



TD/SP/5

December 1983

ANALYSIS OF SERIAL CHANGES IN THE COMPOSITION OF  
VARIOUS ITEMS USING A CORRELATION COEFFICIENT SERIES

(Microcomputer programs)

Shigeaki Shindo

Training Department  
Southeast Asian Fisheries Development Center

Special publication No.5  
December 1983

ANALYSIS OF SERIAL CHANGES IN THE COMPOSITION OF  
VARIOUS ITEMS USING A CORRELATION COEFFICIENT SERIES  
(Microcomputer programs)

Shigeaki Shindo

Training Department  
Southeast Asian Fisheries Development Center

CONTENTS

	Page
1. Introduction .....	1
2. Program No.700 (Standard program; annual changes) .....	2
2.1 Outline .....	2
2.2 Key Operation Procedure .....	4
2.3 Printout .....	5
2.4 Layout of Tables and Diagrams .....	9
2.5 Interpretation of Tables and Diagrams .....	12
2.6 Program List .....	13
3. Program No.720 (monthly changes) .....	16
3.1 Outline .....	16
3.2 Key Operation Procedure .....	17
3.3 Printout .....	18
3.4 Layout of Tables and Diagrams .....	20
3.5 Program List .....	22
4. Program No.701 (Attachments) .....	23
4.1 Outline .....	23
4.2 Key Operation Procedure .....	30
4.3 Printout .....	31
4.4 Program List .....	33

## 1. INTRODUCTION

In the present paper, three original microcomputer programs are introduced. They will be found useful in the analysis of a wide variety of serial changes concerning fishery resources, such as annual or monthly changes, or serial zones of water depth (e.g. 0-19 m, 20-39 m, 40-59 m, etc.). They can also be applied for analysing catch by species of fish (in terms of weight or numbers), catch by types of fishing gear (in terms of weight of catch or number of gear units, vessels etc.) catch by fishing area, etc. The programs are applicable both for investigating the current situation in a fishery and resources and for examining changes within a given time period.

In other words, these programs can be used to analyse;

- (a) annual or monthly changes of species composition (in terms of catch in weight, or in terms of number of individuals);
- (b) annual or monthly changes of gear composition (in terms of catch in weight by different gears, or in terms of number of vessels, or total tonnage of the fleet for different types of gear);
- (c) annual or monthly changes of catch composition for different areas (in terms of the total catch, or in terms of catch of a specific species);
- (d) changes in species composition by depth (in terms of catch in weight or of catch by number of individuals);
- (e) changes in proportion of different gears used for different depth zones (in terms of the catch weight, or the number of vessels, or the total tonnage of fleet used for each type of gear), etc.

The Program No.700 is a standard one suitable for use with any of the above-mentioned analyses except monthly changes. Program No.720 is a minor modification of Program No.700, and is specially arranged for monthly changes. Program No.701 produces attachments to graphs generated by Programs 700 and 720.

The microcomputer used here is a SHARP-1500 with 8K bytes RAM module.

2. PROGRAM NO.700

(Standard program; annual changes)

2.1 Outline

This program was originally devised for the analysis of annual changes of composition by various items (e.g. species, gears, areas). In line number 10 (see Program List below), the first statement is TEST, that is a check on the depth of the four pens of the X-Y plotter. The second and third statements denote selection and setting of a pen. Line numbers from 20 to 60 are the data input, such as initial year, number of years, number of items (i.e. species, gears or areas) and data of items.

Line numbers 121 to 205 contain computation and tabulation of correlation coefficients which include a sub-program (sub-routine) of line numbers 800 to 850. Correlation coefficients in the example given here are those for 1971 (1.00), 1971-72 (0.90), 1971-73 (0.89) (see the second line of Table 1 on p. 10). Similarly the correlation coefficients are calculated for 1972 and 1971 (0.90), 1972 and 1972 (1.00), 1972-73 (0.97), etc. (see the third line of Table 1).

In mathematical expression, the correlation coefficient  $r$  between year A and B is:

$$r = \frac{\sum (X_i - \bar{X}) (Y_i - \bar{Y})}{n \delta x \delta y}$$

Where,  $n$  is number of items (see Table 2 on p. 11)

$X_i$  is datum of item  $i$  for year A.

$Y_i$  is datum of item  $i$  for year B.

$\bar{X}$  is an average of data  $x$

$\bar{Y}$  is an average of data  $y$

$\delta x$  is a standard deviation of  $x$ , that is

$$\delta x = \frac{1}{n} \sum (X_i - \bar{X})^2$$

$\delta y$  is a standard deviation of  $y$ , that is

$$\delta y = \frac{1}{n} \sum (Y_i - \bar{Y})^2$$

Line numbers 270 to 350 are the computation and tabulation of Table 2 and they include two sub-programs (sub-routines) of line numbers 860 to 890 (percentage) and 900 to 990 (ranking).

Line numbers 356 to 523 generate a graph of a series of correlation coefficients, with a sub-program of line numbers 1370 to 1405 (graduations on x and y axes of the graph). Line numbers 525 to 604 generate a graph of catch and include a sub-program of line numbers 1575 to 1590 (outline of curves).

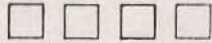
When analysing changes in composition of various items by different depth zones, input "1" instead of the initial year, and the number of zones instead of the number of years (see steps 2 and 3 in Key Operation Procedure below). Then, "1" signifies the first depth zone (e.g. 0-19 m), "2" the second depth zone (e.g. 20-39 m) etc. When the computer work is finished, \*\*\*\*\* END \*\*\*\*\* is printed out on paper and the prompt mark ">" appears on the screen in order to confirm to the operator that the work has been completed. The statement appears in line number 608 in the Program List (see p. 16).



2.2. Key Operation Procedure (Program No. 700)

STEP	KEYSTROKE	DISPLAY (Screen)	Remarks
0	ON	>	Make sure that the prompt character ">" is on the screen; this means that the computer is ready for operation.
1	DEF	PEN SELECT (0-3) ? _	The four small boxes for pen selection are printed out on paper. After that, the computer asks the required pen number.
2	ENTER	INITIAL YEAR = ? _	If you select pen number 2, press 2 and key marked ENTER. (N.B.: the ENTER key must be pressed after every step in operation. This instruction will therefore be omitted from now on). The computer asks initial year in your data.
3	1971	No. of YEARS (6-10) = _	If initial year is 1971, type 1971. Then, computer asks number of years. If it is ten, press 10. The number of years should be between six and ten.
4	10	No. of ITEMS (6-10) ? _	The computer asks number of items. If it is eight, press 8. The number of items should be between six and ten.
5	15704	A (Itm 1, Yr. 1) = ?	The computer asks data of first item in first year. If data is 15,704, type 15704.
6	12327 (Repeat)	A (Itm 2, Yr. 1) = ? (Repeat)	The computer asks data of second item in first year. If data is 12,327, type 12327. The same procedure will be repeated until last item in the last year.
		OPERATING A B C	After input of all data, the computer starts calculation. During calculation "OPERATING A B C" is displayed on screen; where A and B denotes that the computer is presently computing correlation coefficient between year A and B, and C denotes item number which is presently computing percentage and ranking (see Tables on pages 10 and 11). Thus, the operator can see the progress of computer work. The final display in our examples is 10 10 8. After that, the computer start printing all tables and diagrams.
		OPERATING 10 10 8	
		>	When all tables and diagrams are printed out, "***** END *****" is printed out on the paper and the prompt character ">" is on the screen. The work is finished.

2.3 Printout



CORRELATION TABLE

	1971	1978	1979	1980
1 1971	1.00	0.90	0.81	0.86
2 1972	0.90	0.76	0.60	0.65
3 1973	0.89	0.70	0.53	0.58
4 1974	0.88	0.70	0.53	0.58
5 1975	0.80	0.57	0.36	0.41
6 1976	0.57	0.36	0.05	0.12
7 1977	0.80	0.83	0.80	0.85
8 1978	0.90	1.00	0.89	0.92
9 1979	0.81	0.89	1.00	0.99
10 1980	0.86	0.92	0.99	1.00

1973

IT	DATA	%	RK
1	9642	38	2
2	11189	44	1
3	4655	18	3
4	0	0	6
5	0	0	6
6	0	0	6
7	0	0	6
8	0	0	6

DATA TABLE

1972	1973	1974
0.90	0.89	0.88
1.00	0.97	0.98
0.97	1.00	0.99
0.98	0.99	1.00
0.94	0.98	0.97
0.81	0.83	0.83
0.51	0.49	0.45
0.76	0.70	0.70
0.60	0.53	0.53
0.65	0.58	0.58

1971			
IT	DATA	%	RK
1	15704	37	1
2	12327	29	3
3	14401	34	2
4	0	0	6
5	0	0	6
6	0	0	6
7	0	0	6
8	0	0	6

1974			
IT	DATA	%	RK
1	19569	40	2
2	20470	42	1
3	7494	15	3
4	1314	3	4
5	0	0	7
6	0	0	7
7	204	0	5
8	0	0	7

1975	1976	1977
0.80	0.57	0.80
0.94	0.81	0.51
0.98	0.83	0.49
0.97	0.83	0.45
1.00	0.90	0.35
0.90	1.00	0.14
0.35	0.14	1.00
0.57	0.36	0.83
0.36	0.05	0.80
0.41	0.12	0.85

1972			
IT	DATA	%	RK
1	9297	38	1
2	8871	36	2
3	4457	18	3
4	2050	8	4
5	0	0	6
6	0	0	6
7	0	0	6
8	0	0	6

1975			
IT	DATA	%	RK
1	24387	36	2
2	36081	53	1
3	8071	12	3
4	0	0	6
5	0	0	6
6	0	0	6
7	0	0	6
8	77	0	4



1976

IT	DATA	%	RK
1	18414	22	2
2	45929	55	1
3	4526	5	4
4	14912	18	3
5	0	0	6
6	0	0	6
7	0	0	6
8	0	0	6

1979

IT	DATA	%	RK
1	6610	53	1
2	35	0	3
3	5866	47	2
4	0	0	6
5	0	0	6
6	0	0	6
7	0	0	6
8	0	0	6

1977

IT	DATA	%	RK
1	8452	23	2
2	5837	16	3
3	22806	61	1
4	0	0	7
5	15	0	5
6	0	0	7
7	0	0	7
8	383	1	4

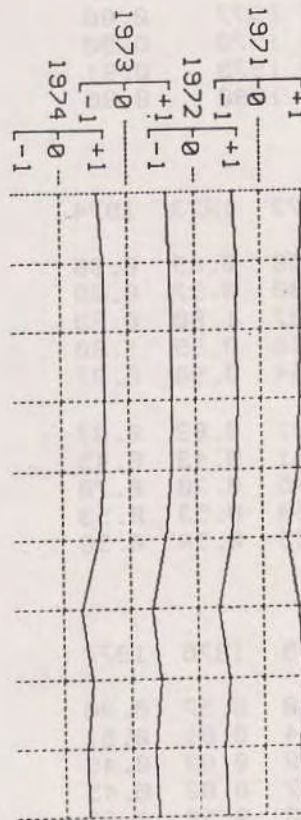
1980

IT	DATA	%	RK
1	12375	47	1
2	1498	6	3
3	12101	46	2
4	232	1	4
5	0	0	7
6	0	0	7
7	54	0	5
8	0	0	7

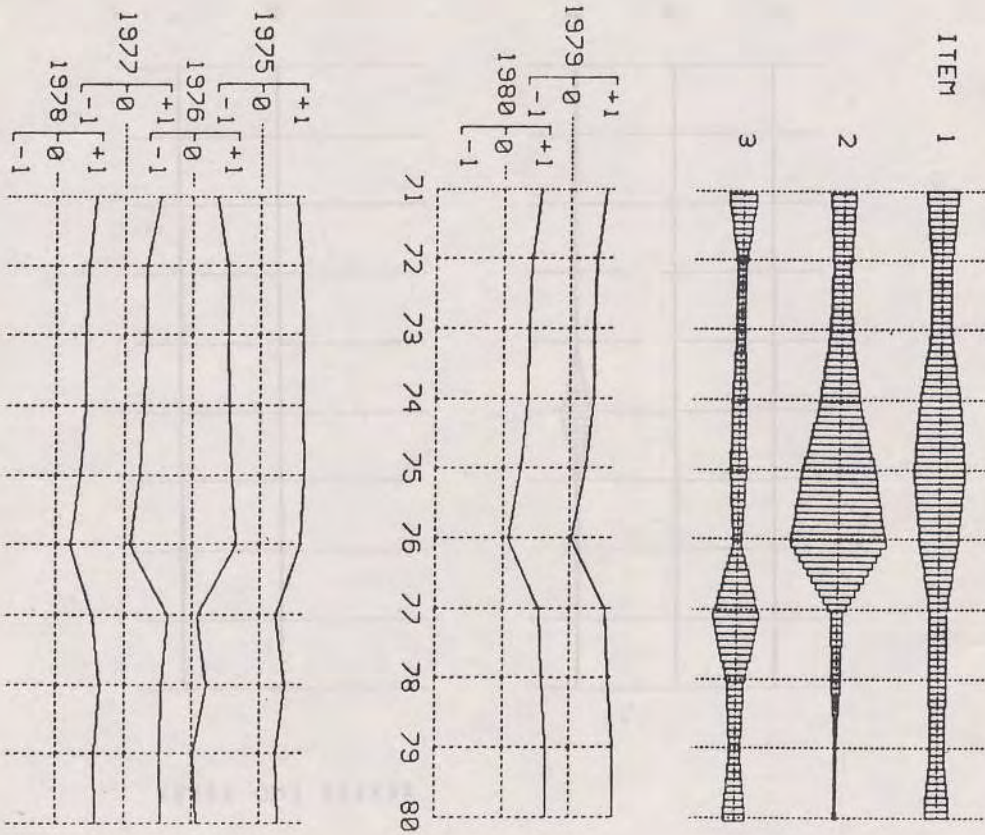
1978

IT	DATA	%	RK
1	8690	31	2
2	4467	16	3
3	8901	32	1
4	2589	9	5
5	15	0	7
6	0	0	8
7	3205	11	4
8	190	1	6

CORRELATION GRAPH

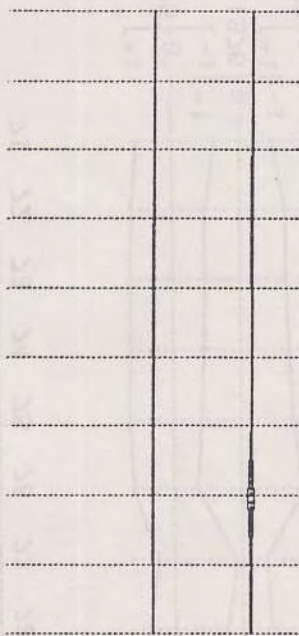


GRAPH of CATCH



ITEM 7

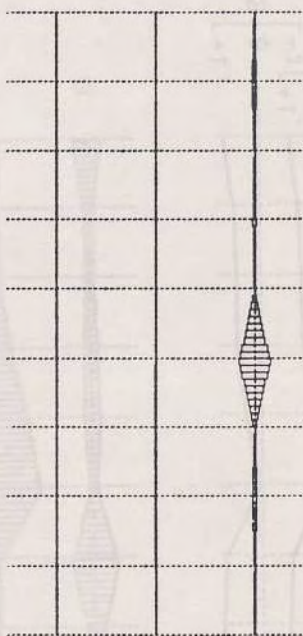
8



ITEM 4

5

6



\*\*\*\*\* END \*\*\*\*\*

2.4 Layout of Tables and Diagrams

Table 1. Table of a series of correlation coefficients.

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
1 1971	1.00	0.90	0.89	0.88	0.80	0.57	0.80	0.90	0.81	0.86
2 1972	0.90	1.00	0.97	0.98	0.94	0.81	0.51	0.76	0.60	0.65
3 1973	0.89	0.97	1.00	0.99	0.98	0.83	0.49	0.70	0.53	0.58
4 1974	0.88	0.98	0.99	1.00	0.97	0.83	0.45	0.70	0.53	0.58
5 1975	0.80	0.94	0.98	0.97	1.00	0.90	0.35	0.57	0.36	0.41
6 1976	0.57	0.81	0.83	0.83	0.90	1.00	0.14	0.36	0.05	0.12
7 1977	0.80	0.51	0.49	0.45	0.35	0.14	1.00	0.83	0.80	0.85
8 1978	0.90	0.76	0.70	0.70	0.57	0.36	0.83	1.00	0.89	0.92
9 1979	0.81	0.60	0.53	0.53	0.36	0.05	0.80	0.89	1.00	0.99
10 1980	0.86	0.65	0.58	0.58	0.41	0.12	0.85	0.92	0.99	1.00

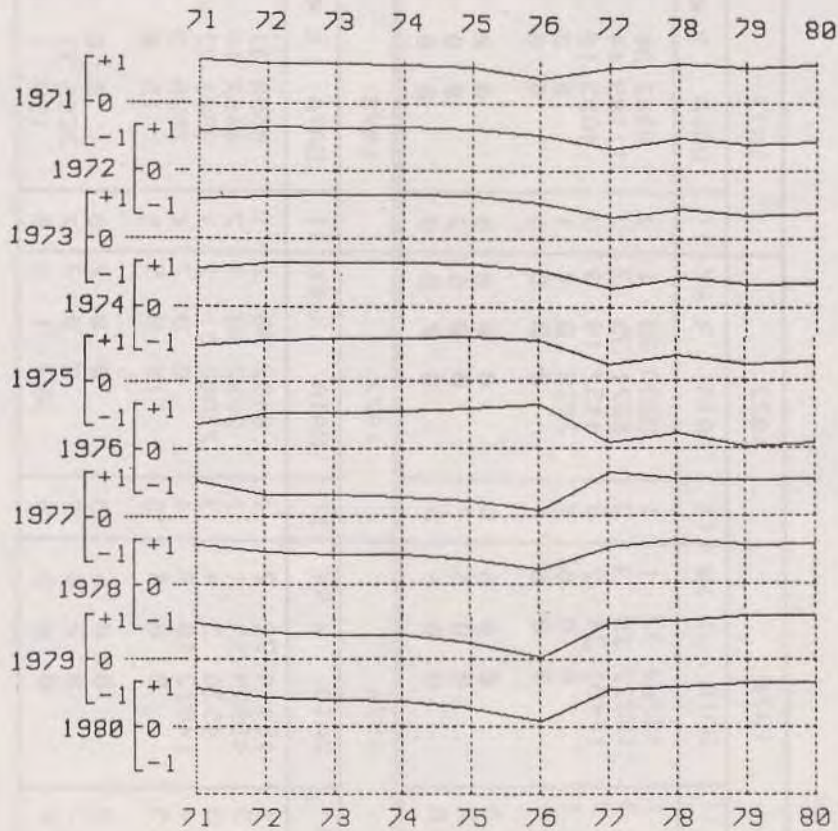


Fig. 1. Graph of series of correlation coefficients.

Table 2. Table of input data, percentage and ranking.

1971			1972			1973			1974			1975		
IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK
1	15704	37	1	9297	38	1	9642	38	2	19569	40	1	24387	36
2	12327	29	2	8871	36	2	11189	44	1	20470	42	2	36081	53
3	14401	34	3	4457	18	3	4655	18	3	7494	15	3	8071	12
4	0	0	4	2050	8	4	0	0	6	1314	3	4	0	0
5	0	0	5	0	0	5	0	0	6	0	0	5	0	0
6	0	0	6	0	0	6	0	0	6	0	0	6	0	0
7	0	0	7	0	0	7	0	0	6	204	0	7	0	0
8	0	0	8	0	0	8	0	0	6	0	0	8	77	0
1976			1977			1978			1979			1980		
IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK	IT	DATA	% RK
1	18414	22	1	8452	23	2	8690	31	2	6610	53	1	12325	47
2	45929	55	2	5837	16	3	4467	16	3	35	0	3	1498	6
3	4526	5	3	22806	61	1	8901	32	1	5866	47	2	12101	46
4	14912	18	4	0	0	4	2589	9	5	0	0	6	232	1
5	0	0	5	15	0	5	15	0	7	0	0	6	0	0
6	0	0	6	0	0	7	0	0	8	0	0	6	0	0
7	0	0	7	0	0	7	3205	11	4	0	0	6	54	0
8	0	0	8	383	1	8	190	1	6	0	0	6	0	0

IT and RK denote item and ranking.

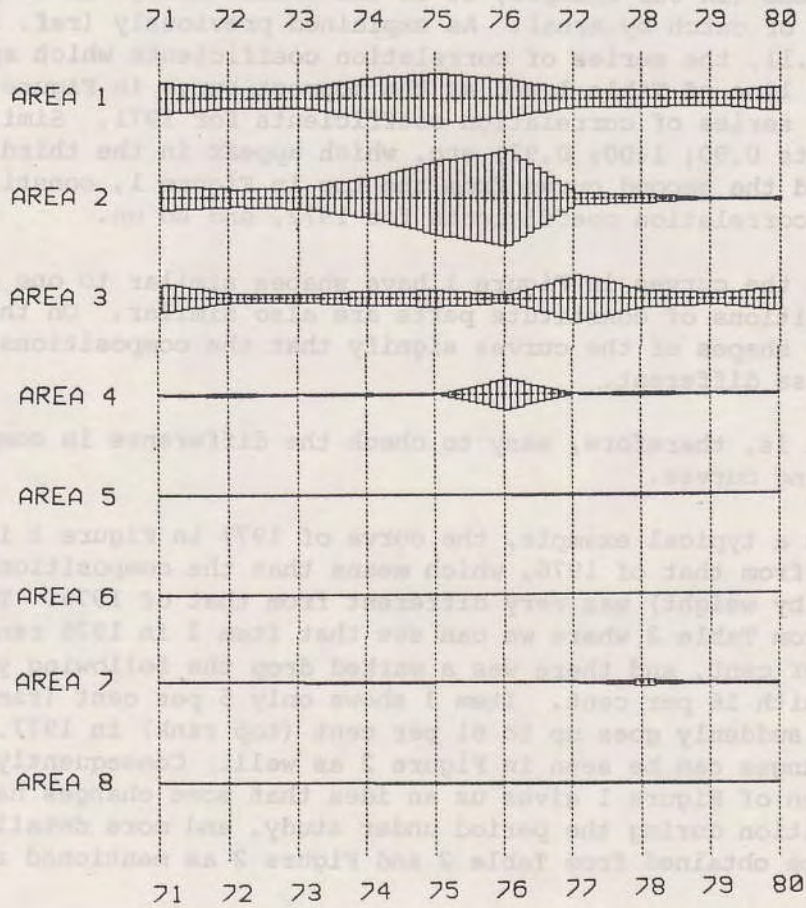


Fig. 2. Graph of annual changes of catch by Area.

## 2.5 Interpretation of Tables and Diagrams

A series of correlation coefficients, including the curves, is an important method for clarifying the serial changes of composition of various items (in our example, it is the annual change in composition and weight of catch by Area). As explained previously (ref. first paragraph of 2.1), the series of correlation coefficients which appear in the second line of Table 1 and as the topmost curve in Figure 1, is called the series of correlation coefficients for 1971. Similarly, coefficients 0.90; 1.00; 0.97; etc. which appear in the third line of Table 1 and the second curve from the top in Figure 1, constitute a series of correlation coefficients for 1972, and so on.

If the curves in Figure 1 have shapes similar to one another, the compositions of constitute parts are also similar. On the contrary, dissimilar shapes of the curves signify that the compositions are also more or less different.

It is, therefore, easy to check the difference in composition by examining curves.

As a typical example, the curve of 1977 in Figure 1 is very different from that of 1976, which means that the composition of catch for 1977 (by weight) was very different from that of 1976. The same emerges from Table 2 where we can see that Item 2 in 1976 ranked 1st with 55 per cent, and there was a marked drop the following year to 3rd rank with 16 per cent. Item 3 shows only 5 per cent (rank 4) in 1976, but suddenly goes up to 61 per cent (top rank) in 1977. The actual changes can be seen in Figure 2 as well. Consequently, a close examination of Figure 1 gives us an idea that some changes have occurred in composition during the period under study, and more detailed information can be obtained from Table 2 and Figure 2 as mentioned above.

2.6 Program List

```
3:REM PROG.-700
5:REM *****
* CATCH/CPUE *
* CORRATION *
* TIME SERIES*
*****
10:"A":CLEAR :
TEST :INPUT "P
EN SELECT(0-3)
?";C:COLOR C:
LF 1
15:INPUT "INITIAL
YEAR=?";U
20:INPUT "No. of Y
EARs (6-10)="?;W
22:DIM D(9)
24:FOR J=0TO W-1
26:D(J)=U+J
28:NEXT J
29:REM *****
30:INPUT "No. of I
TEMs (6-10)="?;
N
32:DIM X(10,10),Y
(10,10)
35:DIM A(10,10),B
(10,10):WAIT 0
40:FOR J=0TO W-1:
FOR I=0TO N-1
45:A$="":CLS
50:A$="A(I,M)+"
STR$(I+1)+"",Y
r "+STR$(J+1)
+"")="
55:PRINT A$;
57:INPUT A(I,J)
60:NEXT I:BEEP 3:
NEXT J:CLS
65:REM *****
70:FOR J=0TO W-1:
FOR I=0TO N-1
80:IF A(I,J)=0LET
A(I,J)=0.00000
1
90:NEXT I:NEXT J
100:REM *****
121:FOR M=0TO W-1:
J=M:FOR I=0TO
N-1
122:X(M,I)=A(I,J):
NEXT I
124:FOR J=0TO W-1:
FOR I=0TO N-1
125:Y(M,I)=A(I,J):
NEXT I
126:GOSUB 800
127:NEXT J:BEEP 3:
NEXT M
128:REM *****
129:LF -2:LPRINT "
CORRELATION T
ABLE":LF 3:FOR
M=0TO W-1
131:IF M=5LF 1
132:IF M=9LPRINT
TAB 1;M+1;D(M)
133:IF M<9LPRINT
TAB 2;M+1;D(M)
:NEXT M
135:LF -(W+3)
136:REM *****
140:M=0:LPRINT TAB
12;D(0):LF 1
141:FOR J=0TO W-1
143:IF J=5LF 1
144:USING "##.##":
LPRINT TAB 12;
B(M,J):NEXT J:
LF 3:USING
145:REM *****
147:Q=1
148:FOR M=1TO W-1
149:IF M=4LF (W+6)
150:IF M=7LF (W+6)
153:LPRINT TAB Q;D
(M):LF 1
155:FOR J=0TO W-1
161:IF J=5LF 1
170:IF J=10LF 1
172:USING "##.##":
LPRINT TAB Q;B
(M,J)
175:NEXT J:USING :
LF -(W+3)
180:Q=Q+6
190:IF Q>=14LET Q=
1
205:NEXT M:LF (W+6
)
260:REM *****
270:LPRINT TAB 1;"
DATA TABLE"
:LF 2
275:FOR J=0TO W-1:
USING
280:LPRINT TAB 6;U
+J:LF 1
285:LPRINT " ITM"
;" DATA ";"
%";" RK":LF 1
287:FOR I=0TO N-1
288:IF I=5LF 1
290:IF I>=9LPRINT
TAB 1;I+1:LF -
1:USING "####
###":LPRINT
TAB 4;A(I,J):
USING
295:IF I<=8LPRINT
TAB 2;I+1:LF -
1:USING "####
###":LPRINT
TAB 4;A(I,J):
USING
300:NEXT I
301:IF N<=10LF -(N
+1)
305:REM *****
309:T=0
310:GOSUB 860
330:IF N<=10LF -(N
+1)
340:GOSUB 900
350:LF 3:NEXT J
355:REM *****
356:LPRINT " CORRE
LATION GRAPH":
LF 3
357:GRAPH :ROTATE
1:SORGN
359:FF=0
360:FOR D=0TO 1
365:FOR I=FFTO FF+
3
367:IF W=16GOTO 140
3
370:IF I=0OR I=4
LET XA=182
```



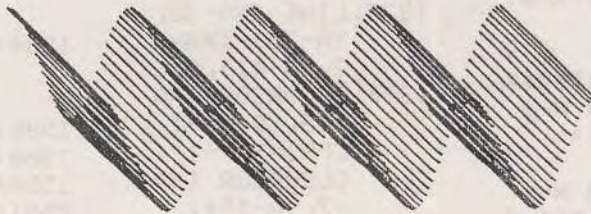
```
371:IF I=00R I=4
    LET YA=0
372:IF I=10R I=5
    LET XA=133
373:IF I=10R I=5
    LET YA=-35
374:IF I=20R I=6
    LET XA=84
375:IF I=20R I=6
    LET YA=0
376:IF I=30R I=7
    LET XA=35
377:IF I=30R I=7
    LET YA=-35
378:GOSUB 1370
380:L=-115
382:FOR J=0TO W-2
384:LINE (182,L)-(
    182,L-50),2,C:
    LINE (133,L)-(
    133,L-50),2,C
386:LINE (84,L)-(8
    4,L-50),2,C:
    LINE (35,L)-(3
    5,L-50),2,C
388:LINE (0,L-50)-
    (215,L-50),2,C
390:DD=182:FOR M=F
    FTO FF+3
392:P1=32.5*B(M,J)
    +DD:P2=32.5*B(
    M,J+1)+DD
394:DD=DD-49
400:LINE (P1,L)-(P
    2,L-50),0,C:P1
    =0:P2=0
402:NEXT M
404:L=L-50:NEXT J
406:FF=FF+4
410:TEXT :LF 5:
    GRAPH :ROTATE
    1:SORGN
420:NEXT D
490:GRAPH :SORGN :
    ROTATE 1:DD=0:
    D=0
491:FOR I=8TO 9
494:IF I=8LET XA=1
    82:IF I=8LET Y
    A=0
496:IF I=9LET XA=1
    33:IF I=9LET Y
    A=-35
498:GOSUB 1370
500:L=-115
502:FOR J=0TO W-2
504:LINE (182,L)-(
    182,L-50),2,C:
    LINE (133,L)-(
    133,L-50),2,C
506:LINE (84,L)-(8
    4,L-50),2,C
508:LINE (84,L-50)
    -(215,L-50),2,
    C:DD=182
510:FOR M=8TO 9
511:IF M<8GOTO 140
    3
512:P1=32.5*B(M,J)
    +DD:P2=32.5*B(
    M,J+1)+DD
516:DD=DD-49
518:LINE (P1,L)-(P
    2,L-50),0,C:P1
    =0:P2=0
520:NEXT M
521:GLCURSOR (62,L
    +22):LPRINT D(
    J)-1900
522:IF J=W-2
    GLCURSOR (62,L
    -27):LPRINT D(
    J+1)-1900
523:L=L-50:NEXT J:
    TEXT :LF 4
524:REM *****
525:LPRINT " GRAPH
    of CATCH":LF
    2
526:GRAPH :ROTATE
    1
527:MAX=A(0,0)
530:FOR I=0TO N-1:
    FOR J=0TO W-1
532:IF MAX<A(I,J)
    LET MAX=A(I,J)
534:NEXT J:NEXT I
535:Z=175:FF=0
536:FOR F=0TO 3:ZZ
    =180:PP=-150
537:FOR I=FFTO FF+
    2
538:IF I=NTEXT :LF
    4:GOTO 608
540:GLCURSOR (Z,0)
    :LPRINT " IT
    EM ";I+1:Z=Z-7
    2
545:IF I=00R I=3
    LINE (0,-150)-
    (215,-150),1,C
547:IF I=60R I=9
    LINE (0,-150)-
    (215,-150),1,C
550:FOR J=0TO W-2
576:IF J=0LET PP=-
    150
577:IF J=1LET PP=-
    200
578:IF J=2LET PP=-
    250
579:IF J=3LET PP=-
    300
580:IF J=4LET PP=-
    350
581:IF J=5LET PP=-
    400
582:IF J=6LET PP=-
    450
583:IF J=7LET PP=-
    500
584:IF J=8LET PP=-
    550
590:GLCURSOR (ZZ,P
    P):GOSUB 1575
591:PP=PP-150-J*50
592:LINE (ZZ,PP)-(
    ZZ,PP-50),1,C
594:IF I=0LINE (0,
    PP-50)-(215,PP
    -50),1,C
595:IF I=3LINE (0,
    PP-50)-(215,PP
    -50),1,C
596:IF I=6LINE (0,
    PP-50)-(215,PP
    -50),1,C
597:IF I=9LINE (0,
    PP-50)-(215,PP
    -50),1,C
```

```
600:NEXT J:ZZ=ZZ-7
      2:PP=-150
601:IF ZZ<36LET ZZ
      =180
602:IF Z<31LET Z=1
      75
603:NEXT I:TEXT :
      LF 3:GRAPH :
      ROTATE 1
604:FF=FF+3:NEXT F
      :TEXT :LF 4
608:LPRINT " *****
      * END ***** " :
      LF 4
700:END
799:REM *****
800:FOR I=0TO N-1
802:USING :PRINT "
      OPERATING
      ";M+1;" ";J+1
      ;" ";I+1
805:Q=Q+X(M,I):P=P+
      Y(M,I)
810:Q=Q+X(M,I)*X(M
      ,I):R=R+Y(M,I)
      *Y(M,I):S=S+X(
      M,I)*Y(M,I)
815:NEXT I:BEEP 2
820:C=(N*S-O*P)/J(
      (N*Q-O*Q)*(N*R
      -P*P))
830:B(M,J)=C
840:O=0:P=0:Q=0:R=
      0:S=0:C=0:X=0:
      Y=0
850:RETURN
855:REM *****
860:FOR I=0TO N-1
870:T=T+A(I,J):
      NEXT I
875:FOR I=0TO N-1
880:TT=INT ((A(I,J)
      )/T*100)+0.5)
881:USING "###"
882:LPRINT TAB 12;
      TT:USING
884:IF I=4LF 1
886:NEXT I
890:RETURN
895:REM *****
900:FOR I=0TO N-1
910:R1=0:N1=1
920:FOR Q=0TO N-1
930:IF A(I,J)<>A(Q
      ,J)GOTO 950
940:N1=N1+1
950:IF A(I,J)>=A(Q
      ,J)GOTO 961
960:R1=R1+1
961:NEXT Q
965:USING "###"
970:LPRINT TAB 15;
      R1+N1/2:USING
975:IF I=4LF 1
976:IF I=9LF 1
977:IF I=14LF 1
980:NEXT I
990:RETURN
999:REM *****
1370:IF I=10GOTO
      1405
1371:GLCURSOR (XA
      -5,YA+30):
      LPRINT U:
      LINE (XA+33,
      YA-35)-(XA-3
      2,YA-35),0,C
1372:LINE (XA+33,
      YA-35)-(XA+3
      3,YA-41),0,C
      :LINE (XA,YA
      -35)-(XA,YA-
      41),0,C
1373:LINE (XA-32,
      YA-35)-(XA-3
      2,YA-41),0,C
1374:GLCURSOR (XA
      +23,YA-45):
      LPRINT "+1":
      GLCURSOR (XA
      -7,YA-45):
      LPRINT "0":
      GLCURSOR (XA
      -32,YA-45):
      LPRINT "-1"
1385:U=U+1:NEXT I
1390:IF D=2GOTO 1
      403
1400:LINE (0,-115
      )-(215,-115)
      ,1,C:LINE (1
      82,-63)-(182
      ,-110),1,C
1401:LINE (133,-9
      8)-(133,-110
      ),1,C:LINE (
      84,-63)-(84,
      -110),1,C
1402:LINE (35,-98
      )-(35,-110),
      1,C:GOTO 140
      5
1403:LINE (84,-11
      5)-(215,-115
      ),1,C:LINE (
      182,-63)-(18
      2,-110),1,C
1404:LINE (133,-9
      8)-(133,-110
      ),1,C
1405:RETURN
1410:REM -----
1575:U1=70/MAX*A(
      I,J):U2=70/M
      AX*A(I,J+1)
1577:Z1=ZZ:Z2=ZZ
1580:FOR R=0TO 9:
      IC=(U2/2-U1/
      2)
1582:LINE (Z1-U1/
      2,PP)-(Z2+U1
      /2,PP-5),0,C
      ,B
1584:PP=PP-5:Z1=Z
      1-IC/10:Z2=Z
      2+IC/10
1586:NEXT R
1588:PP=0
1590:RETURN
1591:REM STATUS(1
      )=4730
65279:END
```

3. PROGRAM No.720  
(Monthly changes)

3.1 Outline

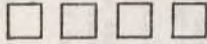
Program No.720 is a modification of Program No.700, specially arranged for monthly changes of composition of various items. As instructed in the Key Operation Procedure below (see steps 4 to 5 in the column of DISPLAY), A(1-JAN)=? is shown on the screen instead of A(Itm 1, Yr.1)=? which appeared in Program No.700. It is not necessary to input the intial month and the number of months. The words JAN, FEB, MAR, ....., DEC are already contained in the Program (line numbers 19 and 20). The other parts of the Program are quite similar to those of Program No.700. Therefore, no detailed explanation is necessary in this case.



3.2 Key Operation Procedure (Program No.720)

STEP	KEYSTROKE	DISPLAY (Screen)	Remarks
1	ON	>	Make sure that the prompt character ">" is on the screen; this means that the computer is ready for operation.
2	DEF A	PEN SELECT (0-3)?_	Four small boxes for pen selection are printed out on paper. If you select pen number 2, press 2. (N.B.: the ENTER key must be pressed after every step in operation. This instruction will therefore be omitted from now on).
3	2	No. of ITEMS (6-10)?_	If there are nine items in your data, press 9.
4	9	A (1 - JAN) = ?	The computer requests data of the first item in January. If your data is 21, type 21.
5	21	A (2 - JAN) = ?	Input data of the second item in January. If your data is 32, input 32. This procedure will be repeated until last item in December.
6	32 (Repeat)	A (3 - JAN) = ? (Repeat)	A sound (beep) is heard between JAN. and FEB., etc., in order to enable you to check data input.
7	*OPERATING* A MAR C.	*OPERATING* A MAR C.	After input of all data, the computer starts computation. During computation "*OPERATING* A JAN. C" is displayed on screen; where A and JAN denotes that the computer is presently calculating correlation coefficient between month A and March, and C denotes item number which is presently computing percentage and ranking (see Tables on page 24 and 25). The final display in our example is 12 DEC. 9.
	>	*OPERATING* 12 DEC 9	After that, the computer starts printing all tables and graphs. When all tables and graphs are printed out, "***** END *****" is printed out on the paper and the prompt character ">" is on the screen. The work is finished.

3.3 Printout



CORRELATION TABLE

	JAN
JAN	1.00
FEB	0.50
MAR	0.52
APR	0.56
MAY	0.32
JUN	-0.13
JUL	0.00
AUG	-0.27
SEP	-0.24
OCT	0.75
NOV	0.25
DEC	-0.37

FEB	MAR	APR
0.50	0.52	0.56
1.00	0.43	0.69
0.43	1.00	0.69
0.69	0.69	1.00
0.10	0.86	0.40
-0.17	0.15	-0.03
0.17	0.47	0.63
-0.64	-0.61	-0.49
-0.20	0.28	0.08
0.57	0.73	0.57
-0.29	-0.07	0.18
-0.43	-0.54	-0.45

MAY	JUN	JUL
0.32	-0.13	0.00
0.10	-0.17	0.17
0.86	0.15	0.47
0.40	-0.03	0.63
1.00	0.11	0.33
0.11	1.00	0.03

0.33	0.03	1.00
-0.45	-0.12	-0.51
0.43	0.77	0.12
0.61	-0.11	0.03
-0.09	0.16	0.48
-0.54	0.24	0.15

AUG	SEP	OCT
-0.27	-0.24	0.75
-0.64	-0.20	0.57
-0.61	0.28	0.73
-0.49	0.08	0.57
-0.45	0.43	0.61
-0.12	0.77	-0.11
-0.51	0.12	0.03
1.00	-0.07	-0.41
-0.07	1.00	0.08
-0.41	0.08	1.00
0.03	-0.02	-0.16
0.03	-0.16	-0.72

NOV	DEC
0.25	-0.37
-0.29	-0.43
-0.07	-0.54
0.18	-0.45
-0.09	-0.54
0.16	0.24
0.48	0.15
0.03	0.03
-0.02	-0.16
-0.16	-0.72
1.00	0.57
0.57	1.00

DATA TABLE

JAN			
ITM	DATA	%	RK
1	21	7	6
2	32	10	4
3	52	16	2
4	47	15	3
5	85	27	1
6	20	6	7
7	10	3	9
8	20	6	7
9	30	9	5

FEB			
ITM	DATA	%	RK
1	40	11	6
2	41	11	5
3	45	12	4
4	48	13	3
5	55	15	2
6	66	18	1
7	14	4	9
8	25	7	8
9	32	9	7

MAR			
ITM	DATA	%	RK
1	40	10	5
2	11	3	9
3	22	6	7
4	77	20	2
5	88	23	1
6	55	14	3
7	44	11	4
8	33	8	6
9	20	5	8

APR				JUL				OCT			
ITM	DATA	%	RK	ITM	DATA	%	RK	ITM	DATA	%	RK
1	10	4	7	1	40	10	7	1	14	12	5
2	12	5	6	2	41	11	6	2	0	0	8
3	41	18	4	3	45	12	5	3	15	13	3
4	45	20	2	4	47	12	4	4	20	17	2
5	45	20	2	5	49	13	3	5	30	25	1
6	45	20	2	6	55	14	2	6	14	12	5
7	20	9	5	7	60	15	1	7	0	0	8
8	10	4	7	8	40	10	7	8	15	13	3
9	0	0	9	9	12	3	9	9	10	8	7

MAY				AUG				NOV			
ITM	DATA	%	RK	ITM	DATA	%	RK	ITM	DATA	%	RK
1	52	12	4	1	10	10	7	1	12	7	8
2	12	3	9	2	12	11	6	2	23	14	3
3	32	8	8	3	19	18	2	3	24	14	2
4	56	13	3	4	15	14	3	4	15	9	6
5	75	18	1	5	0	0	8	5	23	14	3
6	48	12	5	6	0	0	8	6	14	8	7
7	59	14	2	7	14	13	5	7	25	15	1
8	42	10	6	8	15	14	3	8	21	12	5
9	41	10	7	9	20	19	1	9	12	7	8

JUN				SEP				DEC			
ITM	DATA	%	RK	ITM	DATA	%	RK	ITM	DATA	%	RK
1	12	3	9	1	25	7	8	1	12	7	6
2	52	11	6	2	23	6	9	2	45	28	1
3	25	5	8	3	32	9	7	3	12	7	6
4	52	11	6	4	41	11	5	4	0	0	9
5	56	12	5	5	41	11	5	5	12	7	6
6	63	14	3	6	52	14	2	6	13	8	4
7	64	14	2	7	52	14	2	7	31	19	2
8	69	15	1	8	54	15	1	8	25	16	3
9	62	14	4	9	47	13	4	9	10	6	8

3.4 Layout of Table and Diagrams.

Table 3. A series of correlation coefficients.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN	1.00	0.50	0.52	0.56	0.32	-0.13	0.00	-0.27	-0.24	0.75	0.25	-0.37
FEB	0.50	1.00	0.43	0.69	0.10	-0.17	0.17	-0.64	-0.20	0.57	-0.29	-0.43
MAR	0.52	0.43	1.00	0.69	0.86	0.15	0.47	-0.61	0.28	0.73	-0.07	-0.54
APR	0.56	0.69	0.69	1.00	0.40	-0.03	0.63	-0.49	0.08	0.57	0.18	-0.45
MAY	0.32	0.10	0.86	0.40	1.00	0.11	0.33	-0.45	0.43	0.61	-0.09	-0.54
JUN	-0.13	-0.17	0.15	-0.03	0.11	1.00	0.03	-0.12	0.77	-0.11	0.16	0.24
JUL	0.00	0.17	0.47	0.63	0.33	0.03	1.00	-0.51	0.12	0.03	0.48	0.15
AUG	-0.27	-0.64	-0.61	-0.49	-0.45	-0.12	-0.51	1.00	-0.07	-0.41	0.03	0.03
SEP	-0.24	-0.20	0.28	0.08	0.43	0.77	0.12	-0.07	1.00	0.08	-0.02	-0.16
OCT	0.75	0.57	0.73	0.57	0.61	-0.11	0.03	-0.41	0.08	1.00	-0.16	-0.72
NOV	0.25	-0.29	-0.07	0.18	-0.09	0.16	0.48	0.03	-0.02	-0.16	1.00	0.57
DEC	-0.37	-0.43	-0.54	-0.45	-0.54	0.24	0.15	0.03	-0.16	-0.72	0.57	1.00

Table 4. Table of input data, percentage and ranking

JAN			APR			JUL			OCT		
ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK
1	21	7 6	1	10	4 7	1	40	10 7	1	14	12 5
2	32	10 4	2	12	5 6	2	41	11 6	2	0	0 8
3	52	16 2	3	41	18 4	3	45	12 5	3	15	13 3
4	47	15 3	4	45	20 2	4	47	12 4	4	20	17 2
5	85	27 1	5	45	20 2	5	49	13 3	5	30	25 1
6	20	6 7	6	45	20 2	6	55	14 2	6	14	12 5
7	10	3 9	7	20	9 5	7	60	15 1	7	0	0 8
8	20	6 7	8	10	4 7	8	40	10 7	8	15	13 3
9	30	9 5	9	0	0 9	9	12	3 9	9	10	8 7
FEB			MAY			AUG			NOV		
ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK
1	40	11 6	1	52	12 4	1	10	10 7	1	12	7 8
2	41	11 5	2	12	3 9	2	12	11 6	2	23	14 3
3	45	12 4	3	32	8 8	3	19	18 2	3	24	14 2
4	48	13 3	4	56	13 3	4	15	14 3	4	15	9 6
5	55	15 2	5	75	18 1	5	0	0 8	5	23	14 3
6	66	18 1	6	48	12 5	6	0	0 8	6	14	8 7
7	14	4 9	7	59	14 2	7	14	13 5	7	25	15 1
8	25	7 8	8	42	10 6	8	15	14 3	8	21	12 5
9	32	9 7	9	41	10 7	9	20	19 1	9	12	7 8
MAR			JUN			SEP			DEC		
ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK	ITM	DATA	% RK
1	40	10 5	1	12	3 9	1	25	7 8	1	12	7 6
2	11	3 9	2	52	11 6	2	23	6 9	2	45	28 1
3	22	6 7	3	25	5 8	3	32	9 7	3	12	7 6
4	77	20 2	4	52	11 6	4	41	11 5	4	0	0 9
5	88	23 1	5	56	12 5	5	41	11 5	5	12	7 6
6	55	14 3	6	63	14 3	6	52	14 2	6	13	8 4
7	44	11 4	7	64	14 2	7	52	14 2	7	31	19 2
8	33	8 6	8	69	15 1	8	54	15 1	8	25	16 3
9	20	5 8	9	62	14 4	9	47	13 4	9	10	6 8

ITM and RK denote item and ranking respectively.



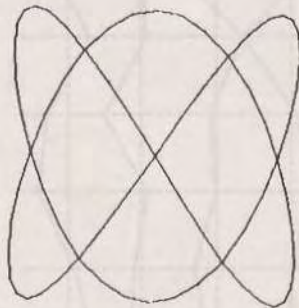
3.5 Program List

```
3:REM PROG.-720
5:REM *****
  * CATCH/CPUE *
  MONTHLY CHANGS
  *****
10:"A":CLEAR :
  TEST :INPUT "P
  EN SELECT(0-3)
  ?";C:COLOR C:
  LF 1:WAIT 0
13:DIM D$(11)
15:FOR J=0TO 11
17:READ D$(J)
19:DATA "JAN", "FE
  B", "MAR", "APR"
  , "MAY", "JUN"
20:DATA "JUL", "AU
  G", "SEP", "OCT"
  , "NOV", "DEC"
21:NEXT J
25:INPUT "No. of I
  TEMs (6-10)?";N
27:DIM X(11, 9), Y(
  11, 9), A(9, 11),
  B(11, 11)
40:FOR J=0TO 11:
  FOR I=0TO N-1
45:A$="":CLS
50:A$="A("+STR$(
  I+1)+"-"+D$(J)
  +")="
55:PRINT A$;
57:INPUT A(I, J):
  CLS
60:NEXT I:BEEP 5:
  NEXT J:CLS
65:REM *****
70:FOR J=0TO 11:
  FOR I=0TO N-1
80:IF A(I, J)=0LET
  A(I, J)=0.00000
  1
90:NEXT I:NEXT J
100:REM *****
121:FOR M=0TO 11:J
  =M:FOR I=0TO N
  -1
122:X(M, I)=A(I, J):
  NEXT I
124:FOR J=0TO 11:
  FOR I=0TO N-1
125:Y(M, I)=A(I, J):
  NEXT I
126:GOSUB 800
127:NEXT J:BEEP 3:
  NEXT M
128:REM *****
129:LF -2:LPRINT "
  CORRELATION T
  ABLE":LF 3:FOR
  M=0TO 11
131:IF M=6LF 1
132:LPRINT TAB 5;D
  $(M)
133:NEXT M
135:LF -15
140:M=0:LPRINT TAB
  13;D$(M):LF 1
141:FOR J=0TO 11
143:IF J=6LF 1
144:USING "##.##":
  LPRINT TAB 12;
  B(M, J):NEXT J:
  LF 3:USING
  145:REM *****
147:Q=1
148:FOR M=1TO 11
150:IF M=4OR M=7OR
  M=10LF 18
153:LPRINT TAB Q+1
  ;D$(M):LF 1
155:FOR J=0TO 11
161:IF J=6LF 1
172:USING "##.##":
  LPRINT TAB Q;B
  (M, J)
175:NEXT J:LF -15
180:Q=Q+6
190:IF Q)=14LET Q=
  1
200:IF M=11LF 18:
  GOTO 260
205:NEXT M:LF -18
260:REM *****
270:LPRINT TAB 1;"
  DATA TABLE"
  :LF 2
275:FOR J=0TO 11:
  USING
280:LPRINT TAB 8;D
  $(J):LF 1
285:LPRINT " ITM"
  ;" DATA ";"
  ?";" RK":LF 1
287:FOR I=0TO N-1
288:IF I=5LF 1
290:IF I)=9LPRINT
  TAB 1;I+1:LF -
  1:USING "####
  ###":LPRINT
  TAB 4;A(I, J):
  USING
295:IF I<=8LPRINT
  TAB 2;I+1:LF -
  1:USING "####
  ###":LPRINT
  TAB 4;A(I, J):
  USING
300:NEXT I
301:IF N<=11LF -(N
  +1)
305:REM *****
309:T=0
310:GOSUB 860
330:IF N<=10LF -(N
  +1)
340:GOSUB 900
350:LF 3:NEXT J
355:REM *****
356:LPRINT " CORRE
  LATION GRAPH":
  LF 3
357:GRAPH :ROTATE
  1:SORGN
359:FF=0
360:FOR D=0TO 2
365:FOR I=FFTO FF+
  3
370:IF I=0OR I=4OR
  I=8LET XA=182
371:IF I=0OR I=4OR
  I=8LET YA=0
372:IF I=1OR I=5OR
  I=9LET XA=133
373:IF I=1OR I=5OR
  I=9LET YA=-35
374:IF I=2OR I=6OR
```

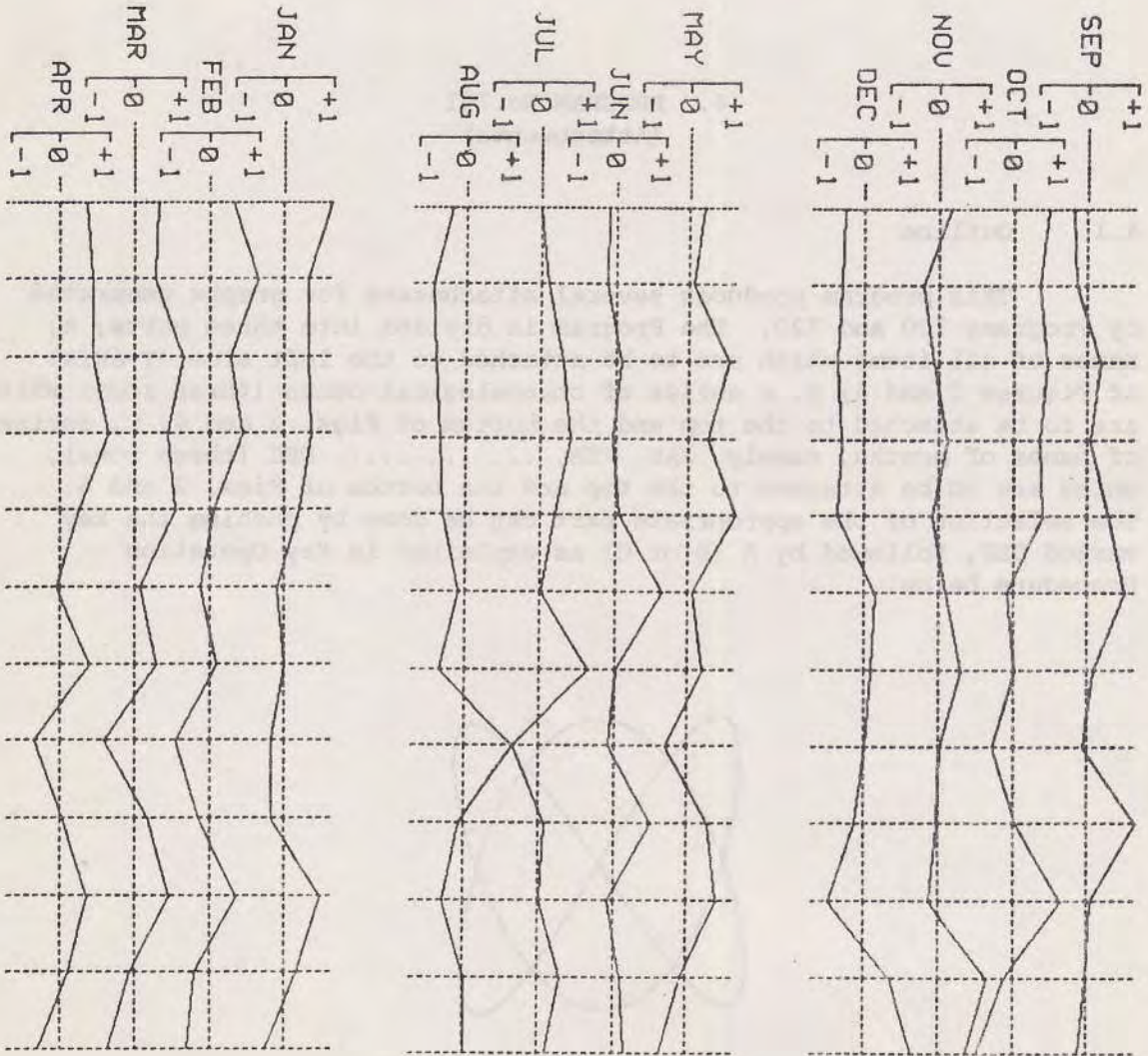
4. PROGRAM No.701  
(Attachments)

4.1 Outline

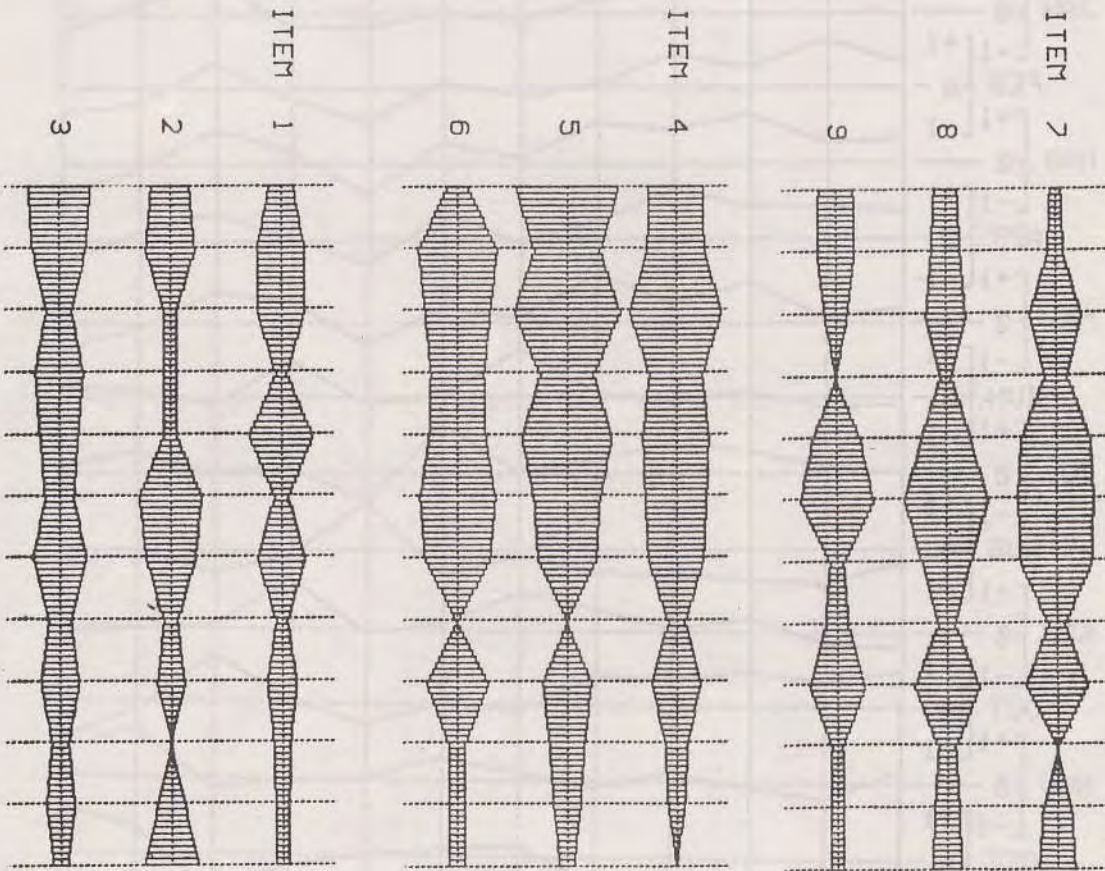
This program produces several attachments for graphs generated by Programs 700 and 720. The Program is divided into three parts; A, names of all items which are to be attached to the left side (Y-axis) of Figures 2 and 4; B, a series of chronological names (three rows) which are to be attached to the top and the bottom of Figs. 2 and 4; C, series of names of months, namely, JAN, FEB, ....., DEC (three rows), which are to be attached to the top and the bottom of Figs. 2 and 4. The selection of the appropriate part can be done by pushing the key marked DEF, followed by A (B or C) as explained in Key Operation Procedure below.



CORRELATION GRAPH



GRAPH of CATCH



\*\*\*\*\* END \*\*\*\*\*

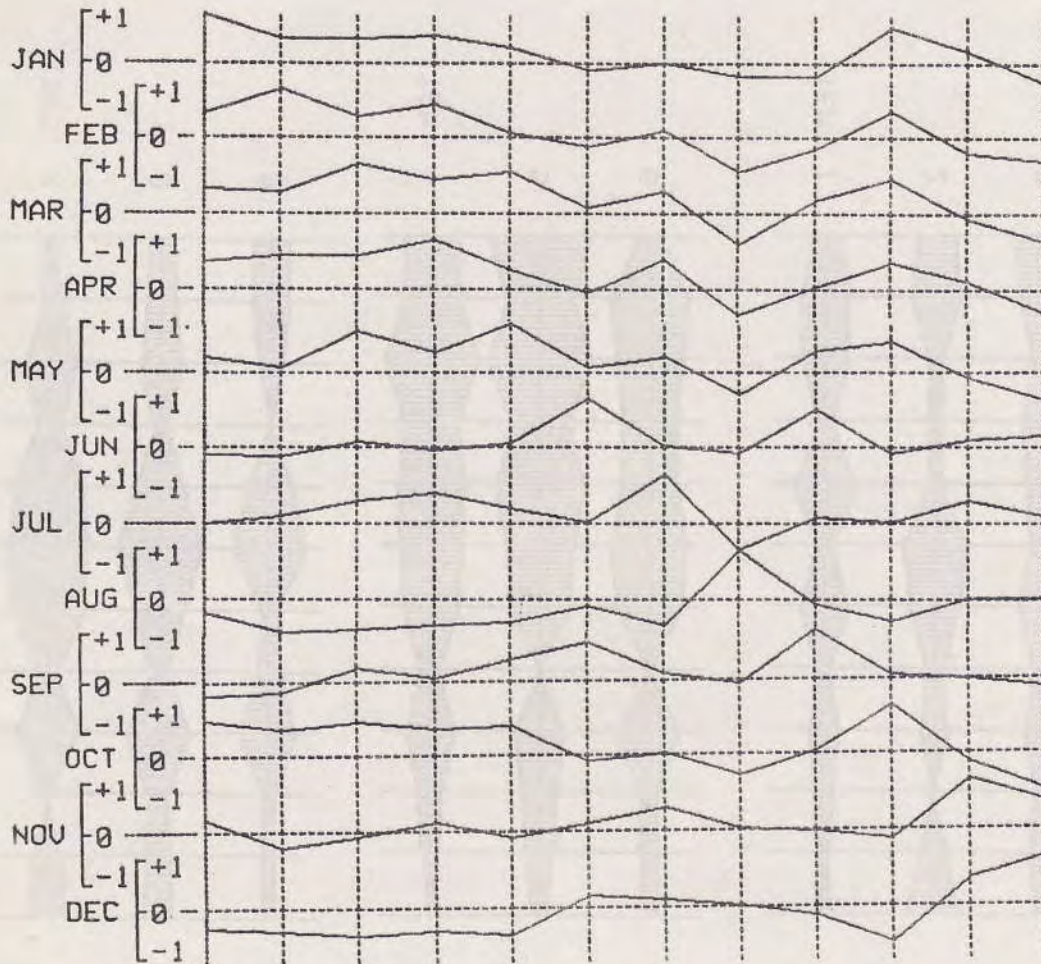


Fig. 3 Graph of curves of correlation coefficients.

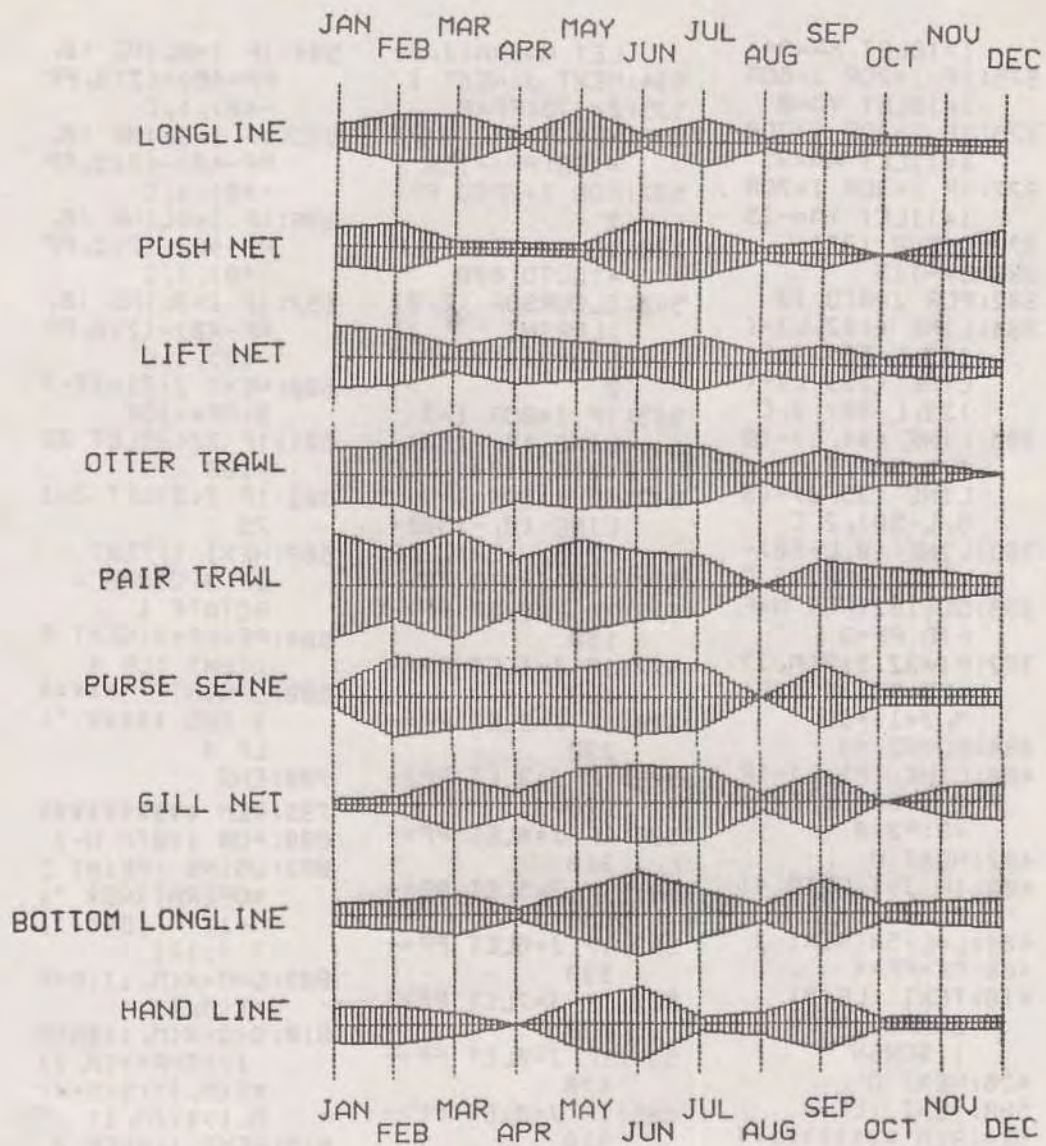


Fig. 4 Graph of monthly changes in catch by gear.

```
I=10LET XA=84
375: IF I=20R I=60R
      I=10LET YA=0
376: IF I=30R I=70R
      I=11LET XA=35
377: IF I=30R I=70R
      I=11LET YA=-35
378: GOSUB 1371
380: L=-115
382: FOR J=0TO 10
384: LINE (182, L)-(
      182, L-50), 2, C:
      LINE (133, L)-(
      133, L-50), 2, C
386: LINE (84, L)-(8
      4, L-50), 2, C:
      LINE (35, L)-(3
      5, L-50), 2, C
388: LINE (0, L-50)-
      (215, L-50), 2, C
390: DD=182: FOR M=F
      FTO FF+3
392: P1=32.5*B(M, J)
      +DD: P2=32.5*B(
      M, J+1)+DD
394: DD=DD-49
400: LINE (P1, L)-(P
      2, L-50), 0, C: P1
      =0: P2=0
402: NEXT M
403: IF J=11GOTO 41
      0
404: L=L-50: NEXT J
406: FF=FF+4
410: TEXT :LF 5:
      GRAPH :ROTATE
      1: SORGN
420: NEXT D
500: TEXT :LF 4
524: REM *****
525: LPRINT " GRAPH
      of CATCH":LF
      2
526: GRAPH :ROTATE
      1
527: MAX=A(0, 0)
530: FOR I=0TO N-1:
      FOR J=0TO 11
532: IF MAX<A(I, J)
      LET MAX=A(I, J)
534: NEXT J: NEXT I
535: Z=175: FF=0
536: FOR F=0TO 3: ZZ
      =180: PP=-150
537: FOR I=FFTO FF+
      2
538: IF I=NTEXT :LF
      4: GOTO 608
540: GLCURSOR (Z, 0)
      :LPRINT " IT
      EM "; I+1: Z=Z-7
      2
545: IF I=0OR I=3
      LINE (0, -150)-
      (215, -150), 1, C
547: IF I=6OR I=9
      LINE (0, -150)-
      (215, -150), 1, C
550: FOR J=0TO 10
576: IF J=0LET PP=-
      150
577: IF J=1LET PP=-
      190
578: IF J=2LET PP=-
      230
579: IF J=3LET PP=-
      270
580: IF J=4LET PP=-
      310
581: IF J=5LET PP=-
      350
582: IF J=6LET PP=-
      390
583: IF J=7LET PP=-
      430
584: IF J=8LET PP=-
      470
585: IF J=9LET PP=-
      510
586: IF J=10LET PP=
      -550
587: IF J=11LET PP=
      -590
590: GLCURSOR (ZZ, P
      P): GOSUB 1575
591: PP=PP-150-J*40
592: LINE (ZZ, PP)-(
      ZZ, PP-40), 1, C
594: IF I=0LINE (0,
      PP-40)-(215, PP
      -40), 1, C
595: IF I=3LINE (0,
      PP-40)-(215, PP
      -40), 1, C
596: IF I=6LINE (0,
      PP-40)-(215, PP
      -40), 1, C
597: IF I=9LINE (0,
      PP-40)-(215, PP
      -40), 1, C
600: NEXT J: ZZ=ZZ-7
      2: PP=-150
601: IF ZZ<36LET ZZ
      =180
602: IF ZZ<31LET Z=1
      75
603: NEXT I: TEXT :
      LF 3: GRAPH :
      ROTATE 1
604: FF=FF+3: NEXT F
      : TEXT :LF 4
608: LPRINT " *****
      * END ***** ":
      LF 4
700: END
799: REM *****
800: FOR I=0TO N-1
802: USING :PRINT "
      *OPERATING* ";
      M+1; " "; D*(J);
      " "; I+1
805: O=O+X(M, I): P=P
      +Y(M, I)
810: Q=Q+X(M, I)*X(M
      I): R=R+Y(M, I)
      *Y(M, I): S=S+X(
      M, I)*Y(M, I)
815: NEXT I: BEEP 2
820: C=(N*S-O*P)/√(
      (N*Q-O*O)*(N*R
      -P*P))
830: B(M, J)=C
840: O=0: P=0: Q=0: R=
      0: S=0: C=0: X=0:
      Y=0
850: RETURN
855: REM *****
```

```
860:FOR I=0TO N-1
870:T=T+A(I,J):
      NEXT I
875:FOR I=0TO N-1
880:TT=INT ((A(I,J)
      )/T*100)+0.5)
881:USING "###"
882:LPRINT TAB 12;
      TT:USING
884:IF I=4LF 1
886:NEXT I
890:RETURN
895:REM *****
900:FOR I=0TO N-1
910:R1=0:N1=1
920:FOR Q=0TO N-1
930:IF A(I,J)<>A(Q
      ,J)GOTO 950
940:N1=N1+1
950:IF A(I,J)>=A(Q
      ,J)GOTO 961
960:R1=R1+1
961:NEXT Q
965:USING "###"
970:LPRINT TAB 15;
      R1+N1/2:USING
975:IF I=4LF 1
976:IF I=9LF 1
980:NEXT I
990:RETURN
999:REM *****
1371:GLCURSOR (XA
      -5, YA+10):
      LPRINT D$(I)
      :LINE (XA+33
      , YA-35)-(XA-
      32, YA-35), 0,
      C
1372:LINE (XA+33,
      YA-35)-(XA+3
      3, YA-41), 0, C
      :LINE (XA, YA
      -35)-(XA, YA-
      41), 0, C
1373:LINE (XA-32,
      YA-35)-(XA-3
      2, YA-41), 0, C
1374:GLCURSOR (XA
      +23, YA-45):
LPRINT "+1":
GLCURSOR (XA
-7, YA-45):
LPRINT "0":
GLCURSOR (XA
-32, YA-45):
LPRINT "-1"
1385:NEXT I
1400:LINE (0, -115
      )-(215, -115)
      , 1, C:LINE (1
      82, -63)-(182
      , -110), 1, C
1401:LINE (133, -9
      8)-(133, -110)
      , 1, C:LINE (
      84, -63)-(84,
      -110), 1, C
1402:LINE (35, -98
      )-(35, -110),
      1, C:GOTO 140
      5
1404:LINE (133, -9
      8)-(133, -110)
      , 1, C
1405:RETURN
1410:REM *****
1575:U1=70/MAX*(A(
      I, J):U2=70/M
      AX*(A(I, J+1)
1577:Z1=ZZ:Z2=ZZ
1580:FOR R=0TO 9:
      IC=(U2/2-U1/
      2)
1582:LINE (Z1-U1/
      2, PP)-(Z2+U1
      /2, PP-4), 0, C
      , B
1584:PP=PP-4:Z1=Z
      1-IC/10:Z2=Z
      2+IC/10
1586:NEXT R
1588:PP=0
1590:RETURN
1591:REM STATUS(1
      )=4215
65279:END
```



4.2 Key Operation Procedure (Program No. 701)

STEP	KEYSTROKE	DISPLAY (Screen)	Remarks
0	ON	>	Make sure that the prompt character ">" is on the screen.
1	DEF A	Number of ITEMS (6-10) = -	The computer requests the number of items. Input it by keystroke. The number of items should be between six and ten. If it is seven, press 7 and key marked ENTER. (N.B. : the ENTER key must be pressed after every step in operation. This instruction will therefore be omitted from now on).
2	7	Name of ITEM = (30 characters)	Display with sound (beep) as your reminder for about three seconds. The number of characters of each item should be 30 or less, including commas, full stops, spaces, etc.
3		Name of ITEM 1 = ?	The computer requests name of ITEM 1. Type name of first item (see Example on page 34). The computer asks name of second item. The same procedure will be repeated until name of last item. The computer starts printing.
4	OTTER TRAWL (Repeat)	Name of ITEM 2 = ? (Repeat)	
		>	The prompt character ">" is on the screen. This means that the work of sub-program A is finished.
1	DEF B	Initial year = -	The computer asks initial year in your data. If it is 1971, type 1971.
2	1971	Number of YEARS (10) = -	The computer asks number of years in your data. If it is ten, type 10.
		>	The computer prints out three rows of series of last two digits of years (1971 = 71 only). After printing, the prompt character ">" is on the screen. The work of sub-program B is finished.
1	DEF C	>	The computer generates three rows of series of names of months from JAN. to DEC. After printing, the prompt character ">" is on the screen. The work of sub-program C is finished.



Example 5.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

Example 4.

71	72	73	74	75	76	77	78	79	80
71	72	73	74	75	76	77	78	79	80
71	72	73	74	75	76	77	78	79	80

4.4 Program List

```
5:REM PROG.-701
7:REM *****
* ATTACHMENTS*
* to PROG-700*
*and PROG-703*
*****
10:"A":CLEAR :
WAIT 0
15:INPUT "Number
of ITEMS (6-10)
=";N
17:DIM A$(11)*30
18:PRINT "Name of
ITEM=(30 char
act.)":BEEP 20
20:FOR J=0TO N-1
25:A$="":CLS
30:A$="Name of IT
EM "+STR$(J+1
)+="":PRINT A$
;
40:INPUT A$(J):
CLS
50:NEXT J
52:REM *****
55:X=180:Y=0:FF=0
60:ON ERROR GOTO
130
62:FOR D=0TO 3
65:GRAPH :SORGN :
ROTATE 1
70:FOR W=FFTO FF+
2
80:GLCURSOR (X,Y)
:LPRINT A$(W)
90:X=X-72
95:IF X<36LET X=1
80
97:GOSUB 300
100:NEXT W
105:IF X<31LET X=1
80
107:FF=FF+3
108:IF J>=NGOTO 13
0
110:GLCURSOR (X,-(
MAX*12+80)):
SORGN :ROTATE
1
120:NEXT D
130:TEXT :LF 5
134:END
235:REM *****
300:MAX=LEN A$(0)
310:FOR J=FFTO FF+
2
320:IF MAX<LEN A$(
J)LET MAX=LEN
A$(J)
330:NEXT J:Q=MAX
340:RETURN
440:REM *****
YEAR in Y-axis
*****
450:"B":CLEAR :
GRAPH :ROTATE
1
460:INPUT "Initial
year=";A:B=A
470:INPUT "Number
of YEARS (10)="
;N
473:X=180
475:FOR D=0TO 2
480:FOR I=0TO N-1
490:GLCURSOR (X,L)
500:LPRINT B-1900
510:L=L-50:B=B+1
520:NEXT I
522:X=X-72:L=0:B=A
:RESTORE
523:NEXT D
525:TEXT :LF 5
527:END
530:REM *****
* MONTH in *
* Y-axis *
*****
540:"C":CLEAR :
GRAPH :ROTATE
1:SORGN
545:DIM A$(11)*3
547:X=180
558:GLCURSOR (X,L)
560:FOR D=0TO 2
580:FOR I=0TO 11
585:READ A$(I)
586:IF X=180LET X=
195:GOTO 599
587:IF X=195LET X=
180:GOTO 599
588:IF X=108LET X=
123:GOTO 599
589:IF X=123LET X=
108:GOTO 599
590:IF X=36LET X=5
1:GOTO 599
591:IF X=51LET X=3
6:GOTO 599
599:GLCURSOR (X,L)
600:LPRINT A$(I)
610:L=L-40
620:NEXT I:X=X-72:
L=0:RESTORE
630:NEXT D
640:TEXT :LF 5
650:END
660:DATA "JAN","FE
B","MAR","APR"
,"MAY","JUN","
JUL","AUG","SE
P","OCT","NOV"
,"DEC",""
665:REM STATUS I=
1325
670:END
```