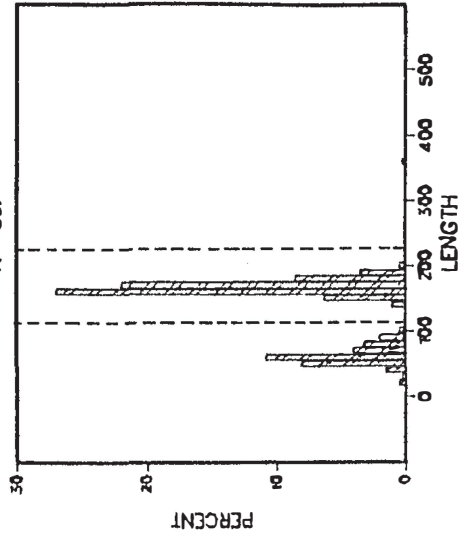
August, 1957

N = 300



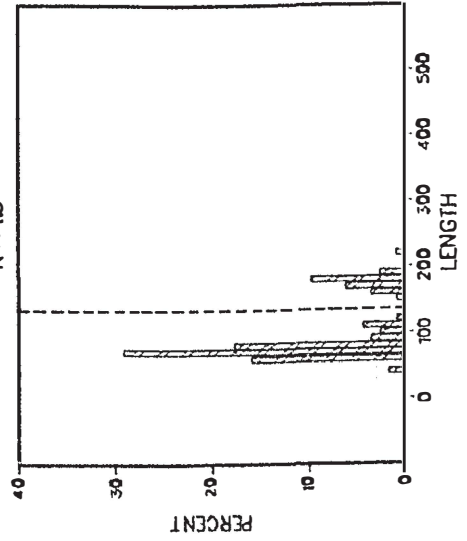
September, 1957

N = 397



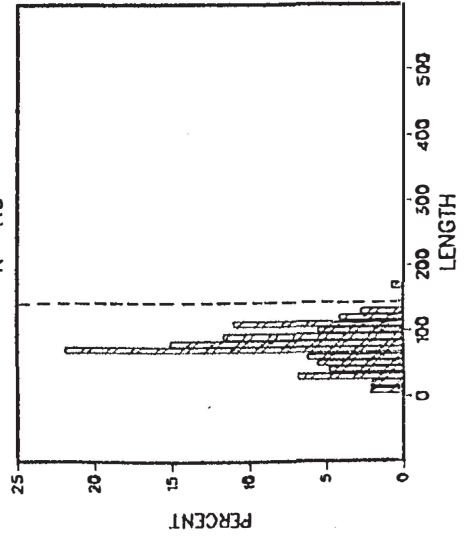
October, 1957

N = 113

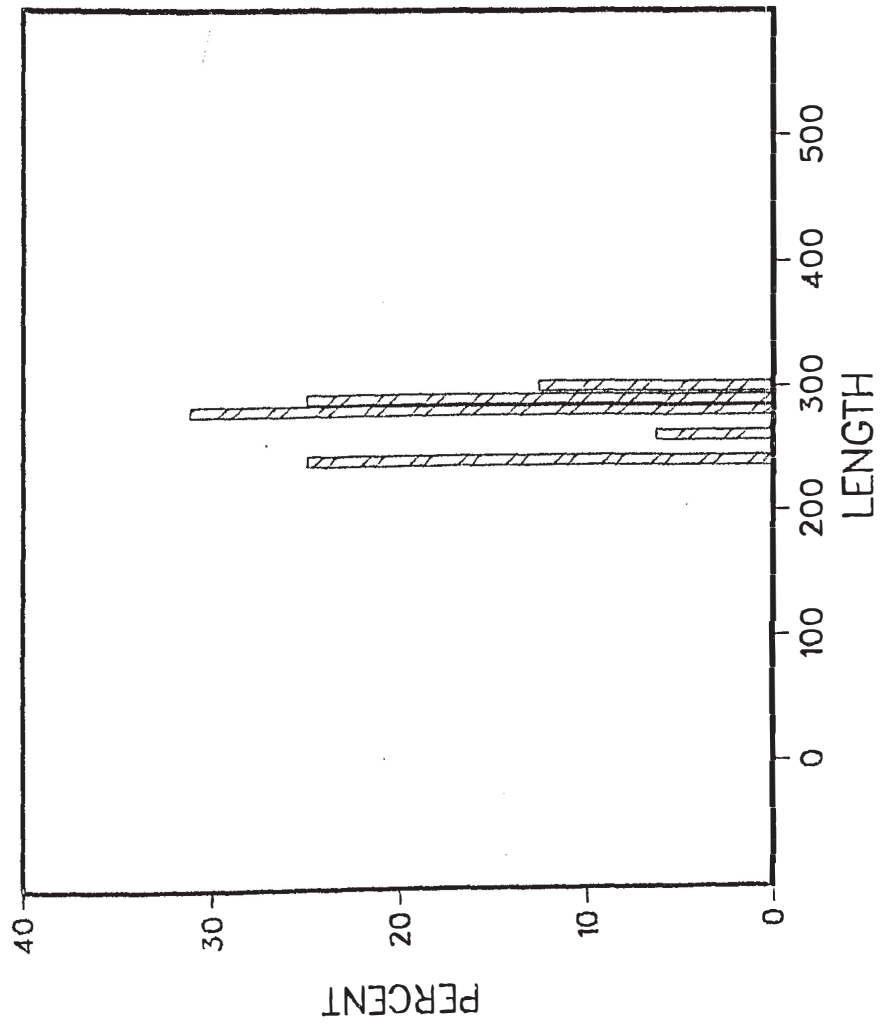


November, 1957

N = 146

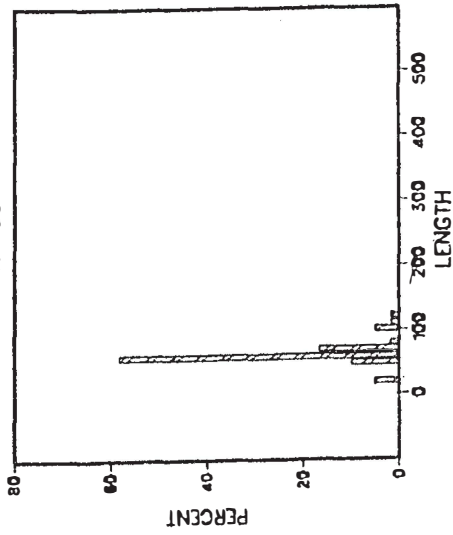


Length Frequency for Croaker
May, 1959
N = 16

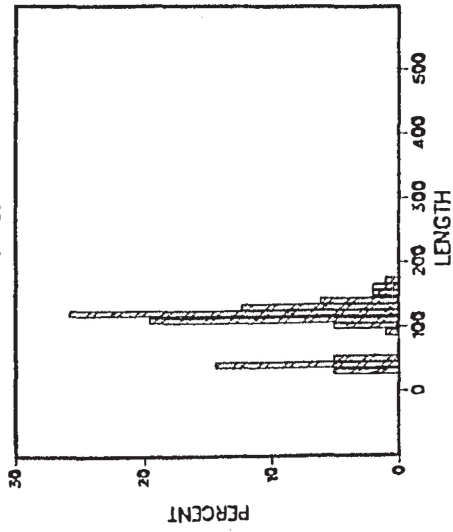


Length Frequency for Croaker

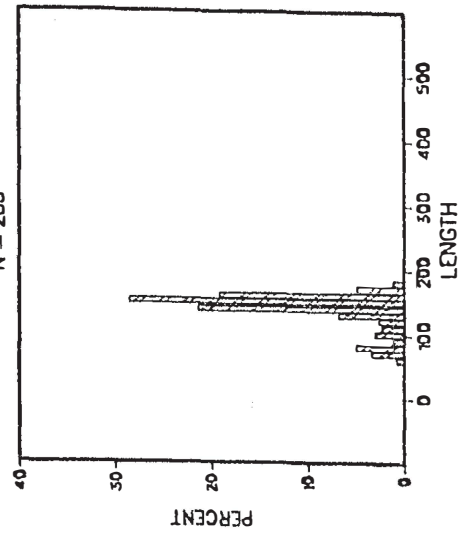
May, 1962
N = 60



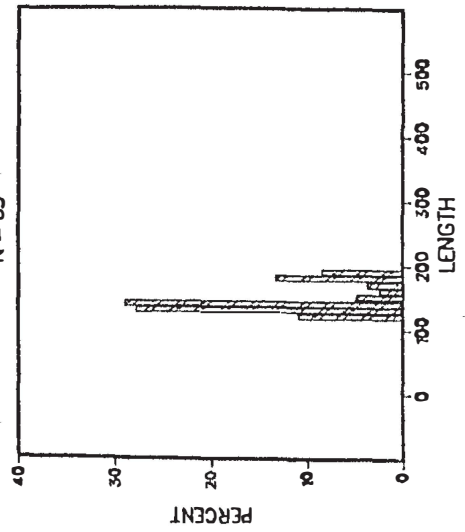
June, 1962
N = 97



July, 1962
N = 266



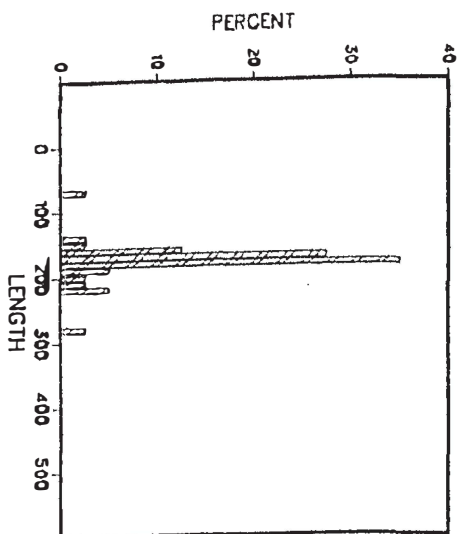
August, 1962
N = 85



Length Frequency for Croaker

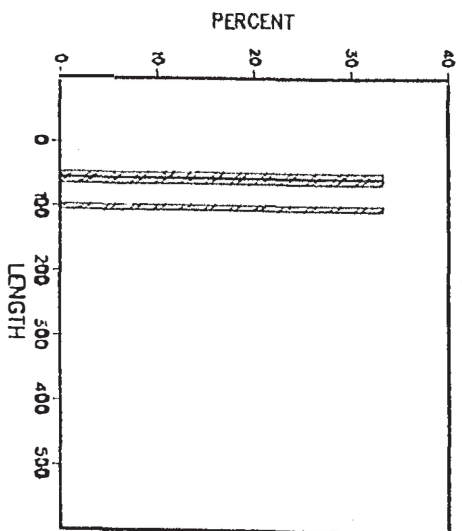
September, 1962

N = 40



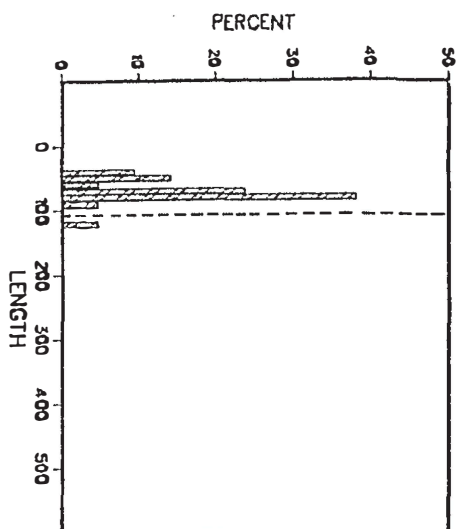
December, 1962

N = 3



November, 1962

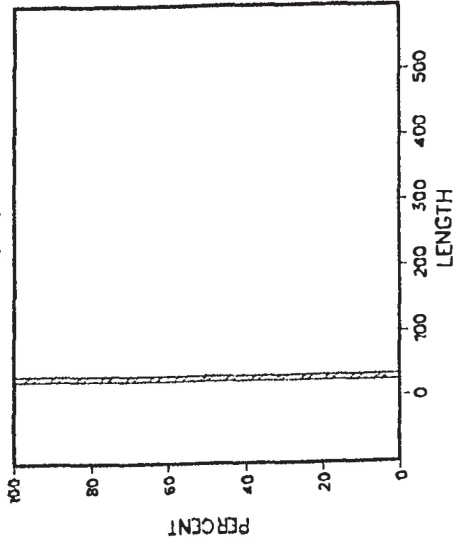
N = 21



Length Frequency for Croaker

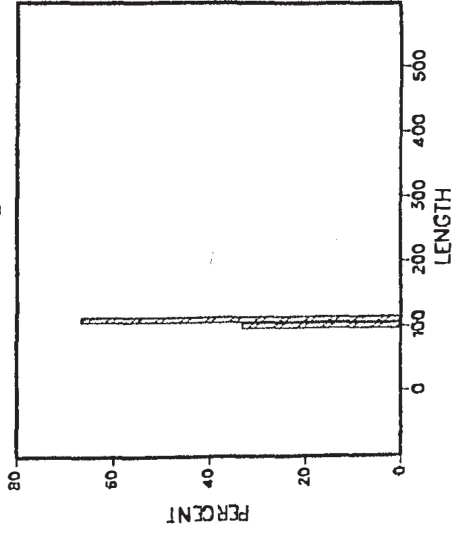
January, 1963

N = 1



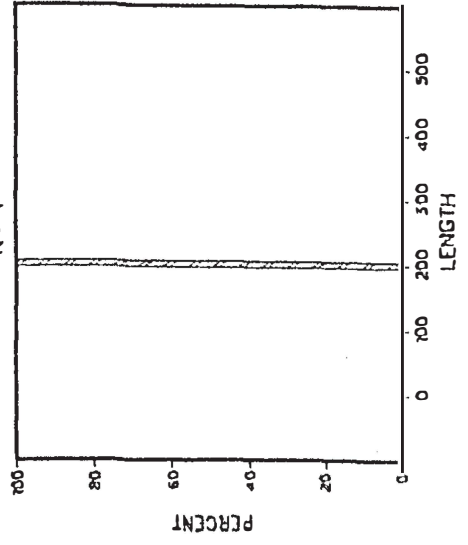
July, 1963

N = 3



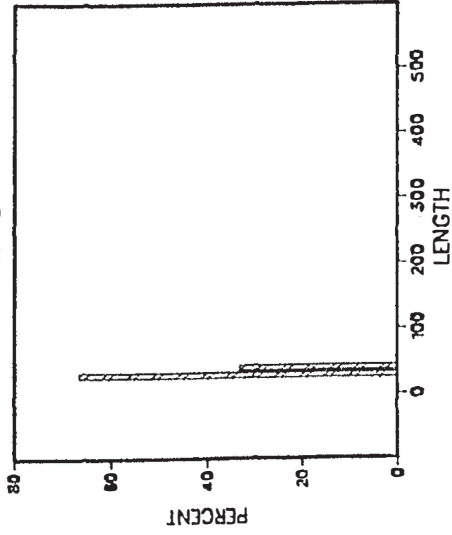
September, 1963

N = 1

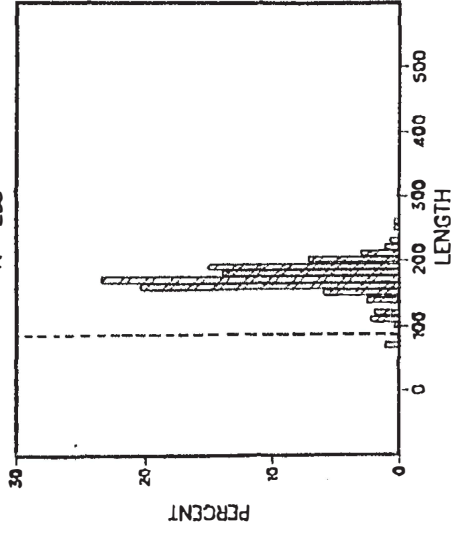


Length Frequency for Crocker

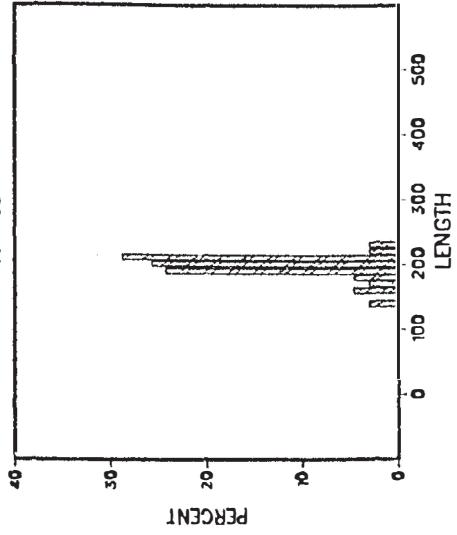
January, 1964
N = 3



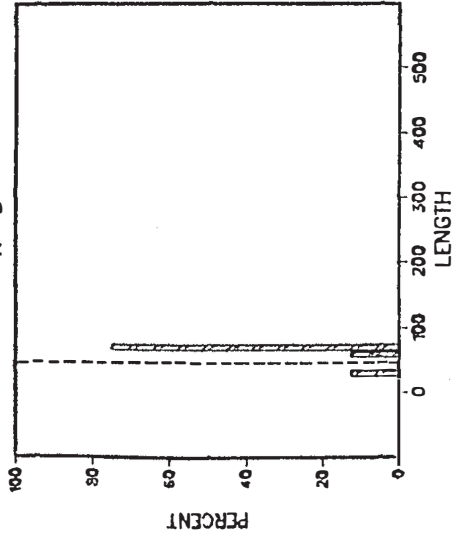
June, 1964
N = 265



July, 1964
N = 66



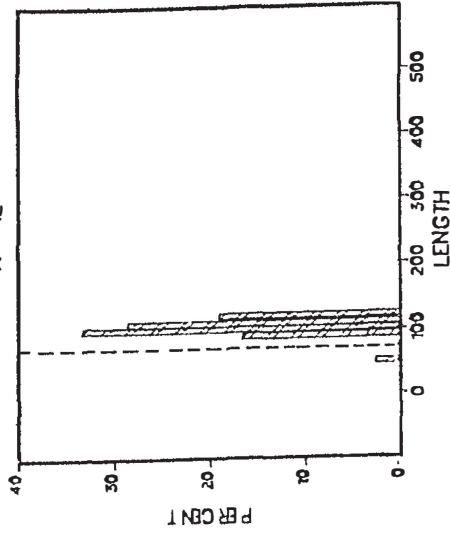
August, 1964
N = 8



Length Frequency for Croaker

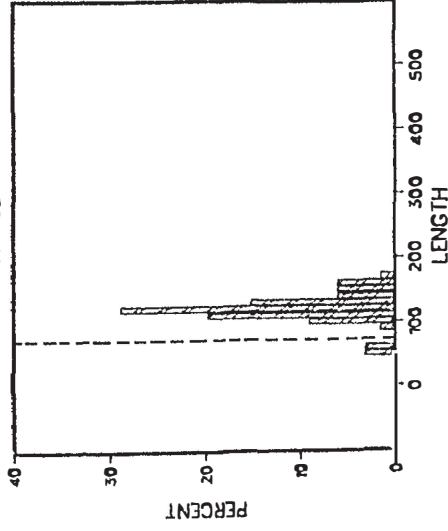
September, 1964

N = 42



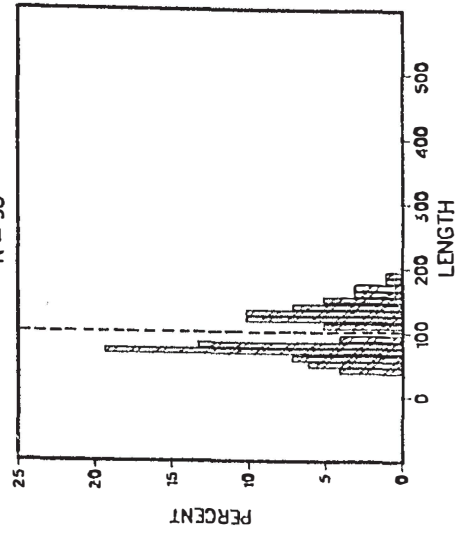
October, 1964

N = 66



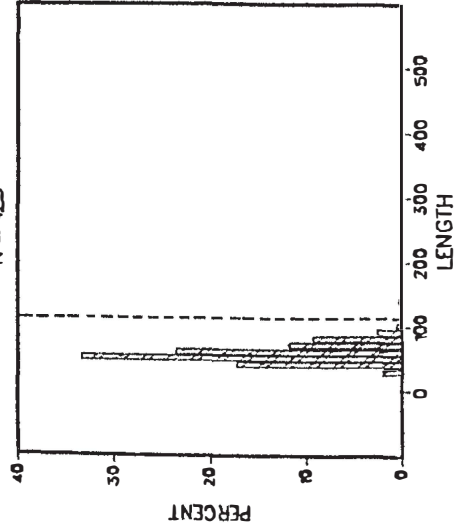
November, 1964

N = 98



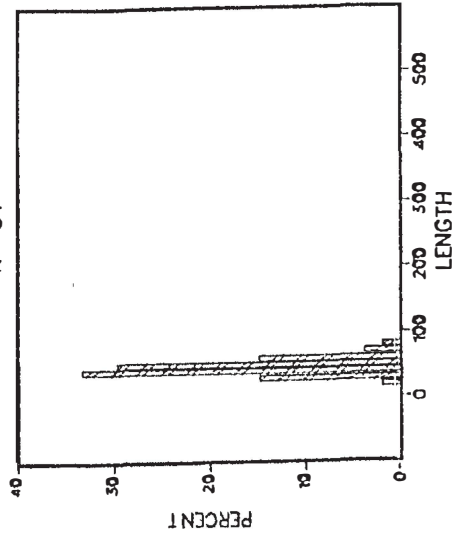
December, 1964

N = 425

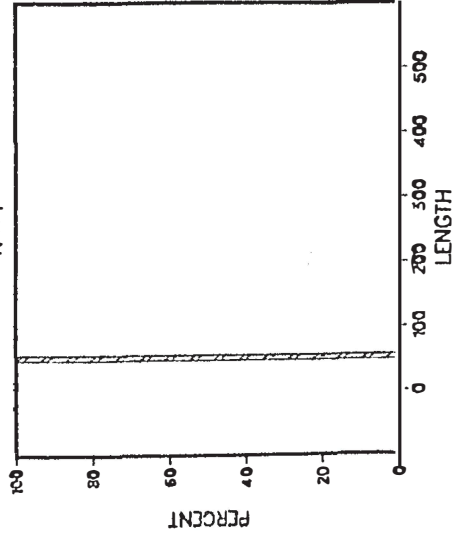


Length Frequency for Croaker

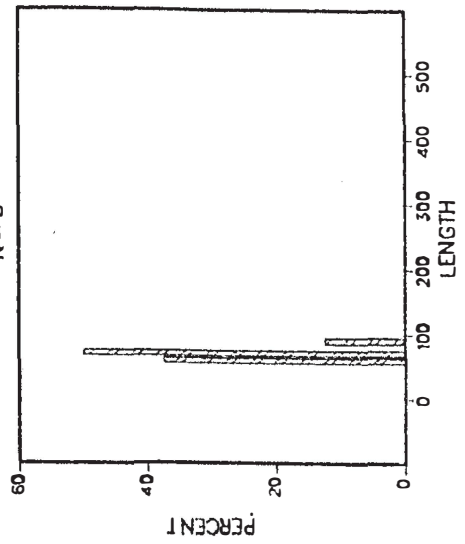
January, 1965
N = 54



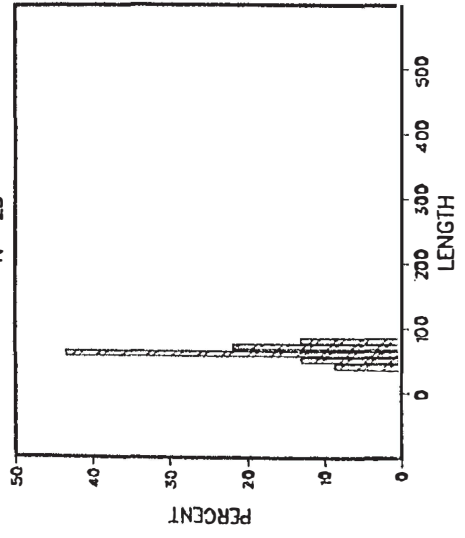
February, 1965
N = 1



March, 1965
N = 8



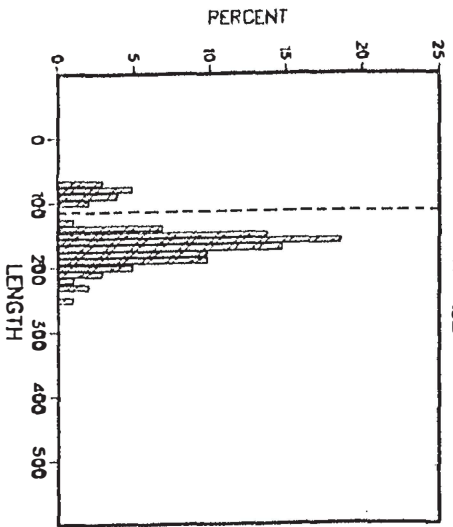
April, 1965
N = 23



Length Frequency for Croaker

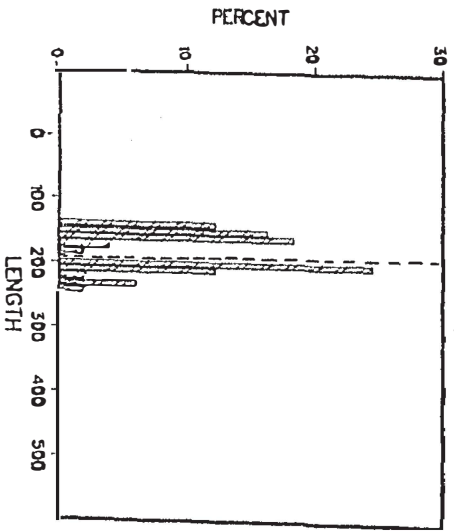
May, 1965

N = 102



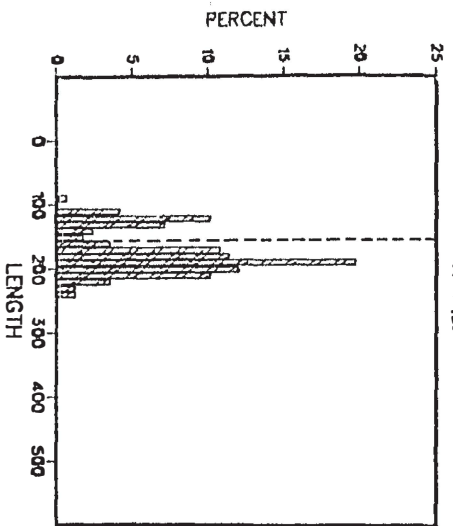
July, 1965

N = 49



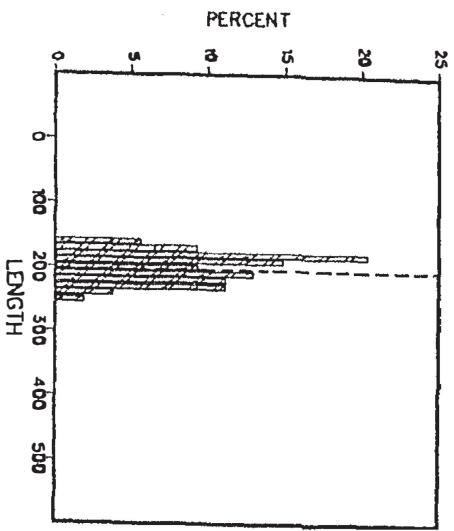
June, 1965

N = 167



August, 1965

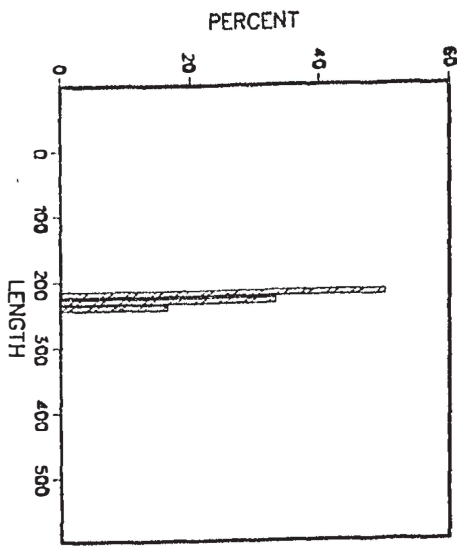
N = 54



Length Frequency for Crocker

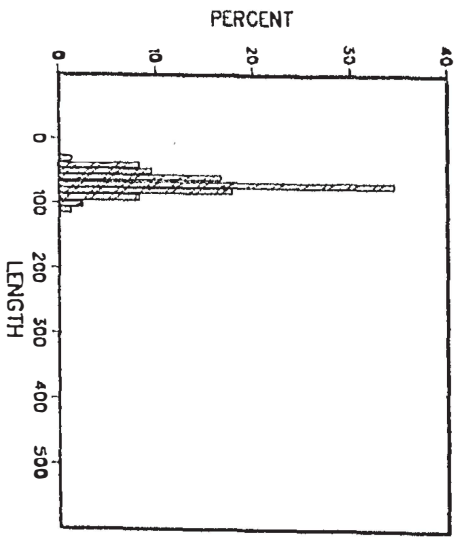
September, 1965

N = 6



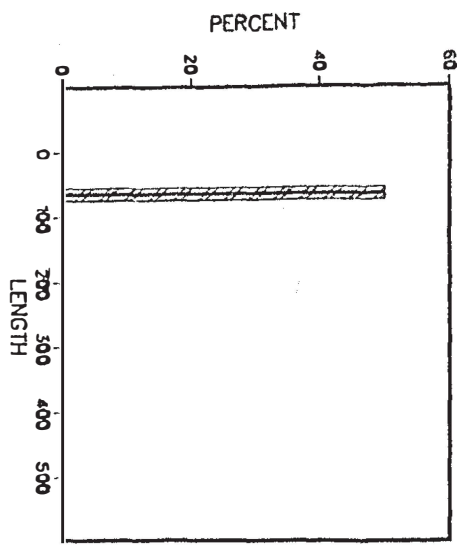
November, 1965

N = 84



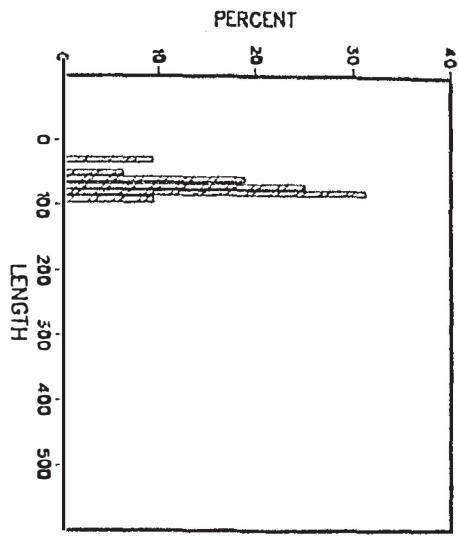
October, 1965

N = 2



December, 1965

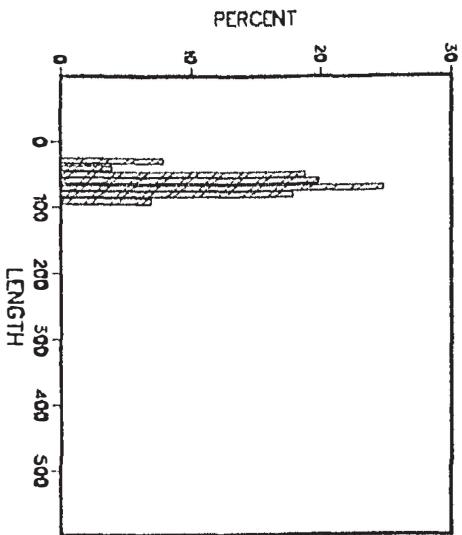
N = 32



Length Frequency for Croaker

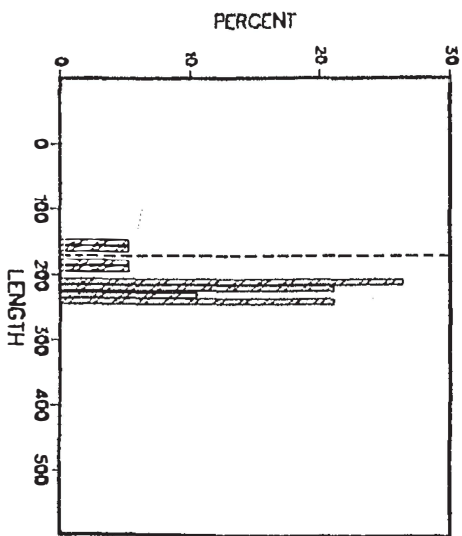
January, 1966

N = 101



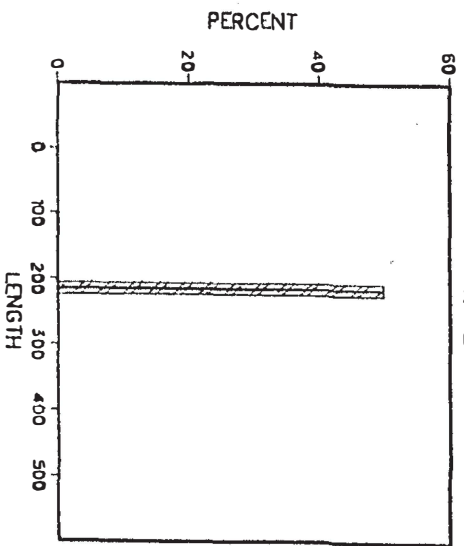
May, 1966

N = 19



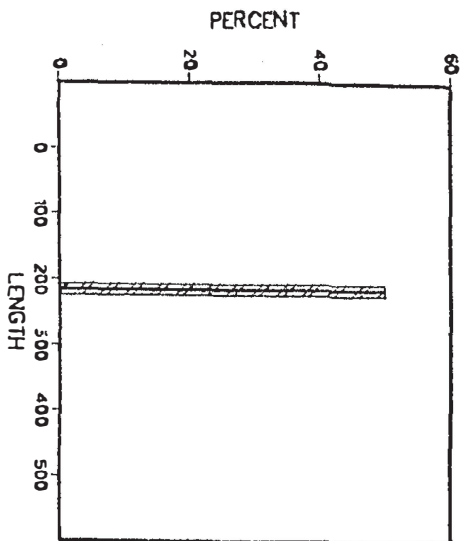
June, 1966

N = 2



July, 1966

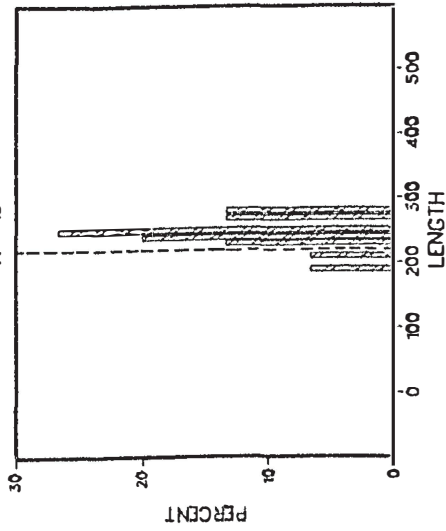
N = 2



Length Frequency for Croaker

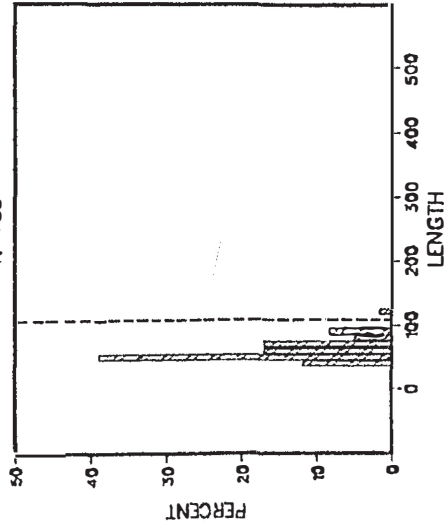
August, 1966

N = 15



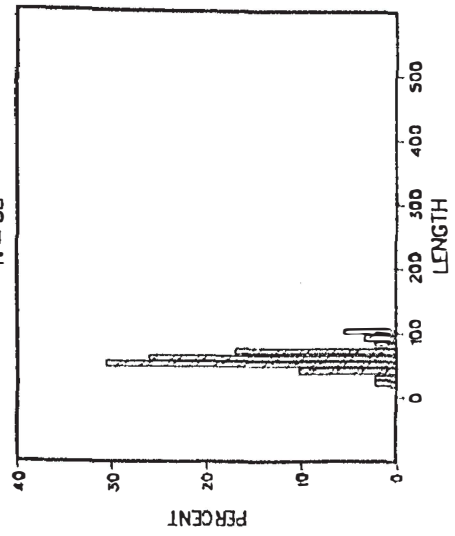
October, 1966

N = 59



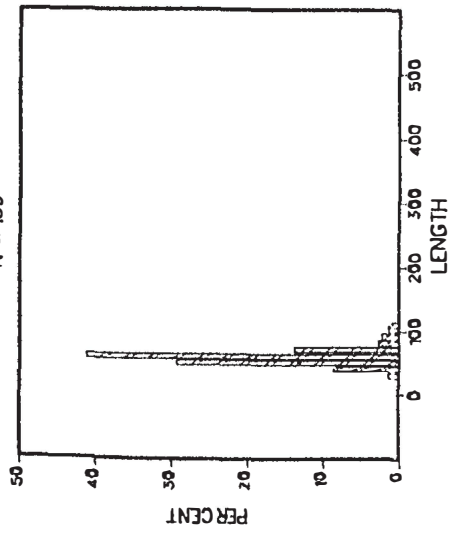
November, 1966

N = 88



December, 1966

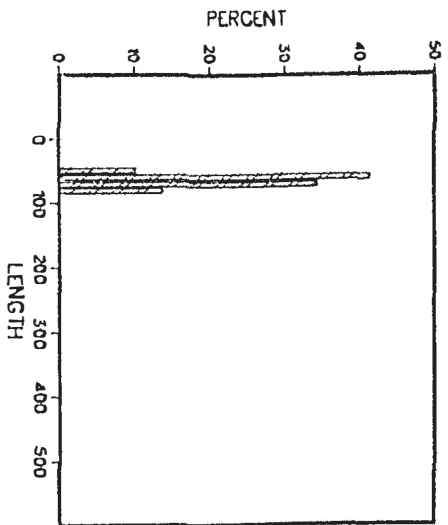
N = 109



Length Frequency for Crocker

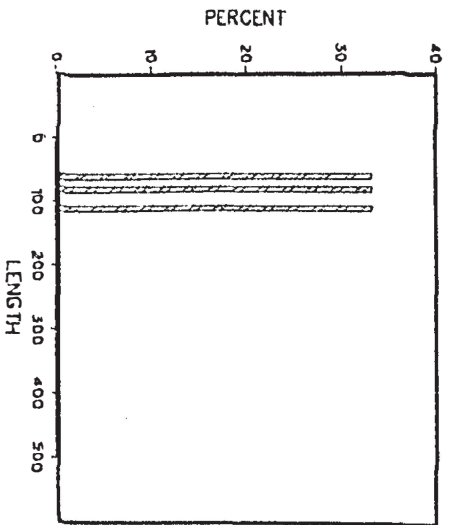
January, 1967

N = 29



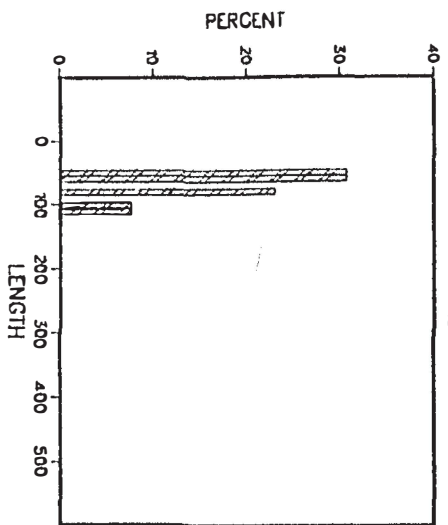
March, 1967

N = 5



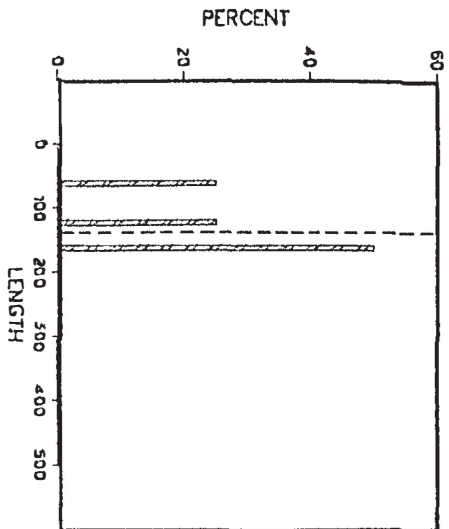
February, 1967

N = 13



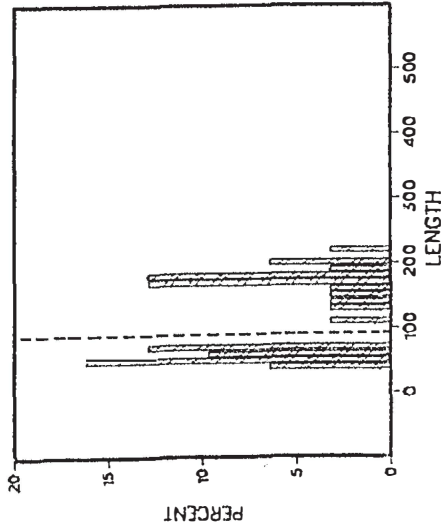
April, 1967

N = 4

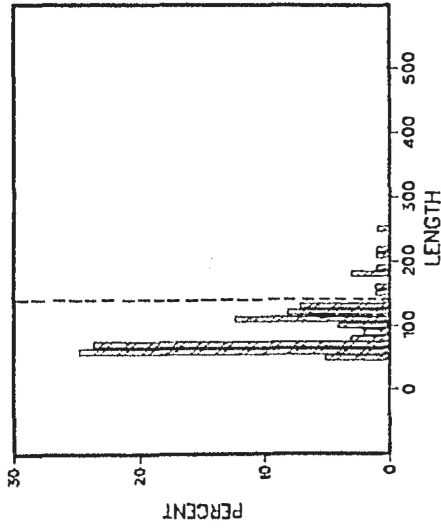


Length Frequency for Crocker

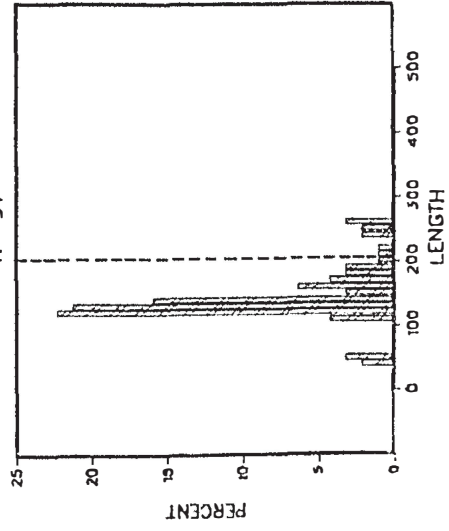
May, 1967
N = 31



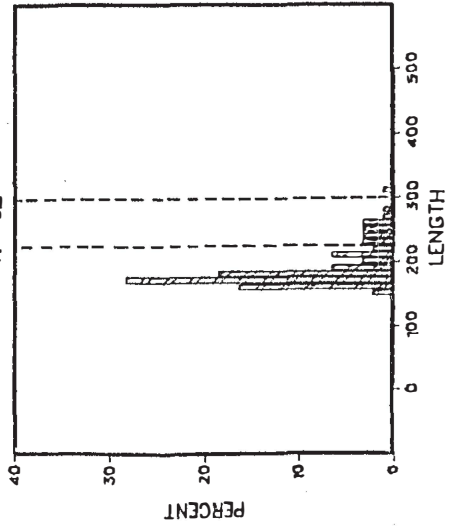
June, 1967
N = 97



July, 1967
N = 94



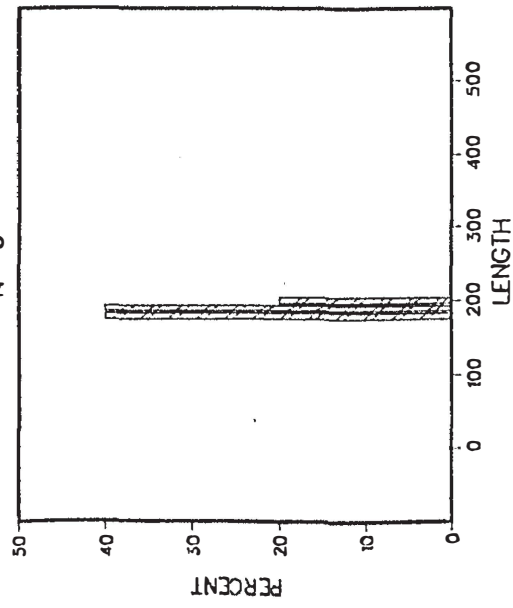
August, 1967
N = 92



Length Frequency for Croaker

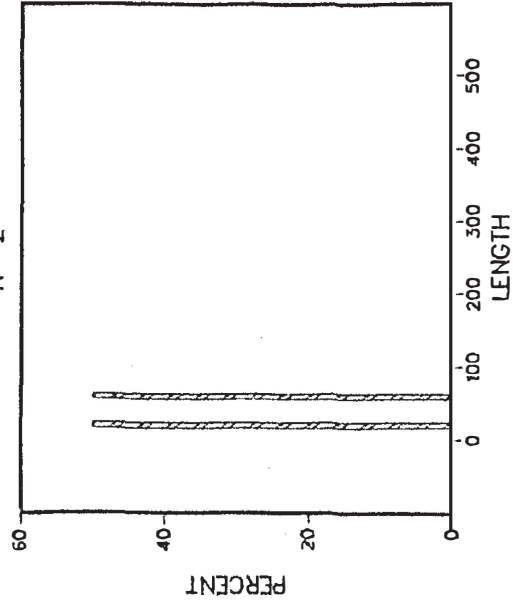
September, 1967

N = 5



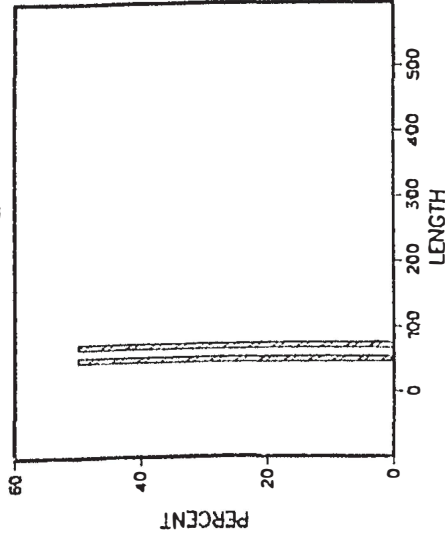
December, 1967

N = 2

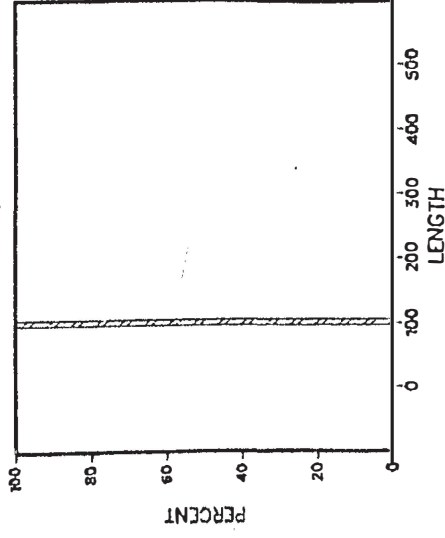


Length Frequency for Croaker

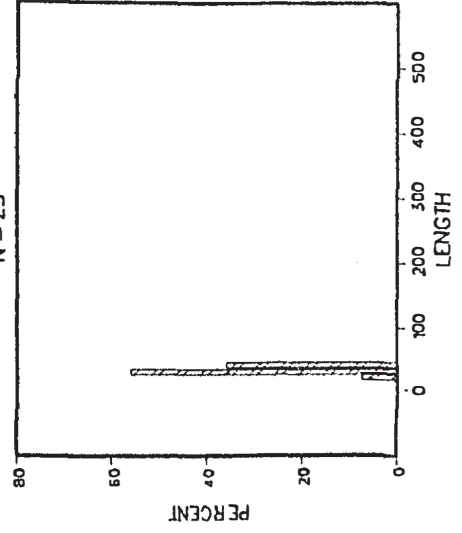
January, 1968
N = 2



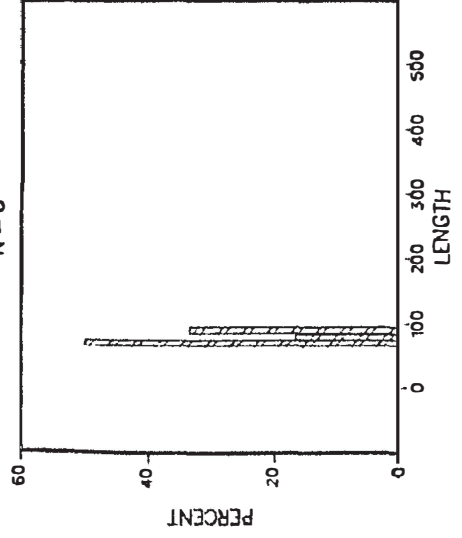
April, 1968
N = 1



June, 1968
N = 25



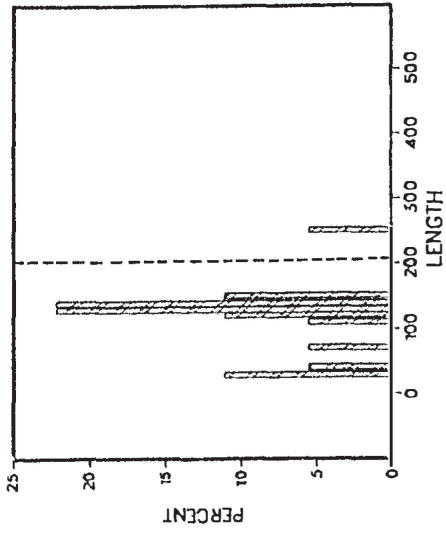
July, 1968
N = 6



Length Frequency for Croaker

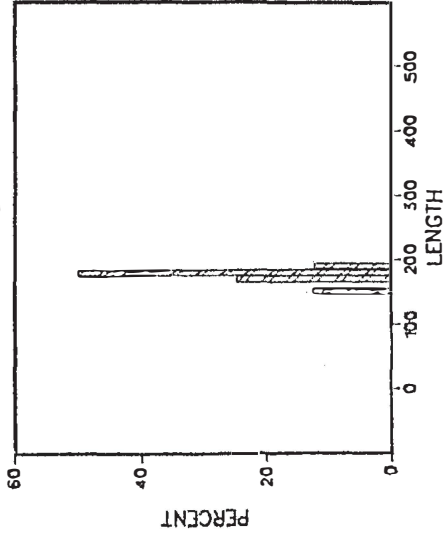
August, 1968

N = 18



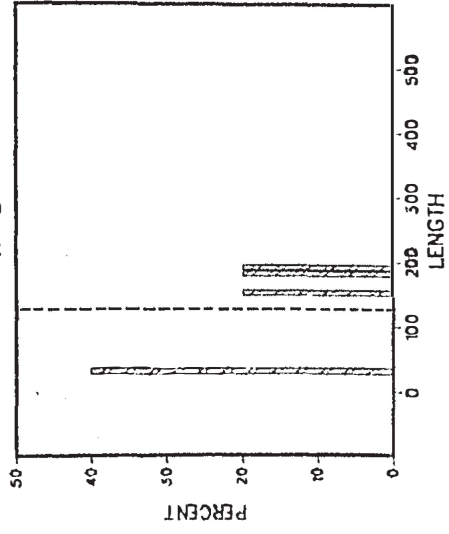
September, 1968

N = 8



October, 1968

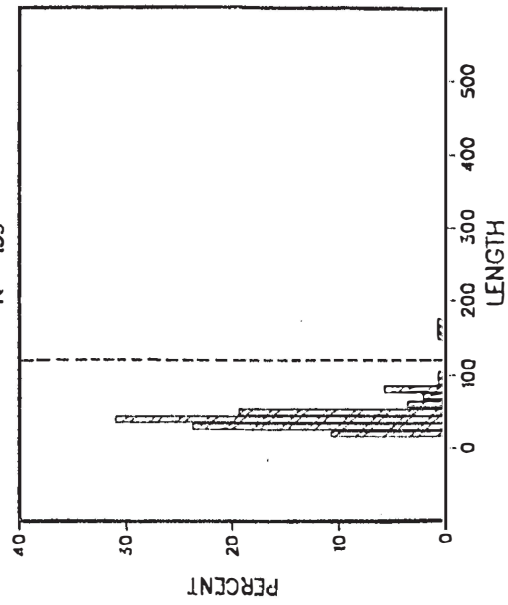
N = 5



Length Frequency for Croaker

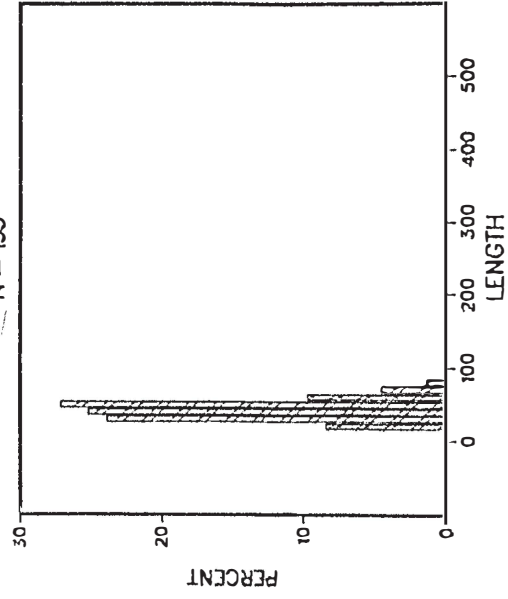
November, 1968

N = 139



December, 1968

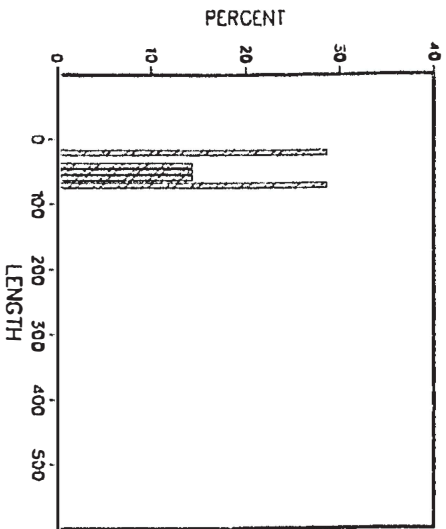
N = 155



Length Frequency for Crocker

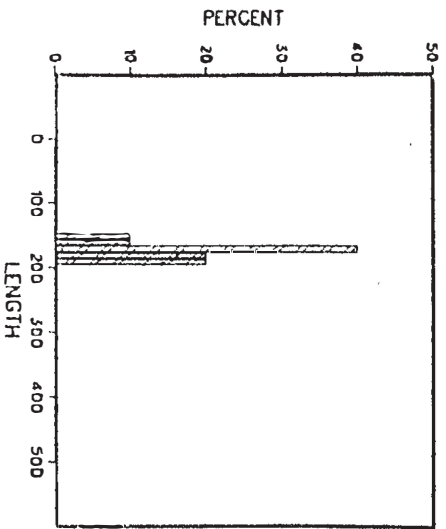
January, 1969

N = 7



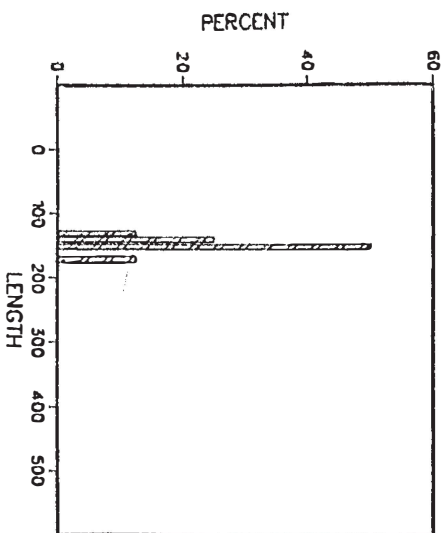
June, 1969

N = 10



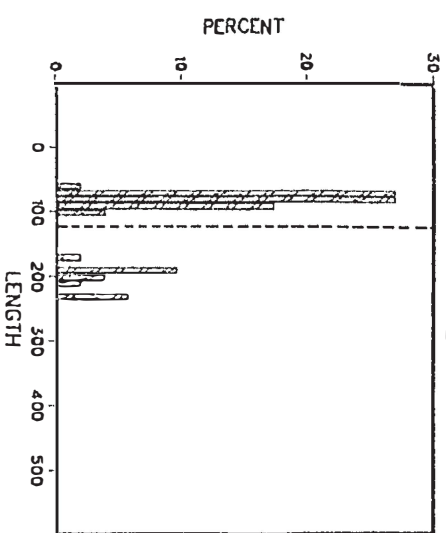
May, 1969

N = 8



July, 1969

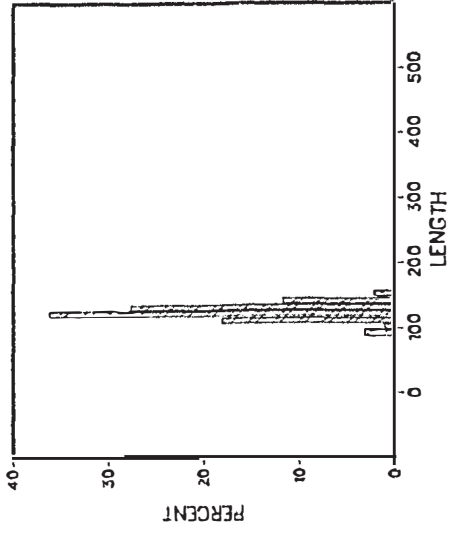
N = 52



Length Frequency for Croaker

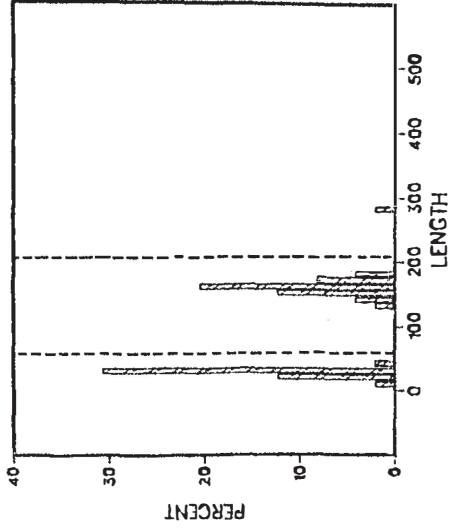
August, 1969

N = 94



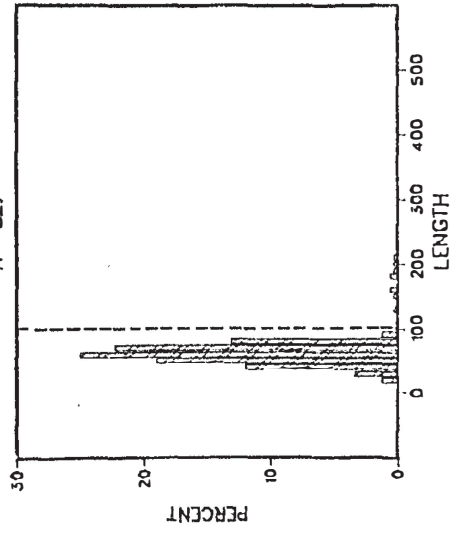
September, 1969

N = 49



October, 1969

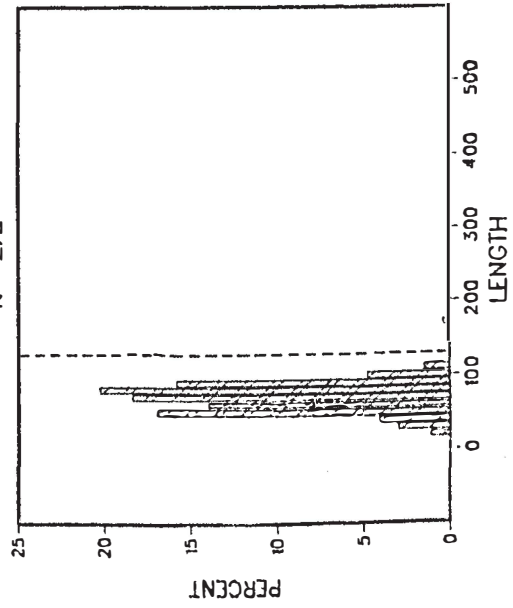
N = 527



Length Frequency for Croaker

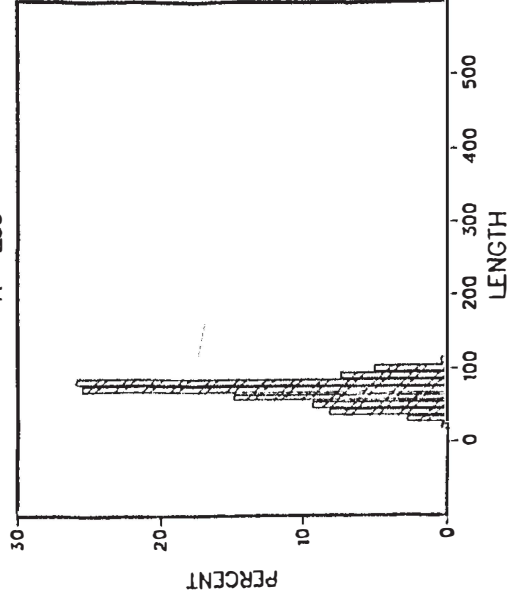
November, 1969

N = 272



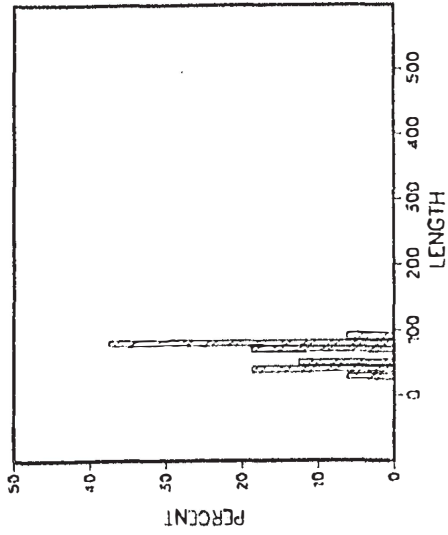
December, 1969

N = 255

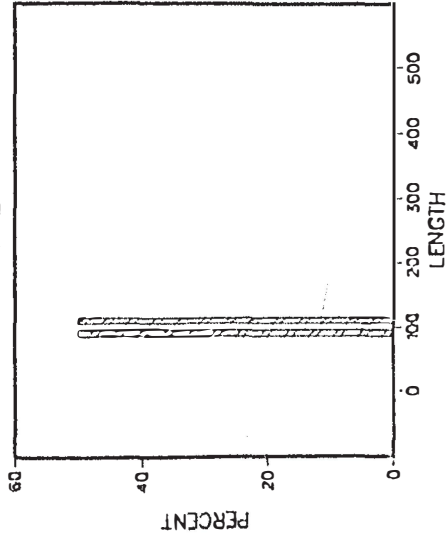


Length Frequency for Croaker

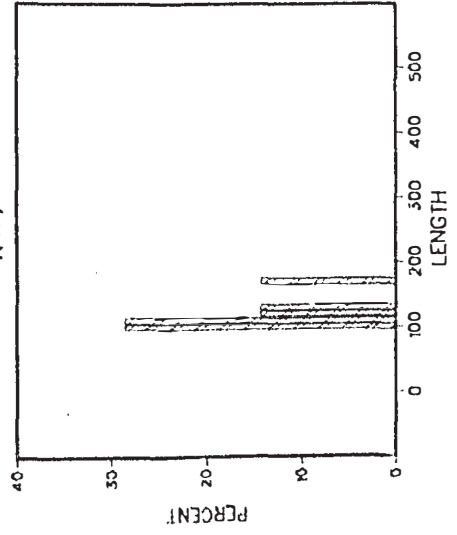
January, 1970
N = 16



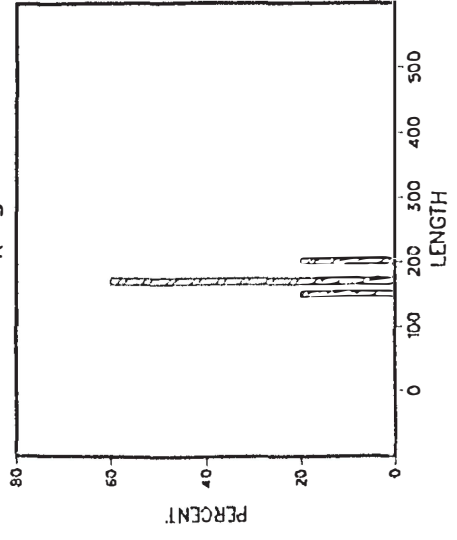
April, 1970
N = 2



May, 1970
N = 7



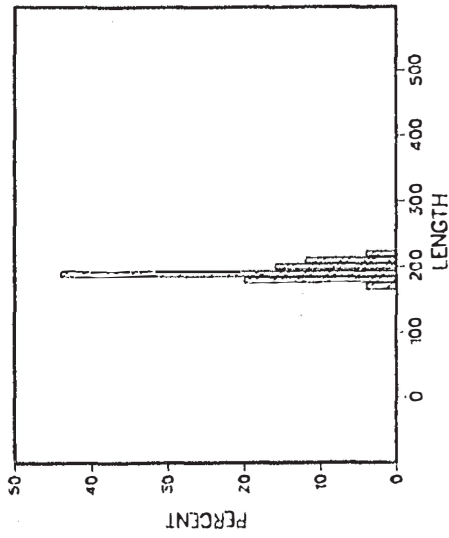
June, 1970
N = 5



Length Frequency for Croaker

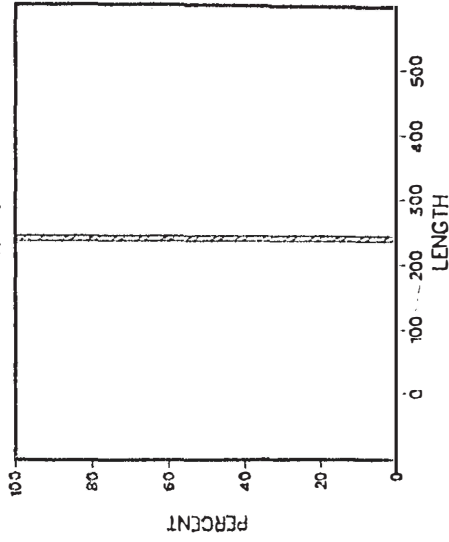
July, 1970

N = 25



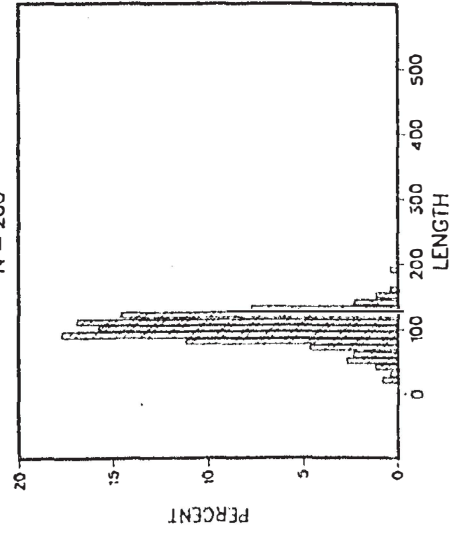
August, 1970

N = 1



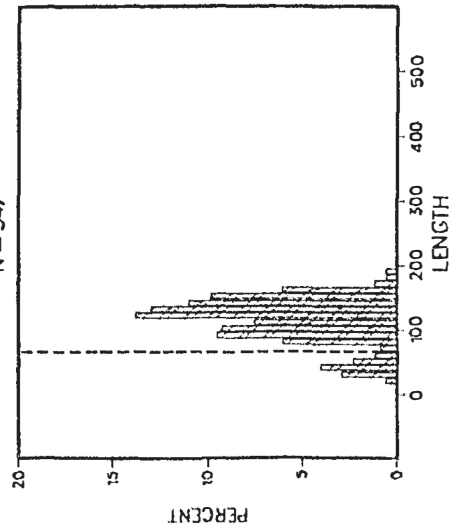
September, 1970

N = 260



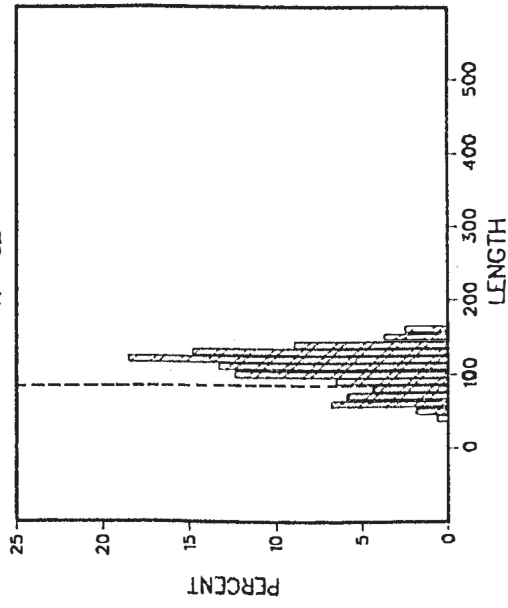
October, 1970

N = 347

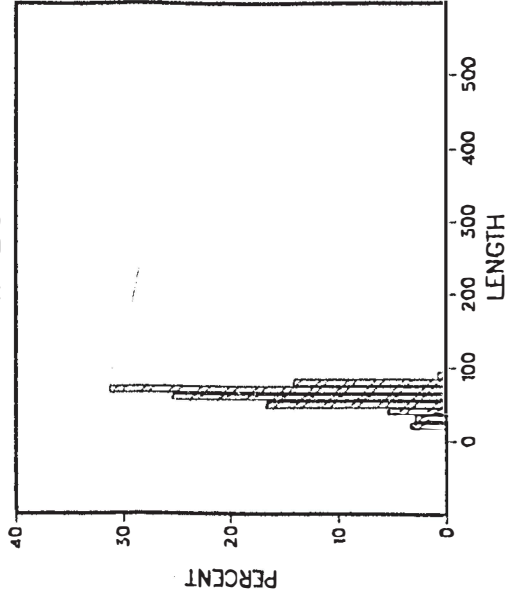


Length Frequency for Croaker

November, 1970
N = 324



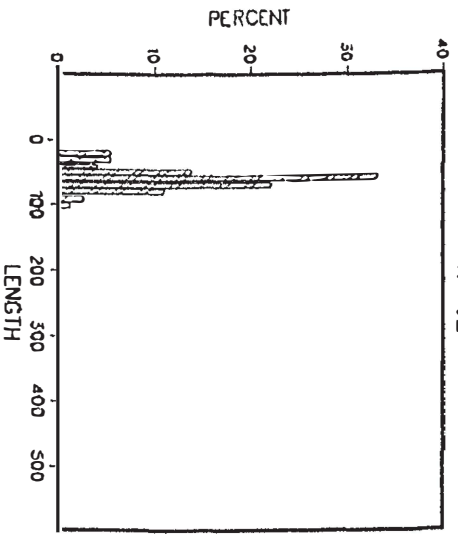
December, 1970
N = 240



Length Frequency for Crocker

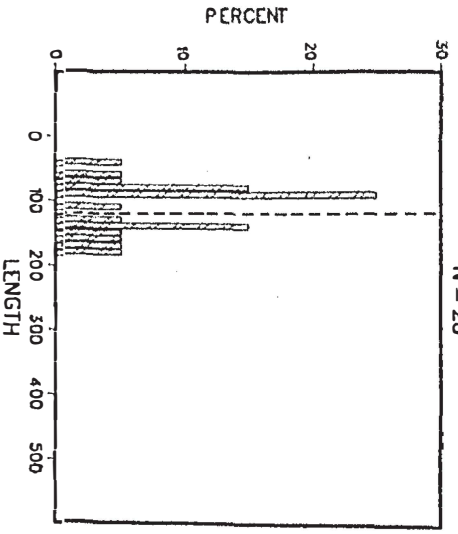
January, 1971

N = 72



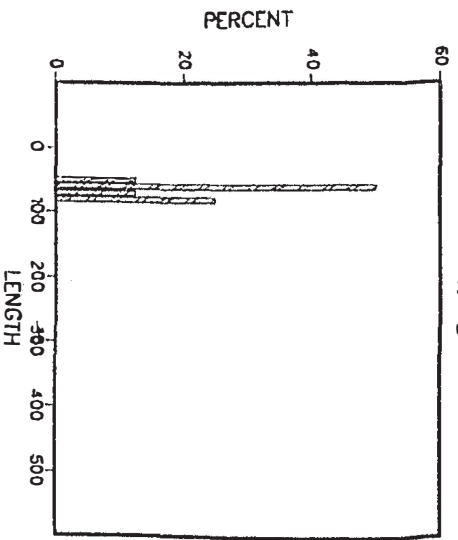
April, 1971

N = 20



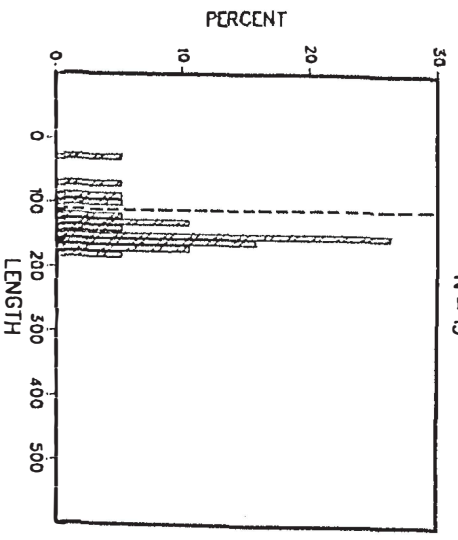
February, 1971

N = 8



May, 1971

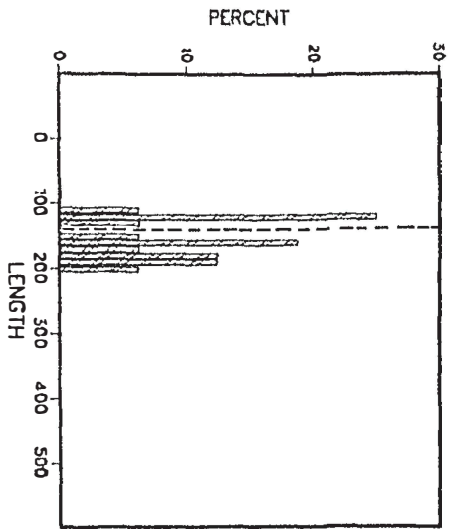
N = 19



Length Frequency for Croaker

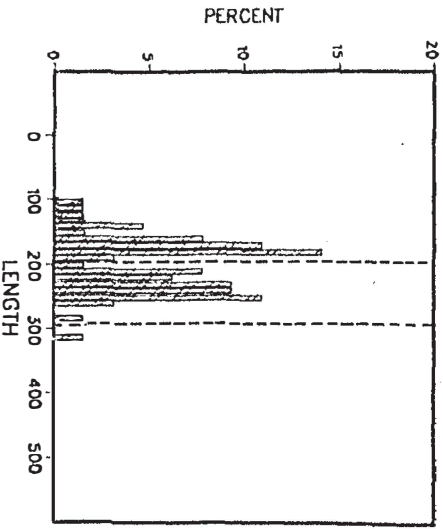
June, 1971

N = 16



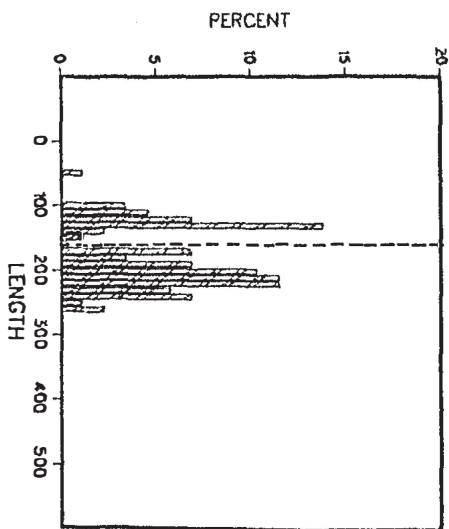
August, 1971

N = 64



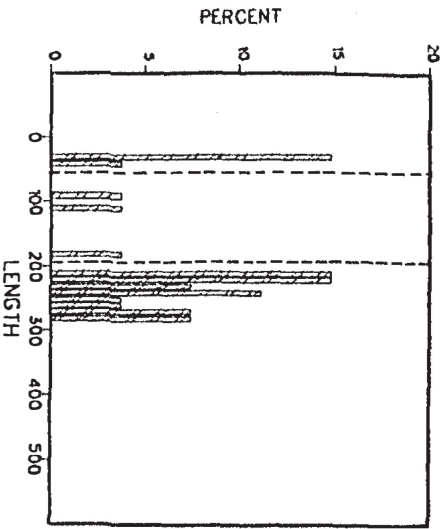
July, 1971

N = 87



September, 1971

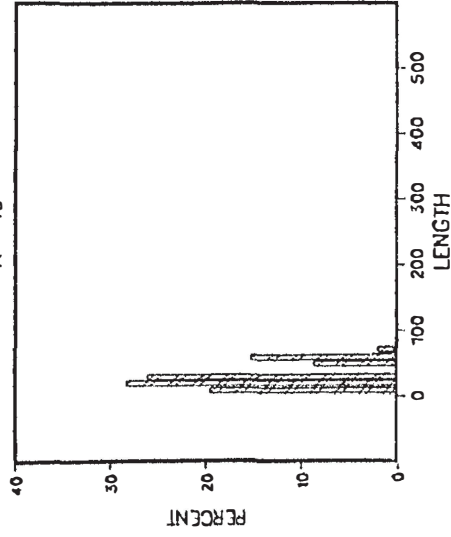
N = 27



Length Frequency for Croaker

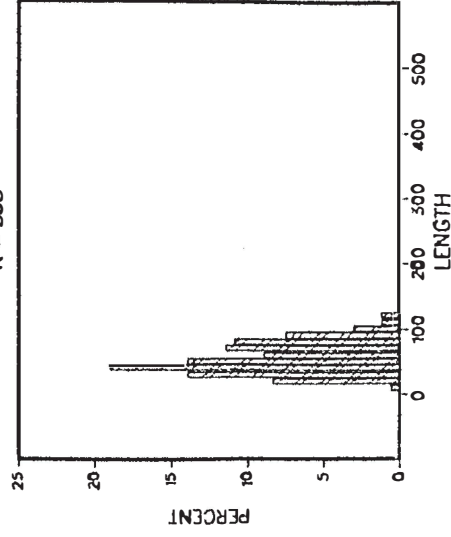
October, 1971

N = 46



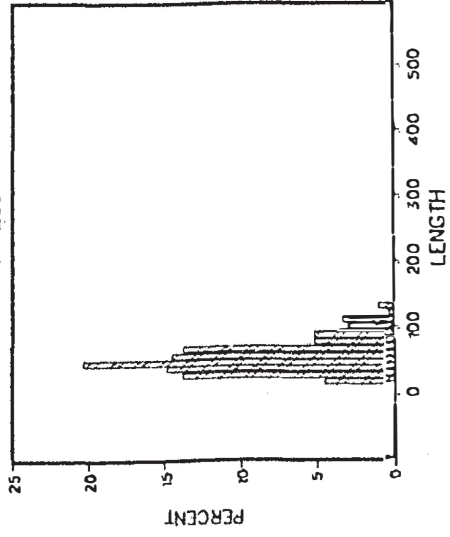
November, 1971

N = 358



December, 1971

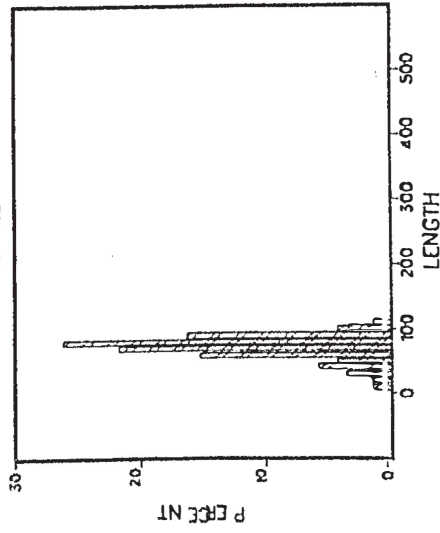
N = 290



Length Frequency for Croaker

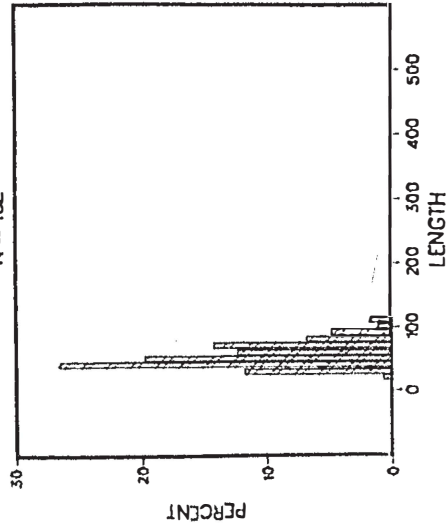
January, 1972

N = 92



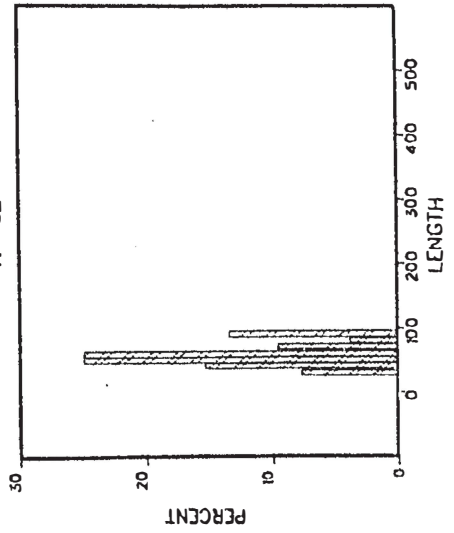
February, 1972

N = 162



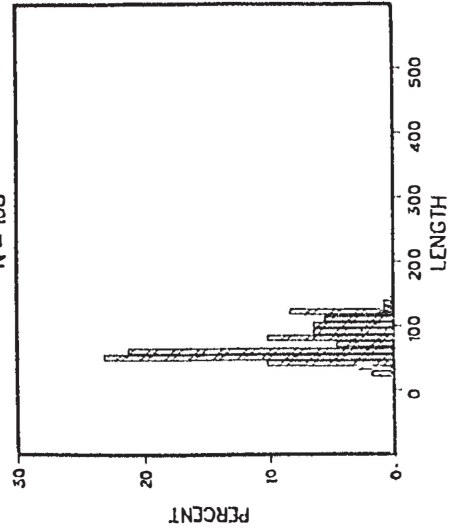
March, 1972

N = 52



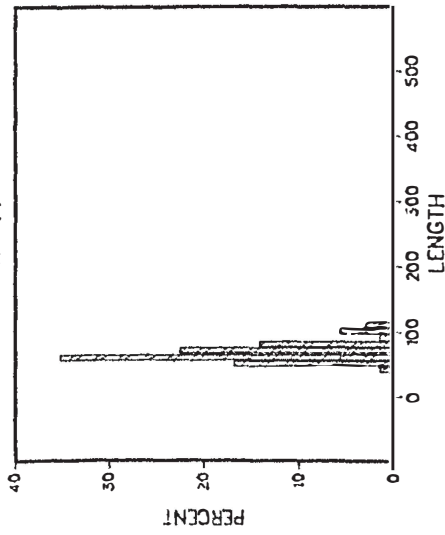
April, 1972

N = 108

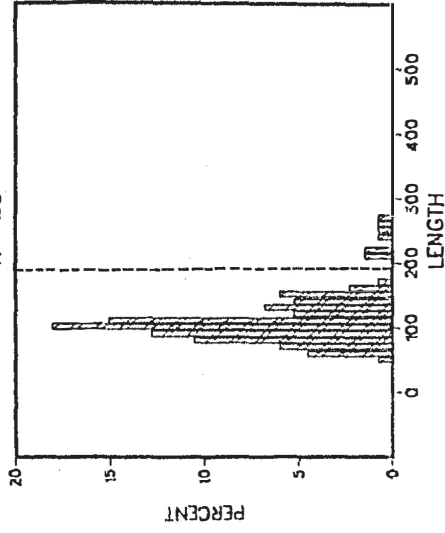


Length Frequency for Croaker

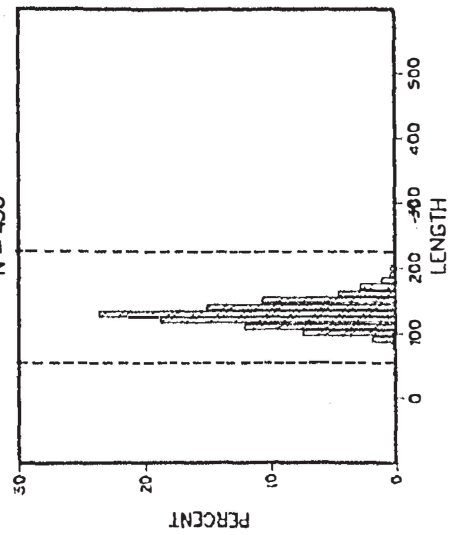
May, 1972
N = 71



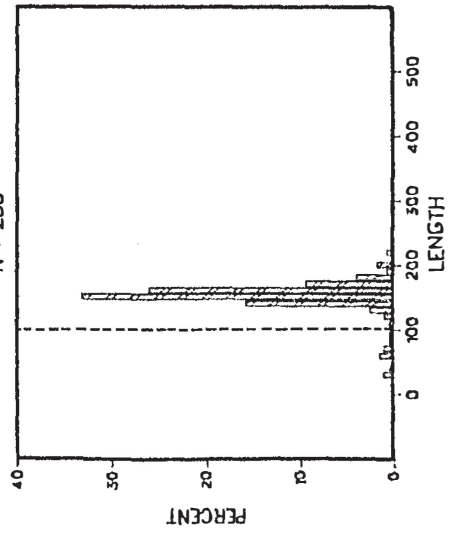
June, 1972
N = 133



July, 1972
N = 430



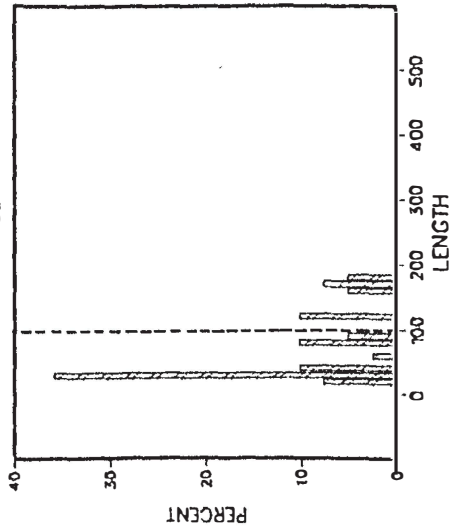
August, 1972
N = 280



Length Frequency for Croaker

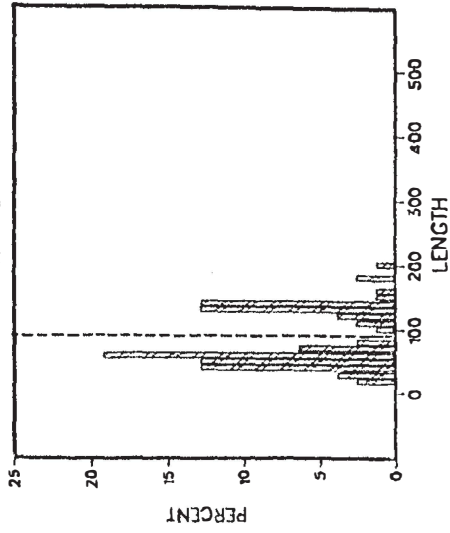
September, 1972

N = 39



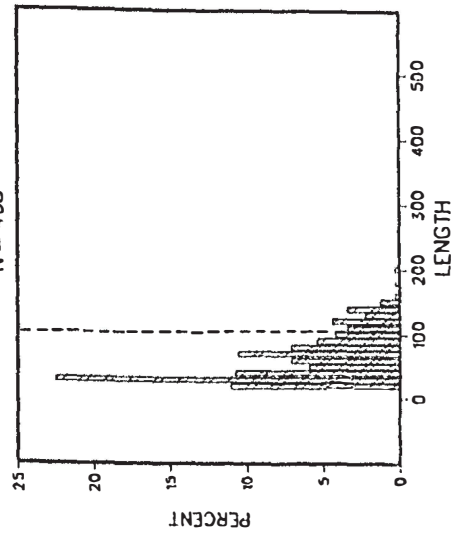
October, 1972

N = 78



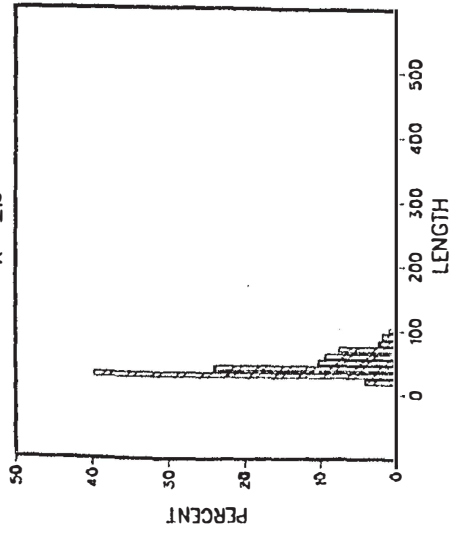
November, 1972

N = 408



December, 1972

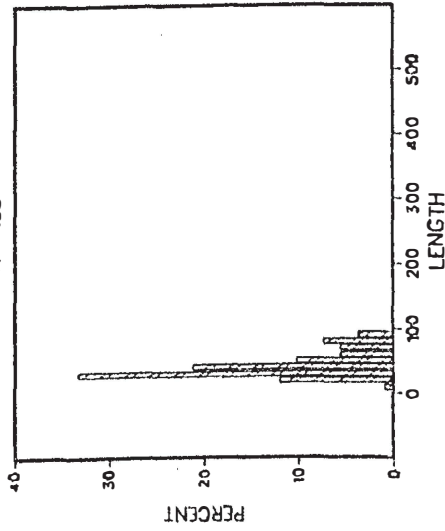
N = 216



Length Frequency for Crocker

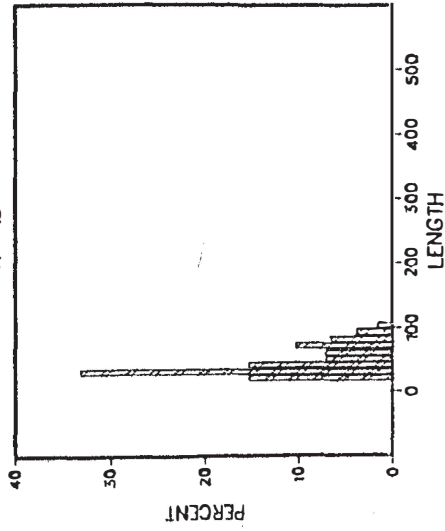
January, 1973

N = 108



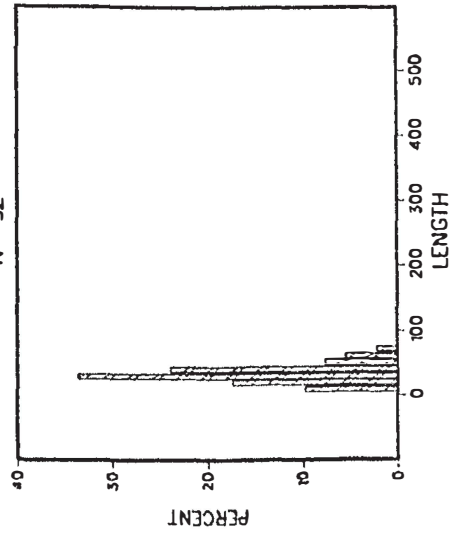
February, 1973

N = 184



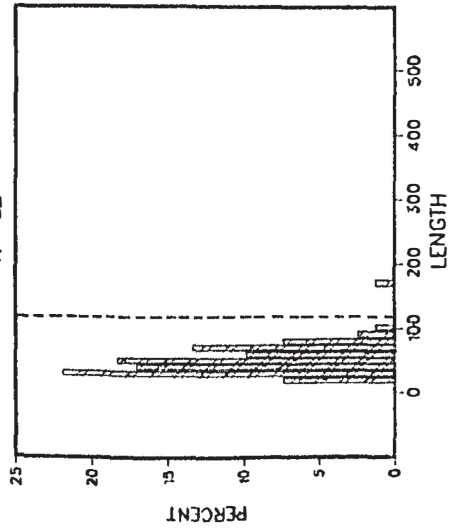
March, 1973

N = 92



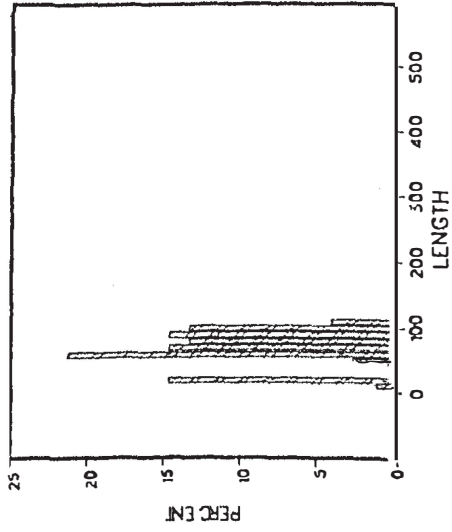
April, 1973

N = 82

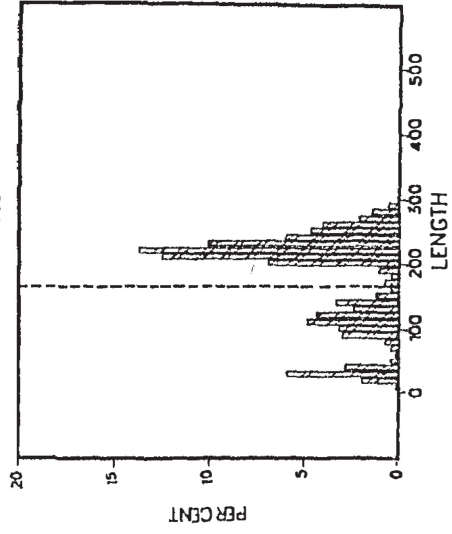


Length Frequency for Croaker

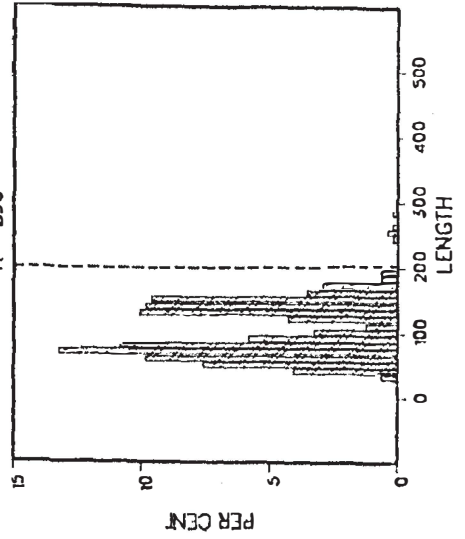
May, 1973
N = 75



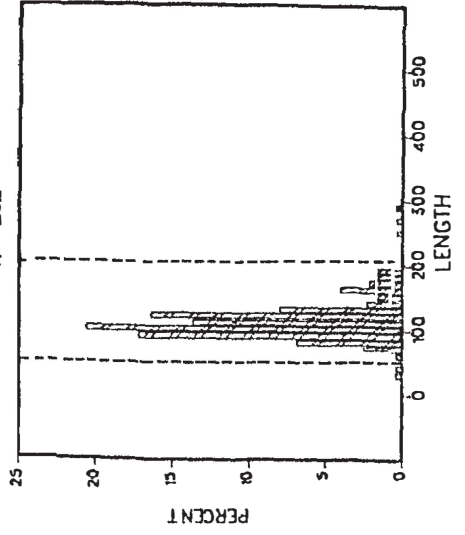
June, 1973
N = 663



July, 1973
N = 396



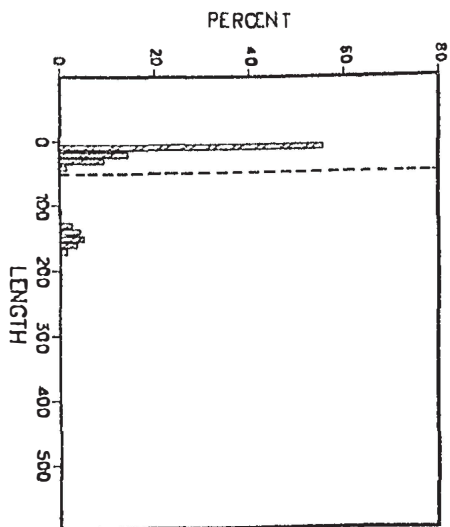
August, 1973
N = 262



Length Frequency for Croaker

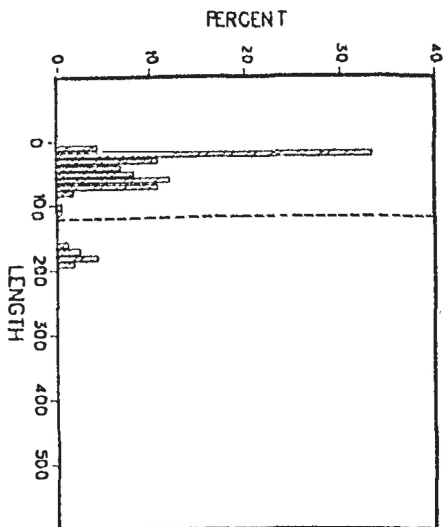
September, 1973

N = 349



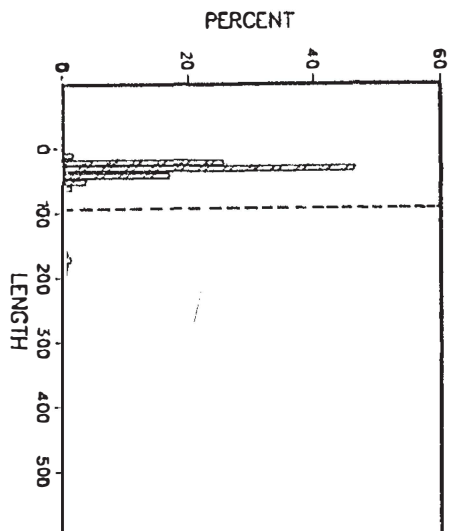
November, 1973

N = 158



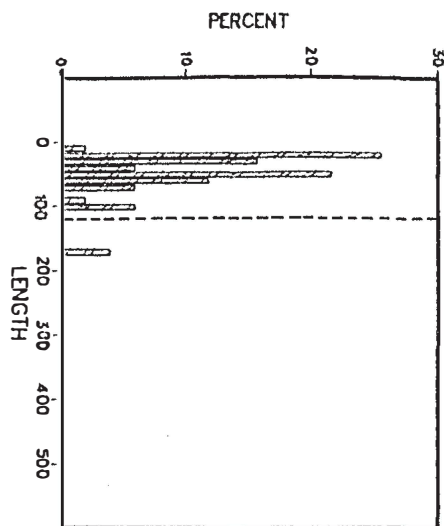
October, 1973

N = 1207



December, 1973

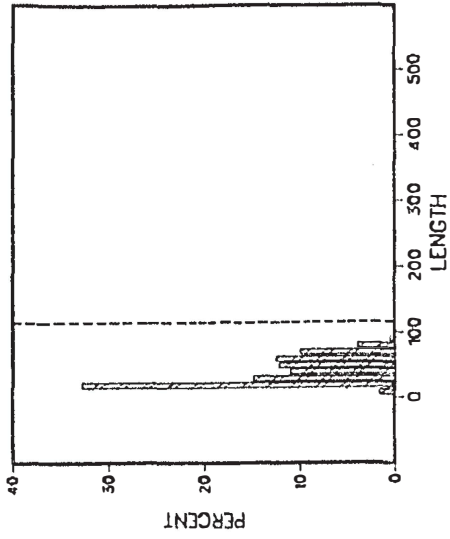
N = 51



Length Frequency for Croaker

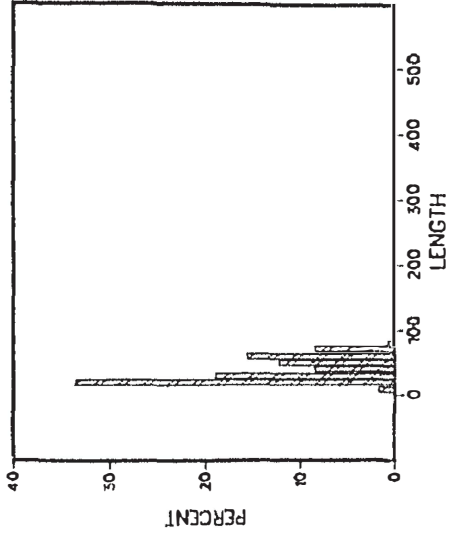
January, 1974

N = 747



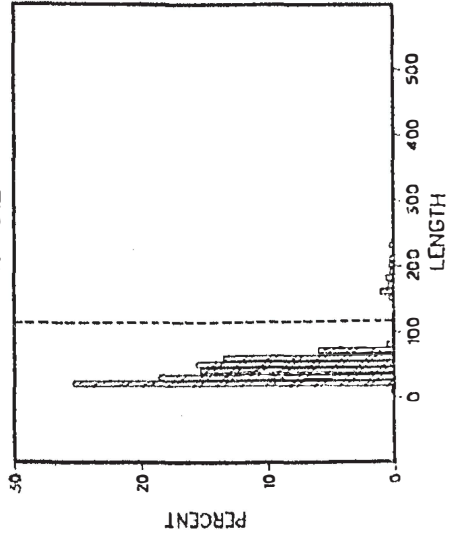
February, 1974

N = 295



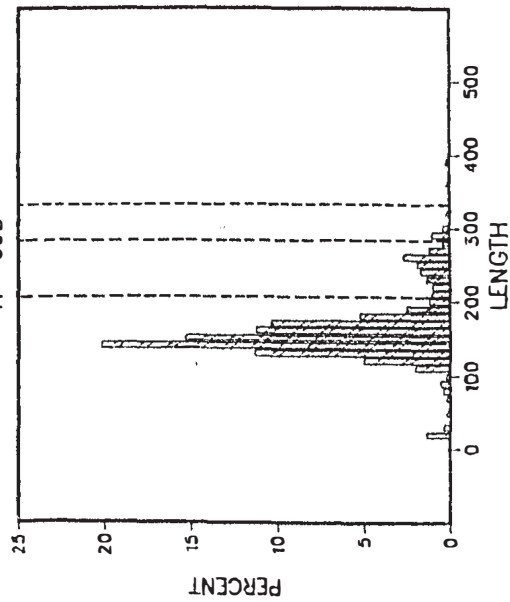
March, 1974

N = 842

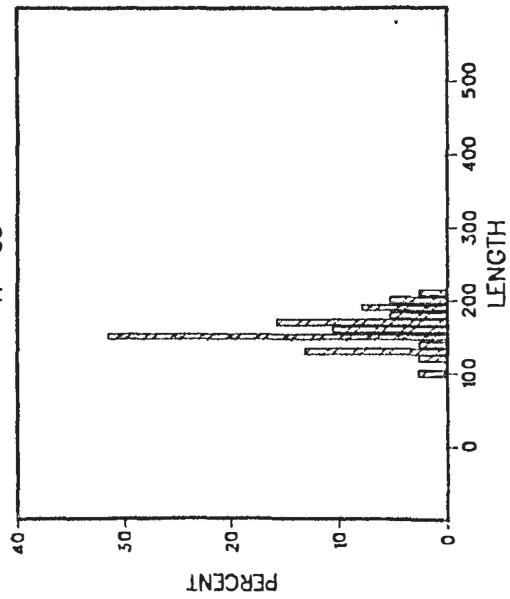


Length Frequency for Croaker

July, 1974
N = 600



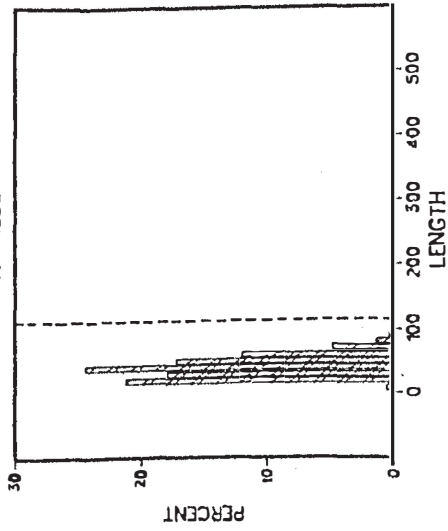
August, 1974
N = 38



Length Frequency for Croaker

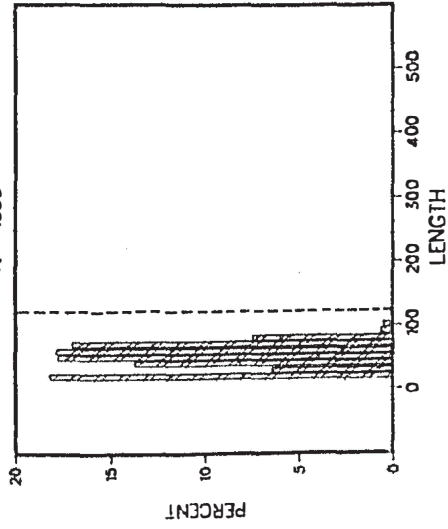
January, 1975

N = 1680



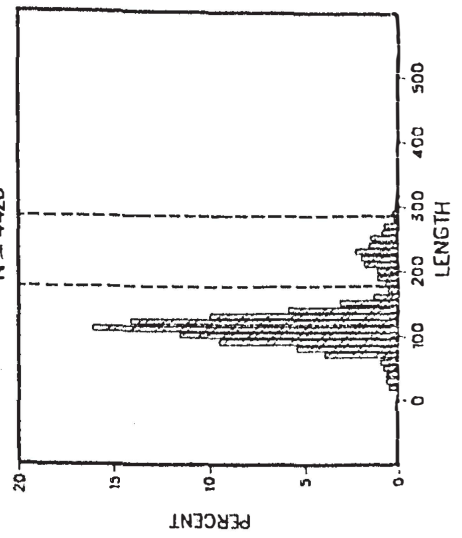
February, 1975

N = 1056



July, 1975

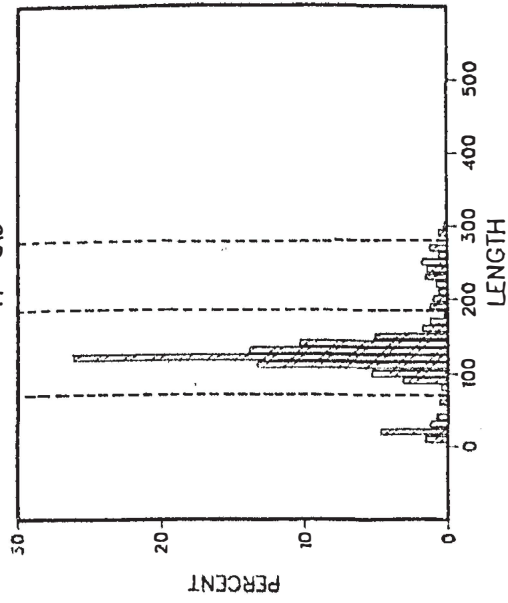
N = 4426



Length Frequency for Croaker

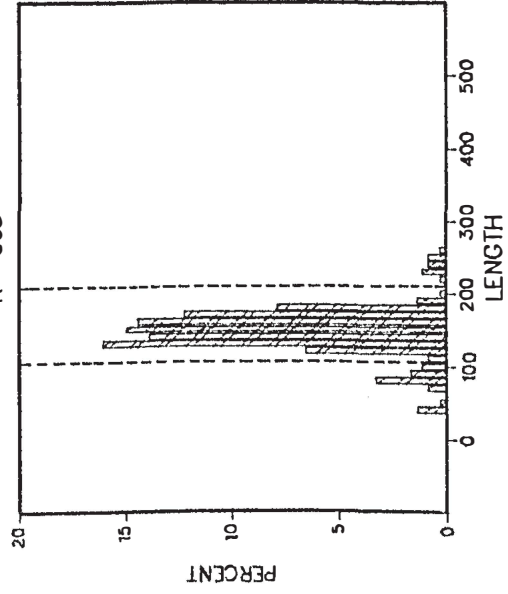
August, 1975

N = 513



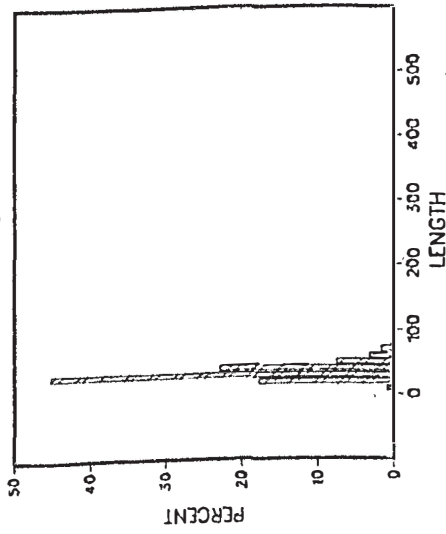
September, 1975

N = 368

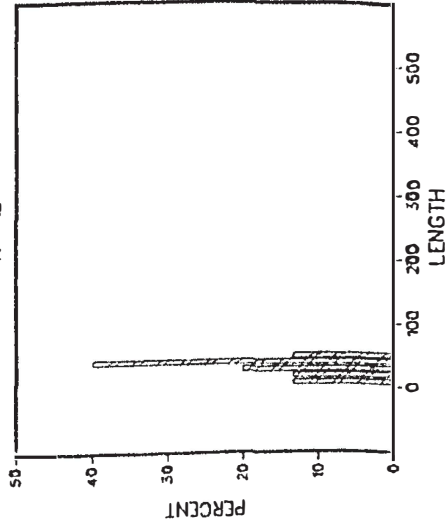


Length Frequency for Croaker

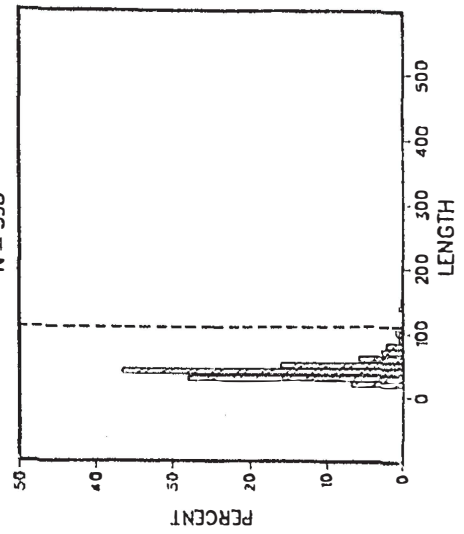
January, 1976
N = 694



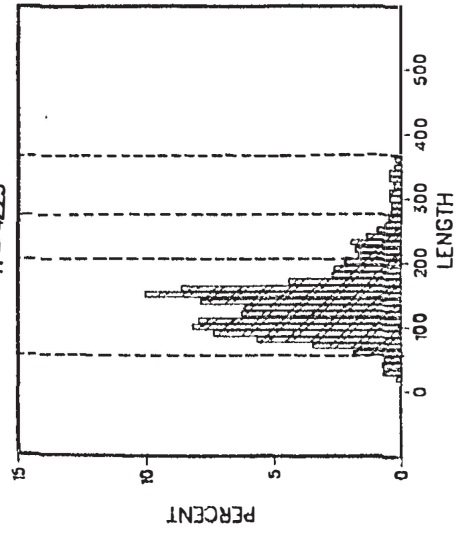
February, 1976
N = 15



March, 1976
N = 598



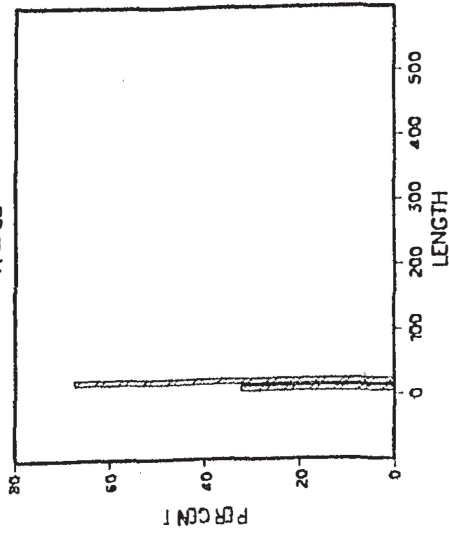
July, 1976
N = 4225



Length Frequency for Croaker

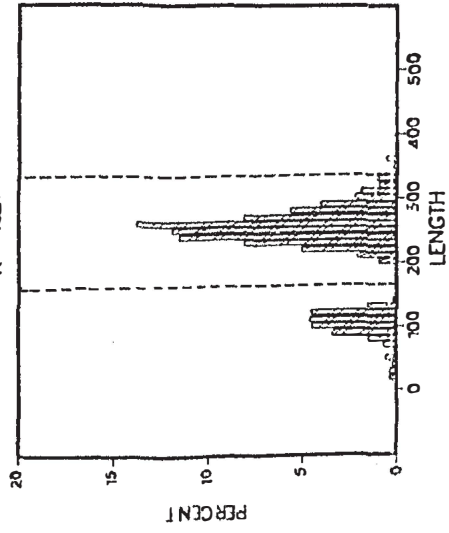
March, 1977

N = 68



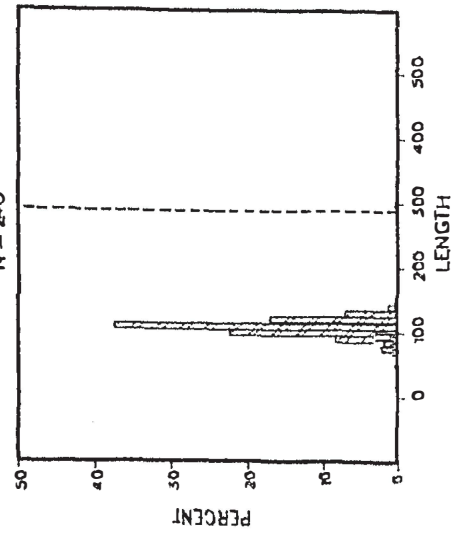
July, 1977

N = 1024



August, 1977

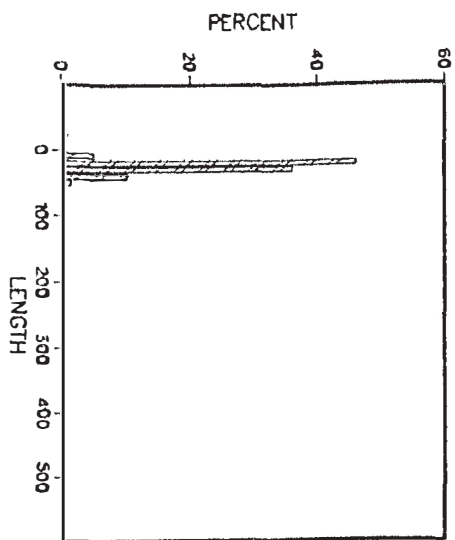
N = 240



Length Frequency for Crocker

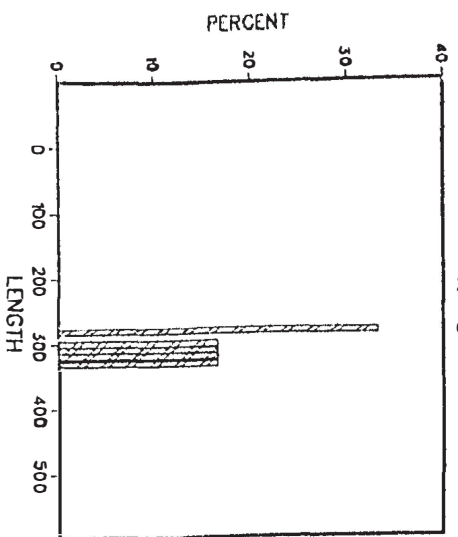
February, 1978

N = 467



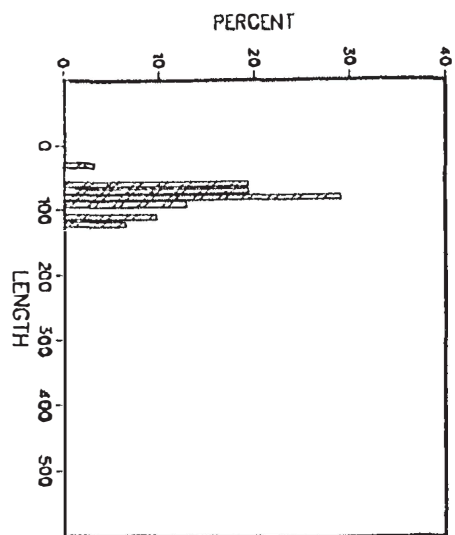
August, 1978

N = 6



July, 1978

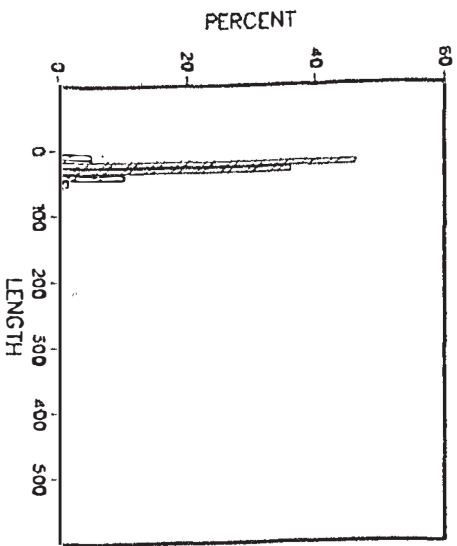
N = 31



Length Frequency for Crocker

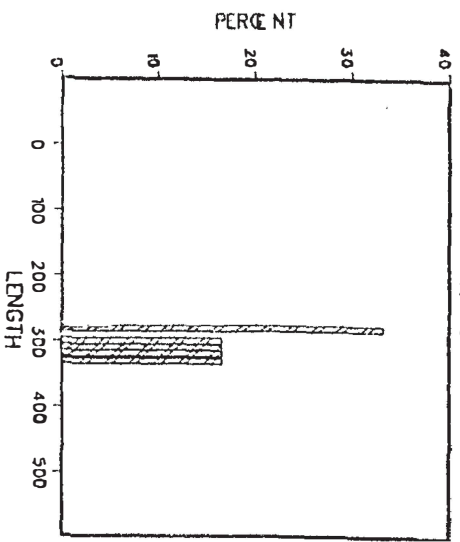
February, 1978

N = 467



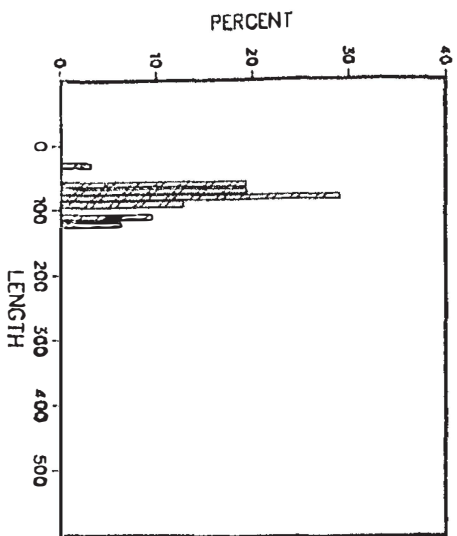
August, 1978

N = 6



July, 1978

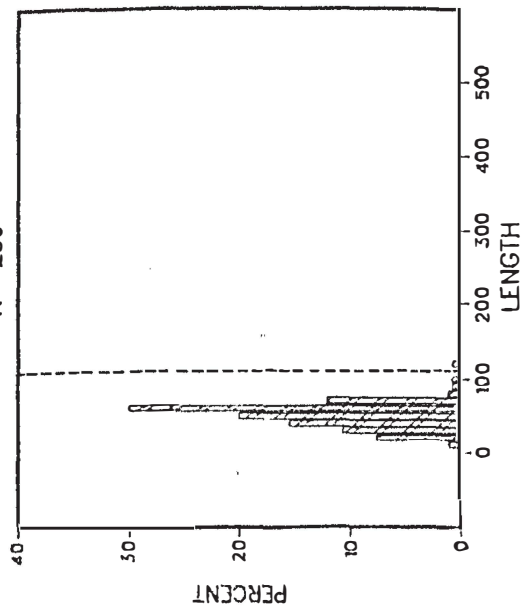
N = 31



Length Frequency for Croaker

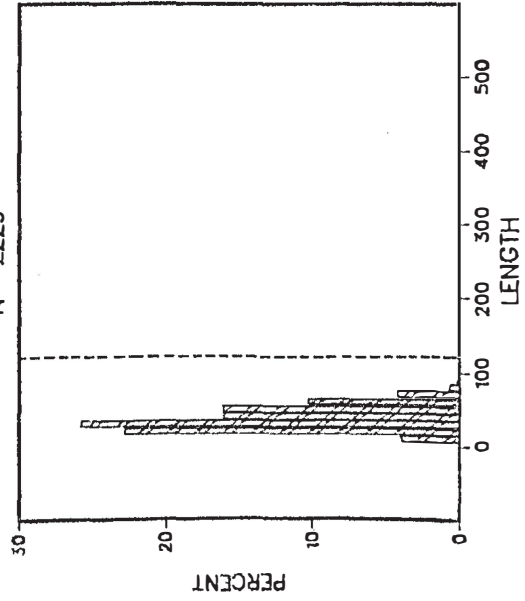
November, 1978

N = 290



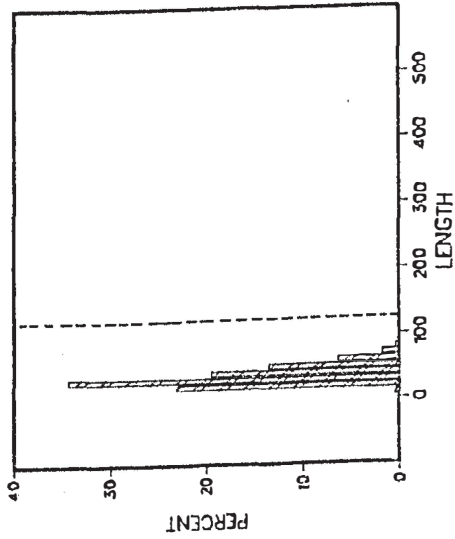
December, 1978

N = 2229

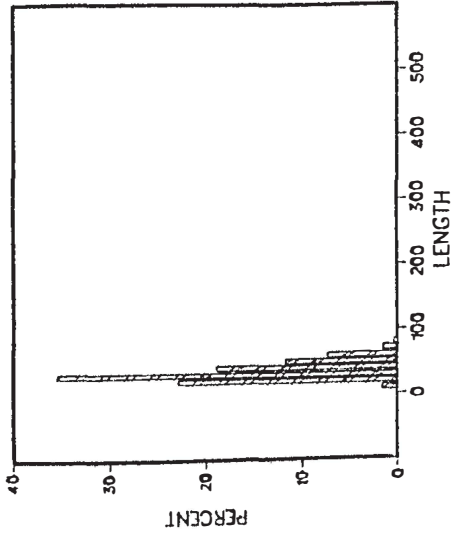


Length Frequency for Croaker

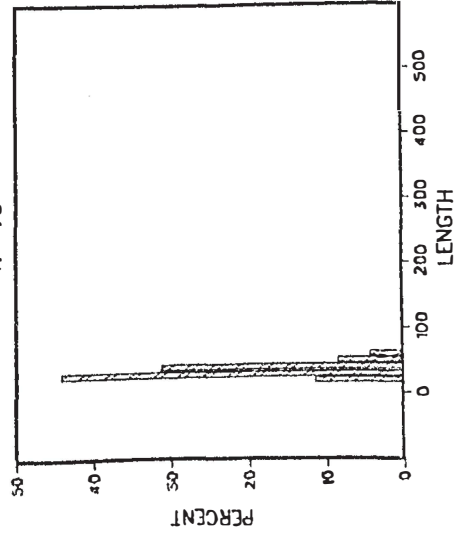
January, 1979
N = 3372



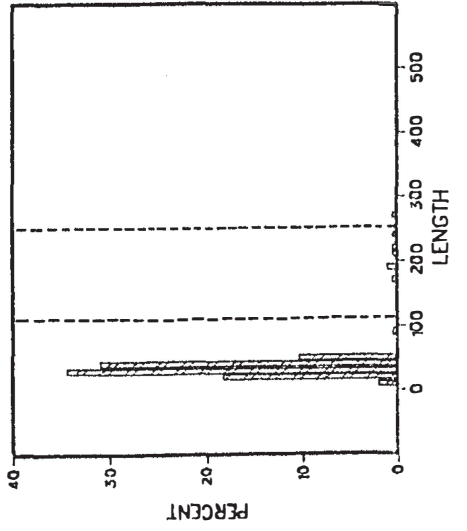
February, 1979
N = 1214



March, 1979
N = 70



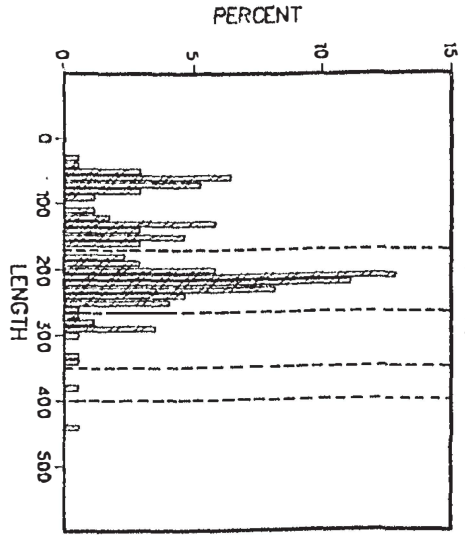
June, 1979
N = 203



Length Frequency for Croaker

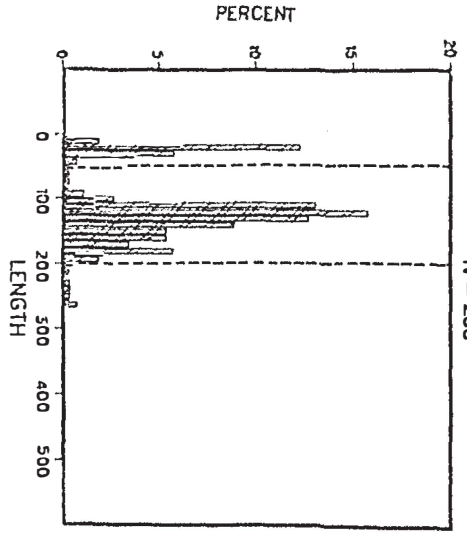
July, 1979

N = 171



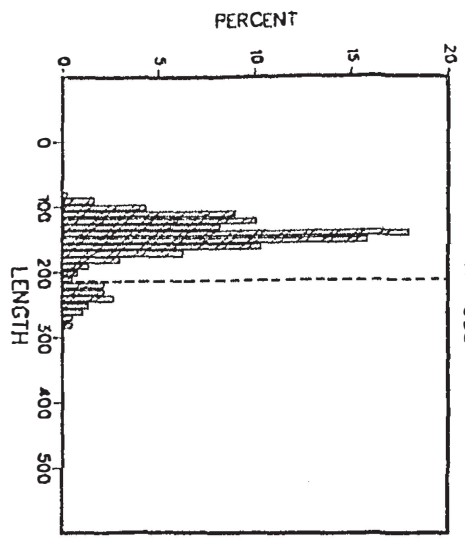
September, 1979

N = 260



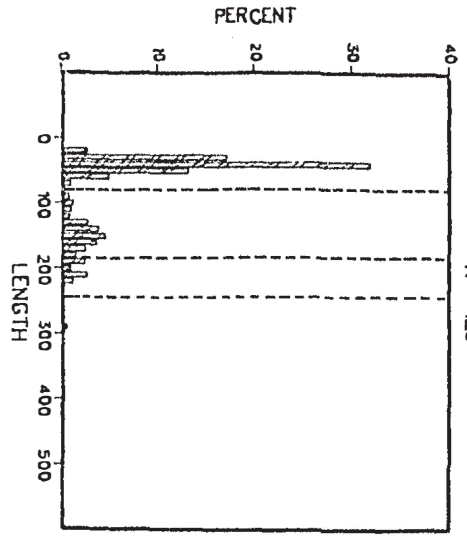
August, 1979

N = 368



October, 1979

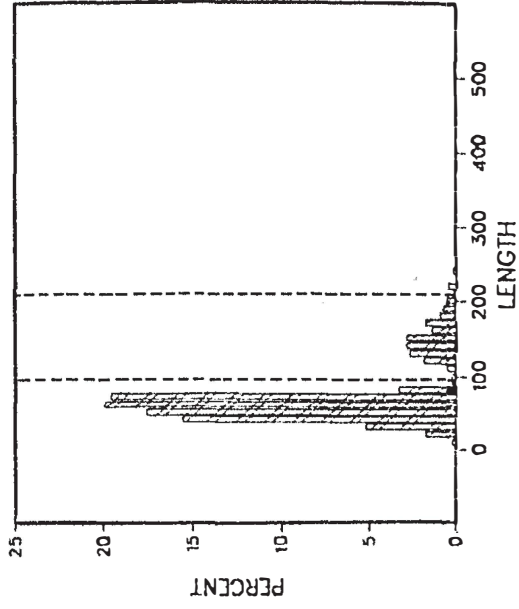
N = 426



Length Frequency for Croaker

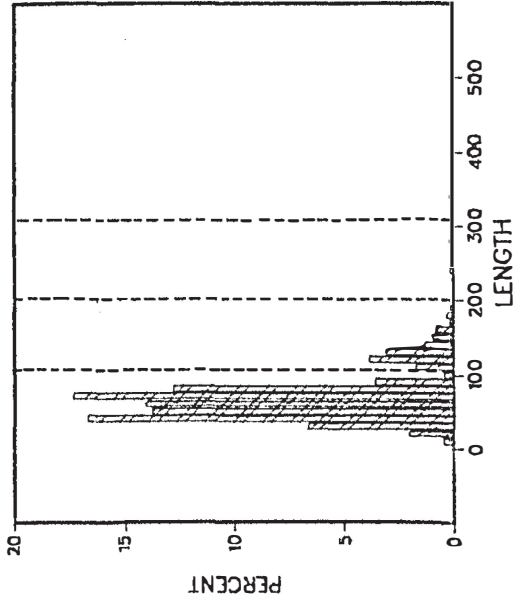
November, 1979

N = 637



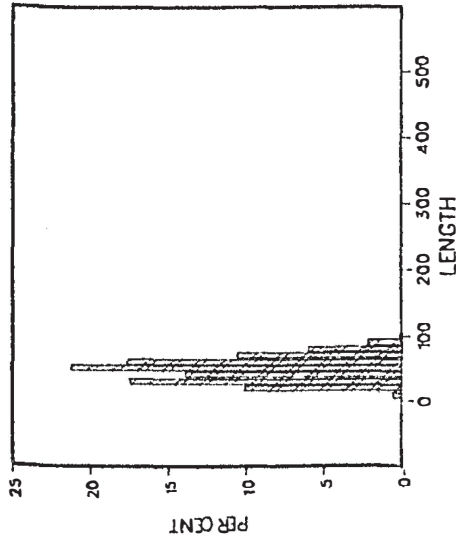
December, 1979

N = 757

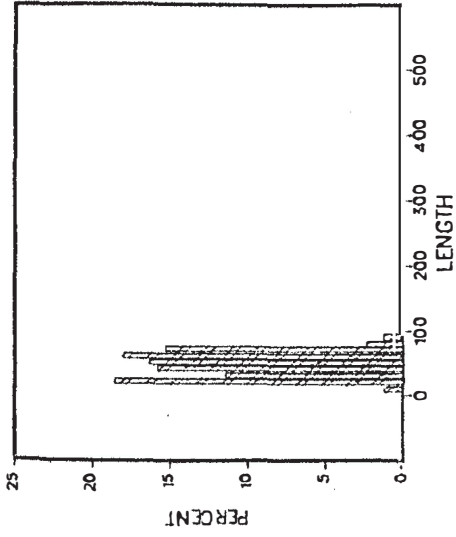


Length Frequency for Croaker

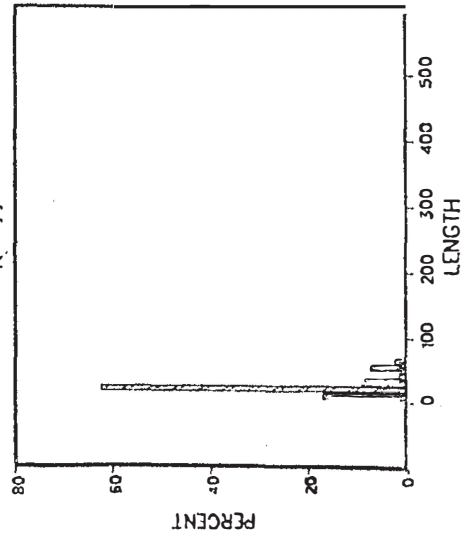
January, 1980
N = 556



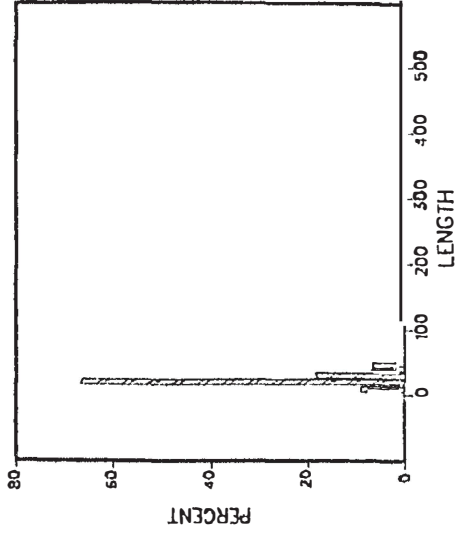
February, 1980
N = 183



March, 1980
N = 77

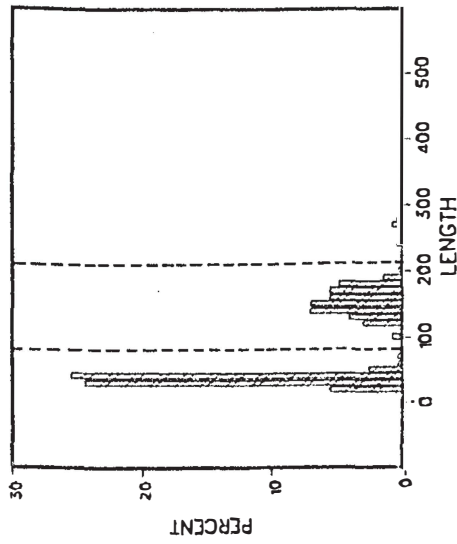


April, 1980
N = 66

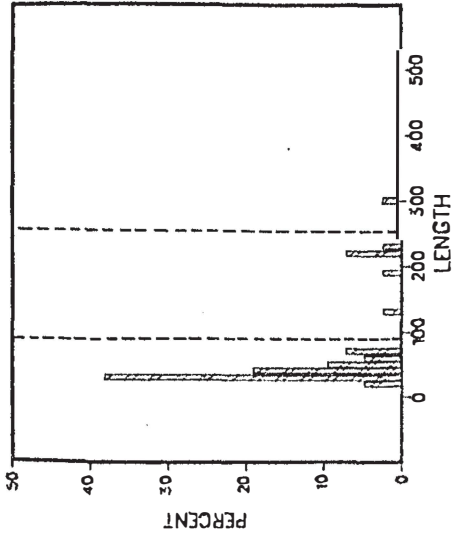


Length Frequency for Croaker

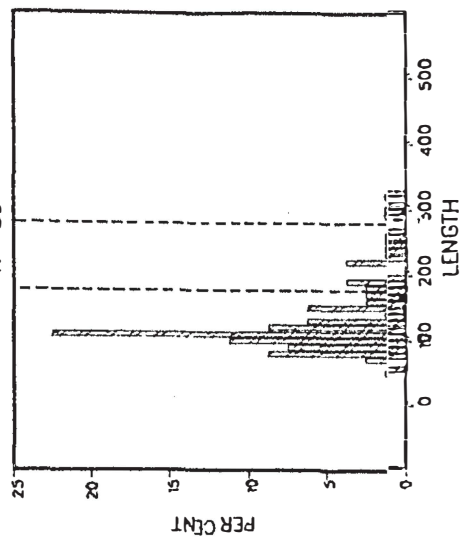
May, 1980
N = 271



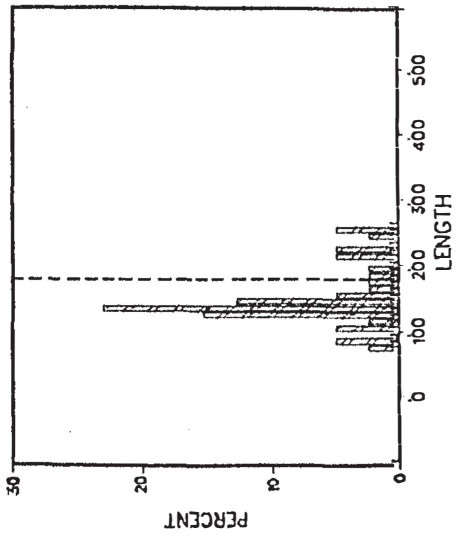
June, 1980
N = 42



July, 1980
N = 80



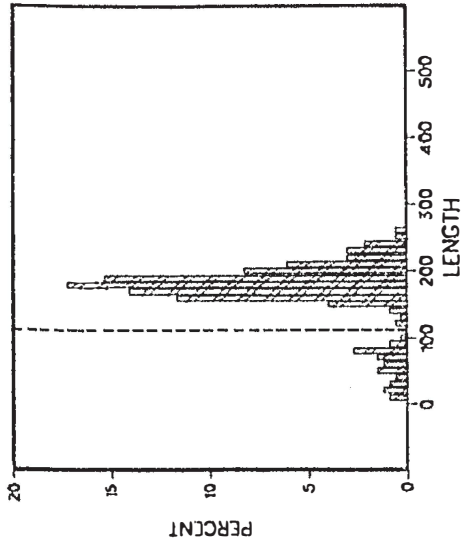
August, 1980
N = 39



Length Frequency for Croaker

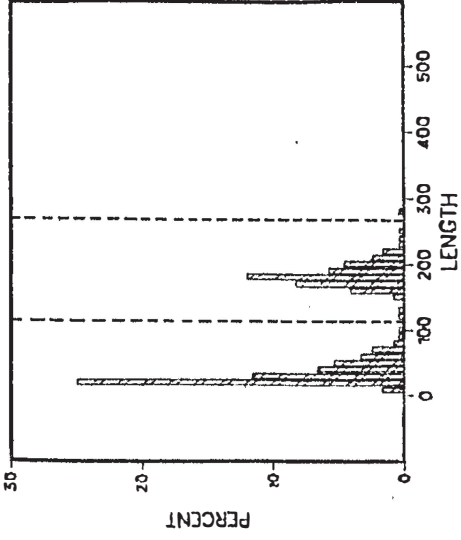
September, 1980

N = 326



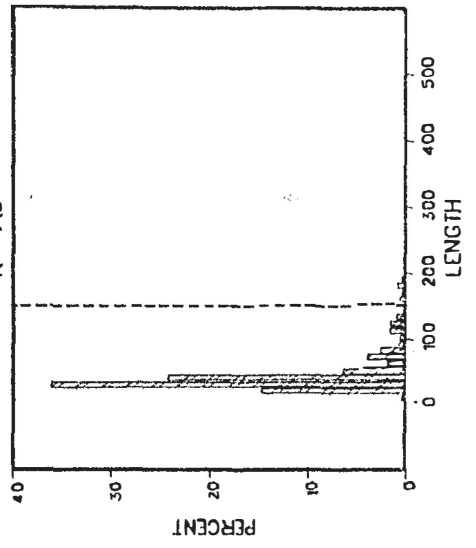
October, 1980

N = 241



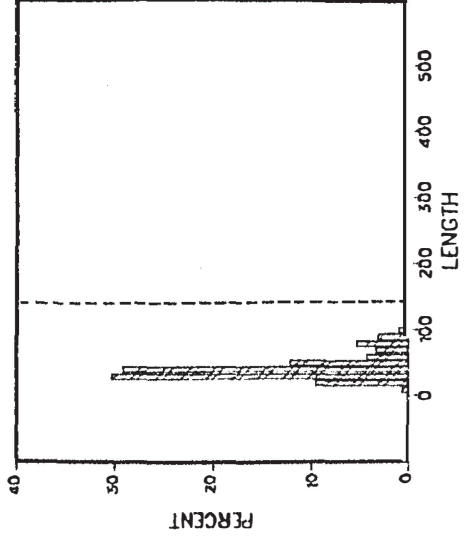
November, 1980

N = 715



December, 1980

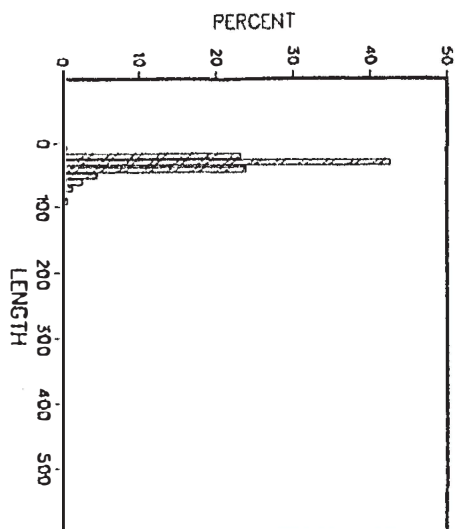
N = 848



Length Frequency for Crocker

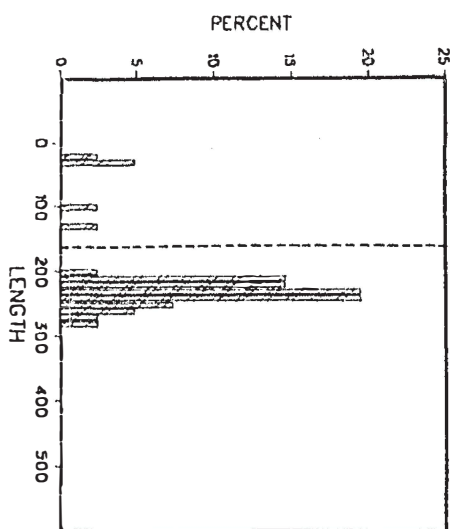
January, 1981

N = 50



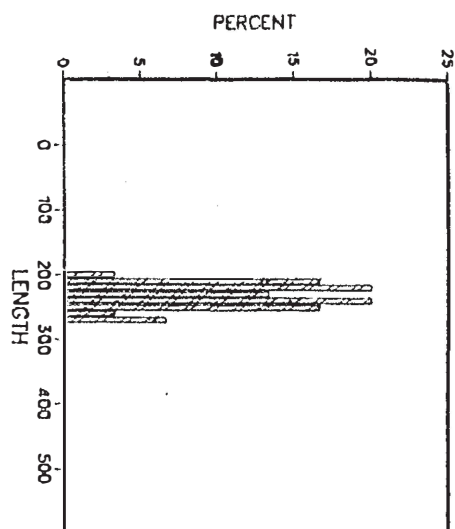
June, 1981

N = 41



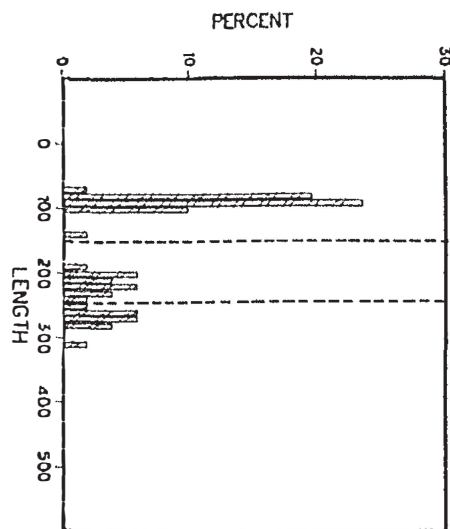
May, 1981

N = 30



July, 1981

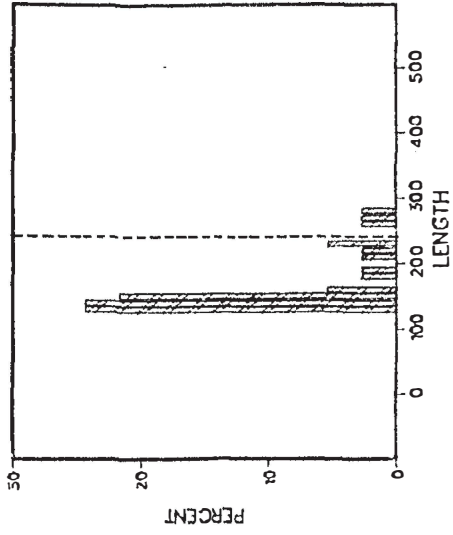
N = 51



Length Frequency for Croaker

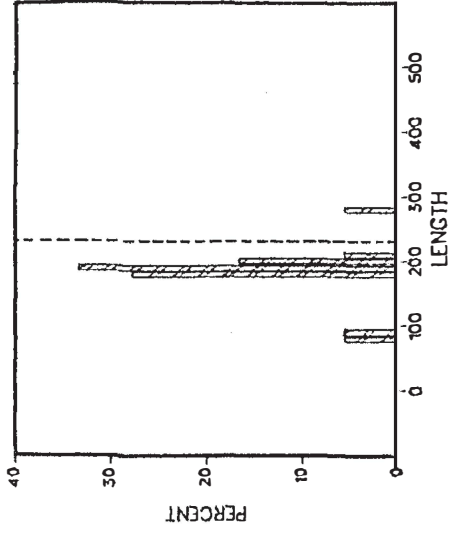
August, 1981

N = 37



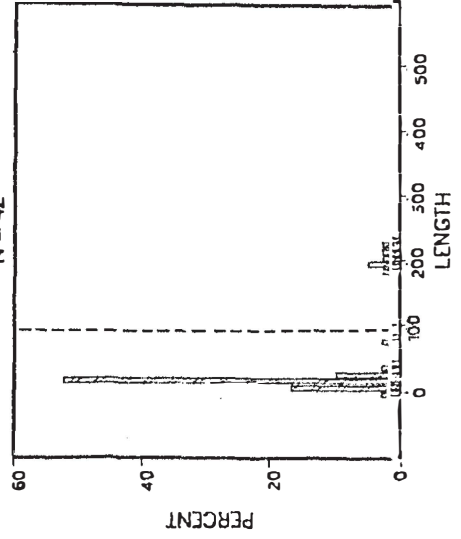
September, 1981

N = 18



October, 1981

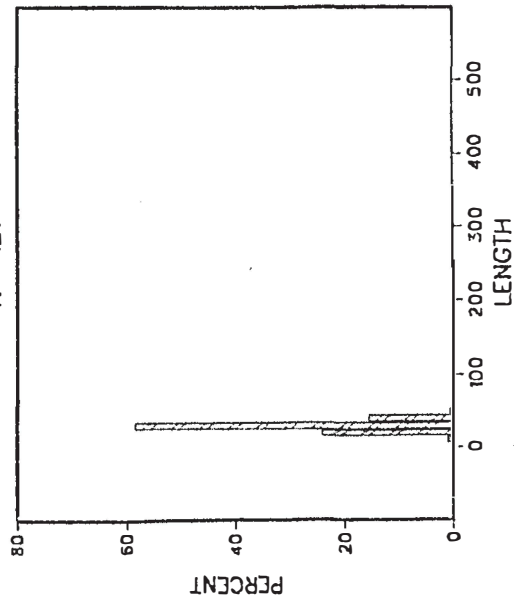
N = 42



Length Frequency for Croaker

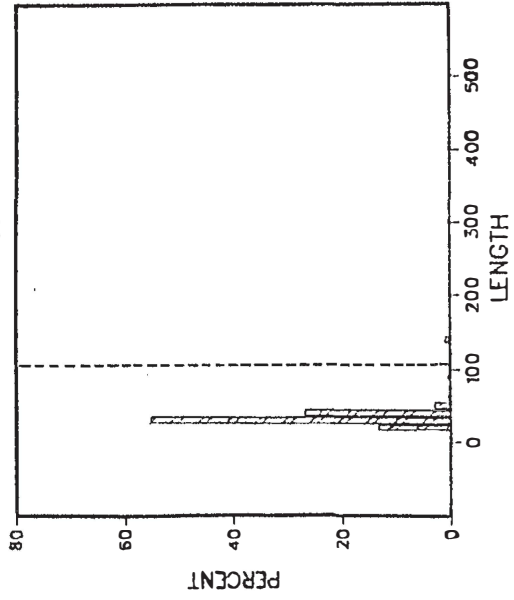
November, 1981

N = 424



December, 1981

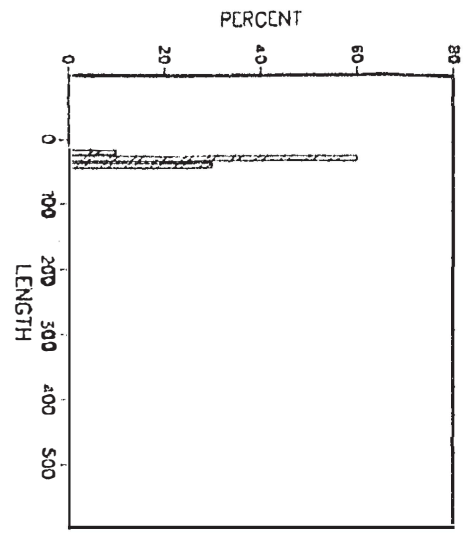
N = 309



Length Frequency for Croaker

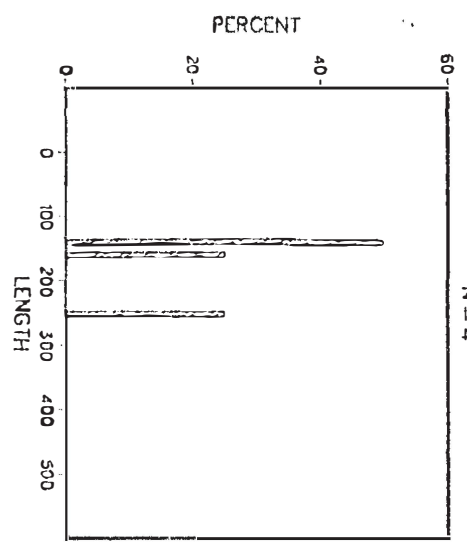
January, 1982

N = 20



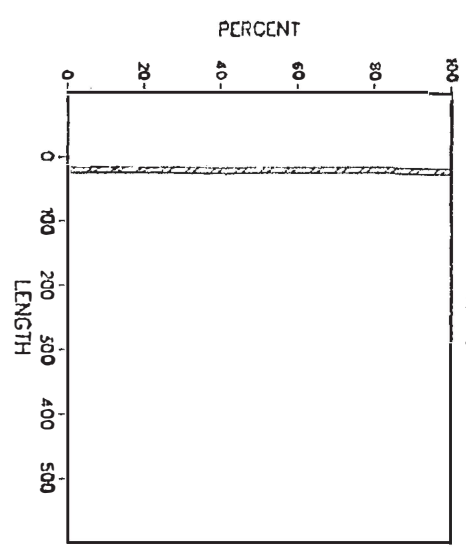
April, 1982

N = 4



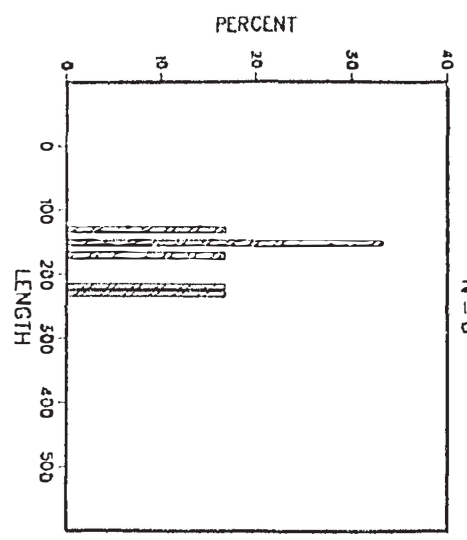
February, 1982

N = 1



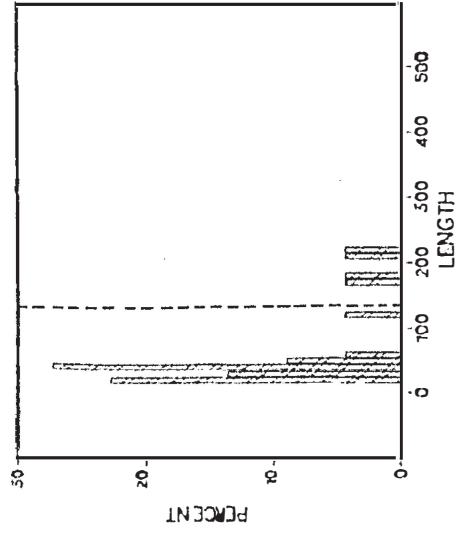
May, 1982

N = 6

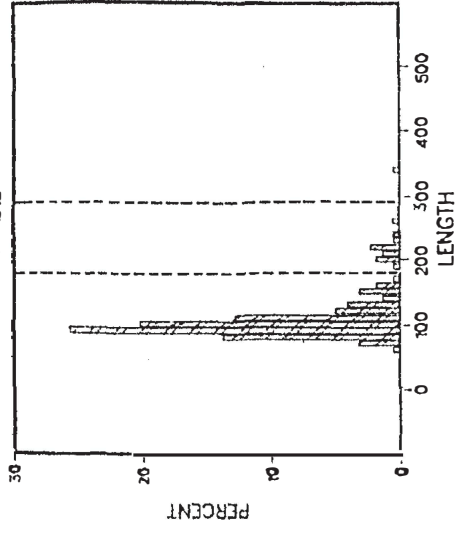


Length Frequency for Croaker

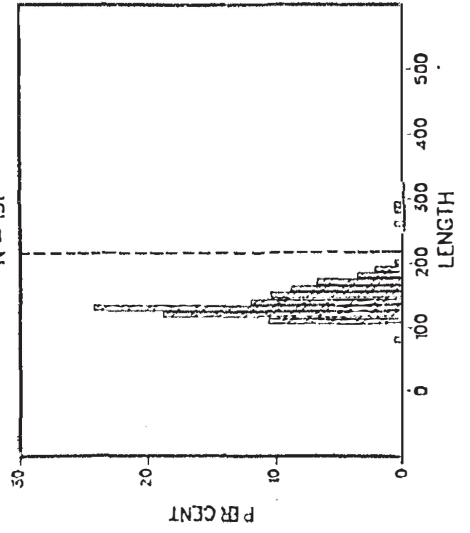
June, 1982
N = 22



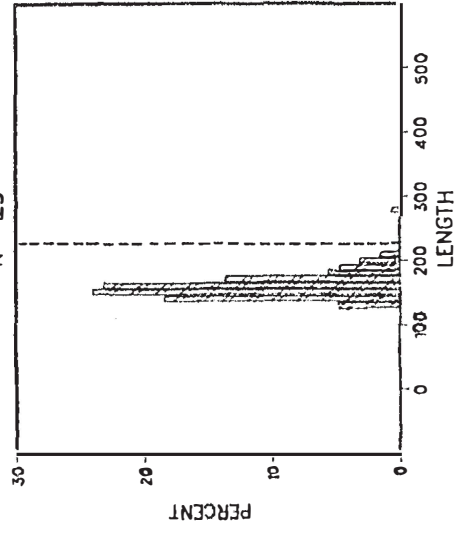
July, 1982
N = 218



August, 1982
N = 191



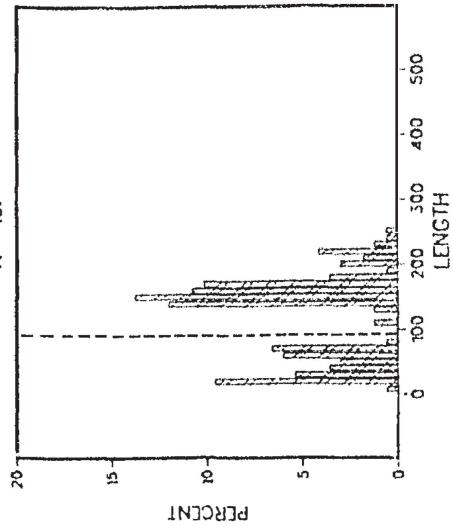
September, 1982
N = 125



Length Frequency for Croaker

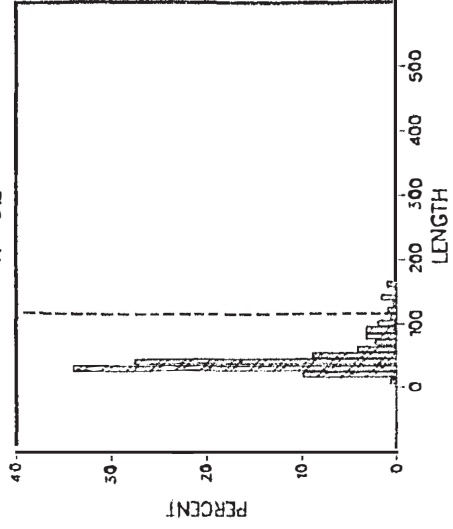
October, 1982

N = 167



November, 1982

N = 315



December, 1982

N = 290

