```
      PROGRAM RASC(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE10,TAPE99,
     - TAPE55)
C
C
C
C                RRRRR  AAAAA  SSSSS  CCCCC
C                R   R  A   A  S      C
C                RRRRR  AAAAA  SSSSS  C
C                R R    A   A      S  C
C                R  R   A   A      S  C
C                R   R  A   A  SSSSS  CCCCC
C
C
C          BY  F.P. AGTERBERG AND L.D. NEL
C
C          GEOLOGICAL SURVEY OF CANADA
C          JANUARY 1981
C
C
C          PROGRAM RASC IS A REVISED VERSION OF THE
C          PROGRAMS SEQONE AND SEQTWO PRESENTED DURING
C          THE IGCP PROJECT 148 WORKSHOPS IN DARTMOUTH, N.S.,
C          AUGUST, 1979, AND OTTAWA, FEBRUARY, 1980.
C
C
C           PROGRAM INPUTS
C           --------------
C
C
C  COLUMNS  FORMAT  NAME          DESCRIPTION
C  -------  ------  ----          -----------
C
C     CARD NO. 1     RUN PARAMETERS
C     ----------     --------------
C
C  1- 3     I3      NS            -NO. OF SEQUENCES OR WELLS
C  4- 6     I3      IOCR          -ELEMENTS WHICH OCCUR LESS THAN IOCR
C                                  TIMES IN DATA SET WILL BE IGNORED
C  7- 9     I3      INIQ          -EQUALS 1 IF UNIQUE EVENTS OR MARKER
C                                  HORIZONS ARE INCLUDED.  OTHERWISE
C                                  SET EQUAL TO 0.
C 10-14     F5.1    CRIT          -TRANSPOSE ELEMENTS WITH SUM.LT.CRIT
C                                  IN ORDER MATRIX, WILL BE ZEROED
C                                  CRIT MUST BE .LE. IOCR
C 15-19     F5.1    TOL           -TOLERANCE
C 20-29     F10.5   AAA           -AAA.NE.0 REPLACES A=1.645
C
C     CARD NO. 2     LIMITS
C     ----------     ------
C
C
C  1- 5     I5      N             -NO. OF EVENT LABELS IN DICTIONARY
C  6-10     I5      MAX           -MULTIPLE OF 20 SUCH THAT THE NUMBER
C                                  OF EVENTS IN LONGEST SEQUENCE IS
C                                  LESS THAN OR EQUAL TO MAX
```

```
C 11-16    I6     ITER          -MAX. NO. OF CUMULATIVE ORDER MATRIX
C                                 TRANSFORMATIONS ALLOWED
C
C     CARD NO. 3     PROCESSING CONTROL
C     ----------     ------------------
C
C  FOR SHORT VERSION OF RASC (RANKING ALGORITHMS ONLY), IALPHA=0
C
C
C  1- 3    I3     ITAPE         -IF ITAPE=1 DATA WILL BE READ OFF
C                                 TAPE10, IF=0 DATA WILL BE READ OFF
C                                 CARDS DIRECTLY AFTER CARD NO. 5
C  4- 6    I3     IOMAT         -IF=1 ORDER AND FREQUENCY MATRICES
C                                 AS WELL AS INTERMEDIATE TABLES WILL
C                                 BE PRINTED.  IF=0 THESE OUTPUTS WILL
C                                 BE SUPPRESSED.
C  7- 9    I3     ISRT          -IF ISRT=1 SUBROUTINE PRESRT WILL
C                                 PRESEQUENCE DATA FOR OPTIMIZED
C                                 STARTING SEQUENCE
C 10-12    I3     IALPHA        -IF=0, TERMINATION AFTER RANKING
C                                 IF=1, SCALING WILL BE DONE
C                                 IF=2, STEPWISE SEQUENCING PROGRESS
C                                 WILL BE PRINTED BEFORE TERMINATION.
C 13-15    I3     ITAB1         -IF=1, AN OCCURRENCE TABLE FOR THE
C                                 WELLS IS CONSTRUCTED
C 16-18    I3     ISCORE        -IF=1, STEP MODEL COMPARISON OF
C                                 INDIVIDUAL WELLS AND FOSSILS WITH
C                                 OPTIMAL SEQUENCE IS PERFORMED
C 19-21    I3     ICOMP         -IF=1, NORMALITY TEST ON INDIVIDUAL
C                                 WELLS IS PERFORMED
C 22-24    I3     ISKIP         -IF=1, CUMULATIVE ORDER MATRIX IS USED
C 25-27    I3     IFIN          -IF=1, FINAL REORDERING APPLIED
C 28-30    I3     INOSC          =0  NO SCALING OUTPUT
C                                 =1  WEIGHTED DISTANCE OUTPUT ONLY
C                                 =2  WEIGHTED AND UNWEIGHTED OUTPUT
C
C
C     CARD NO. 4     UNIQUE EVENTS
C     ----------     -------------
C
C     IF INIQ=1, UP TO 20 UNIQUE EVENTS WILL BE READ OFF THIS CARD
C     IN 20I4 FORMAT.  IF NO UNIQUE EVENTS ARE REQUESTED , THIS
C     CARD IS LEFT BLANK.  IF UNIQUE EVENTS ARE INCLUDED "ICOMP"
C     MUST EQUAL 1.
C
C
C     CARD NO. 5     MARKER HORIZONS
C     ----------     ---------------
C     IF INIQ=1 , UP TO 20 MARKER HORIZONS WILL BE READ
C     IN 20I4 FORMAT.  IF NO MARKER HORIZONS ARE REQUESTED
C     THIS CARD SHOULD BE LEFT BLANK
C
C
C     DATA SET
C     --------
C
```

```
      C                                                                       115
      C     DATA.....THE DATA CONSISTS OF NS SEQUENCES EACH CONSISTING OF     116
      C               7 CARDS. THE FIRST BEING A TITLE CARD CONTAINING THE NAME 117
      C               OF THE SEQUENCE (COLUMNS 1-20). THE REMAINING 6 CONTAIN 118
      C               THE SEQUENCE,FORMAT(20I4). UNUSED CARDS ARE LEFT BLANK. 119
      C                                                                       120
      C     INPUT....DATA CAN BE READ EITHER FROM EXTERNAL TAPE10             121
      C               (IF ITAPE=1) OR FROM CARDS POSITIONED IMMEDIATELY       122
      C               AFTER CARD NO. 5  (IF ITAPE=0)                          123
      C                                                                       124
      C  ---------------------------------------------------------------------125
      C                                                                       126
            DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)   127
            DIMENSION ITITLE(260,10),C(145,145)                               128
            DIMENSION IRANGE(260,2),JIRCOD(260),QDAR(150),XLEV(150)           129
            DIMENSION IPAIR(2,150),MPAIR(150)                                 130
            DIMENSION A(300),B(300),CC(600),WVEC(10)                          131
            DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40),TMAT(25,120)        132
            COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                   133
            COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                    134
            INTEGER AA,X,TEST,T,COUNT,R,AID,TMAT                              135
            PRINT 1000                                                        136
            PRINT 1001                                                        137
            PRINT 1002                                                        138
            PRINT 1003                                                        139
     1000 FORMAT(1H1,4X,"RESULTS OBTAINED BY MEANS OF PROGRAM RASC")          140
     1001 FORMAT(5X,"PREPARED BY F.P. AGTERBERG AND L.D. NEL")                141
     1002 FORMAT(5X,"GEOLOGICAL SURVEY OF CANADA")                            142
     1003 FORMAT(5X,"JANUARY 1981")                                           143
      C                                                                       144
      C                                                                       145
      C     READ INPUTS                                                       146
      C     -----------                                                       147
      C                                                                       148
      C ... READ RUN PARAMETERS, LIMITS AND PROCESSING OPTIONS                149
      C                                                                       150
            READ 1010,NS,IOCR,INIQ,CRIT,TOL,AAA                              151
     1010 FORMAT(3I3,2F5.1,F10.5)                                             152
            READ 1020,N,MAX,ITER                                              153
     1020 FORMAT(2I5,I6)                                                      154
            READ 1030,ITAPE,IOMAT,ISRT,IALPHA,ITAB1,ISCORE,ICOMP,ISKIP,IFIN   155
           1     ,INOSC                                                       156
     1030 FORMAT(10I3)                                                        157
            PRINT 1040                                                        158
            PRINT 1041                                                        159
            PRINT 1042,NS,IOCR,INIQ,CRIT,TOL,AAA                             160
            PRINT 1043                                                        161
            PRINT 1044,N,MAX,ITER                                             162
            PRINT 1045                                                        163
            PRINT 1046,ITAPE,IOMAT,ISRT,IALPHA,ITAB1,ISCORE,ICOMP,ISKIP,IFIN  164
           1     ,INOSC                                                       165
     1040 FORMAT(///5X,"VALUES OF INPUT PARAMETERS"//)                        166
     1041 FORMAT(" RUN PARAMETERS:    NS IOCR INIQ  CRIT    TOL    AAA")     167
     1042 FORMAT(19X,I3,2X,I3,4X,I1,1X,2(F5.1,1X),F10.5)                      168
     1043 FORMAT(/" LIMITS:              N    MAX   ITER")                    169
     1044 FORMAT(17X,2(I5,1X),I6)                                             170
     1045 FORMAT(/" PROCESSING OP:  ITAPE IOMAT ISRT IALPHA ITAB1 ISCORE ICO  171
```

```
     1MP ISKIP IFIN INOSC")                                                    172
1046 FORMAT(21X,I1,5X,I1,4X,I1,6X,I1,5X,I1,6X,I1,2(5X,I1),4X,I1,I6)            173
      ICRIT=CRIT                                                               174
175   DO 100 I=1,260                                                           175
      IRCODE(I)=0                                                              176
      IUNIQ(I,1)=0                                                             177
      IUNIQ(I,2)=0                                                             178
 100 CONTINUE                                                                  179
180 C                                                                          180
    C ... READ UNIQUE EVENTS AND MARKER HORIZONS                               181
    C                                                                          182
      READ 1050,(NUNIQ(J),J=1,20)                                              183
 1050 FORMAT(20I4)                                                             184
185   IF(INIQ.EQ.1) PRINT 1060                                                 185
 1060 FORMAT(///" THE FOLLOWING UNIQUE EVENTS HAVE BEEN SELECTED:"/)           186
      DO 105 I=1,20                                                            187
      ID=NUNIQ(I)                                                              188
      IF(ID.EQ.0) GO TO 110                                                    189
190   IUNIQ(ID,1)=1                                                            190
      PRINT 1070,ID                                                            191
 1070 FORMAT(5X,I4)                                                            192
  105 CONTINUE                                                                 193
  110 READ 1050,(NUNIQ(J),J=1,20)                                              194
195   IF(INIQ.EQ.1) PRINT 1080                                                 195
 1080 FORMAT(///" THE FOLLOWING MARKER HORIZONS HAVE BEEN SELECTED:"/)         196
      DO 115 I=1,20                                                            197
      ID=NUNIQ(I)                                                              198
      IF(ID.EQ.0) GO TO 120                                                    199
200   IUNIQ(ID,2)=1                                                            200
      PRINT 1070,ID                                                            201
  115 CONTINUE                                                                 202
 120  WRITE(55,*) "IUNIQ PRINT AT 196 ",IUNIQ                                  203
    C                                                                          204
205 C ... READ WELL DATA                                                       205
    C                                                                          206
      DO 130 I=1,NS                                                            207
      NUNIQ(I)=0                                                               208
      DO 125 J=1,120                                                           209
210   TMAT(I,J)=0                                                              210
      X(I,J)=0                                                                 211
  125 CONTINUE                                                                 212
  130 CONTINUE                                                                 213
      IODATA=5                                                                 214
215   IF(ITAPE.EQ.1) IODATA=10                                                 215
      DO 135 I=1,NS                                                            216
      READ(IODATA,1090) (NAM(I,J),J=1,3),(NAMA(I,J),J=1,3)                     217
 1090 FORMAT(2A4,A2,2A4,A2)                                                    218
      READ(IODATA,1100) (TMAT(I,J),J=1,120)                                    219
220   1100 FORMAT(20I4)                                                        220
  135 CONTINUE                                                                 221
      DO 145 I=1,NS                                                            222
      DO 140 J=1,120                                                           223
      X(I,J)=TMAT(I,J)                                                         224
225   140 CONTINUE                                                             225
  145 CONTINUE                                                                 226
      PRINT 1110                                                               227
 1110 FORMAT(///"   ORIGINAL SEQUENCE DATA")                                   228
```

```
                C                                                                229
230             C ... PRINT ORIGINAL SEQUENCE DATA                               230
                C                                                                231
                      CALL ECHO                                                  232
                C                                                                233
                C                                                                234
235             C     PREPROCESSING                                              235
                C     -------------                                              236
                C                                                                237
                C                                                                238
                      PRINT 2000                                                 239
240                   PRINT 2001                                                 240
               2000 FORMAT(/////5X,"PREPROCESSING INITIATED")                    241
               2001 FORMAT(5X,"----------------------")                          242
                      DO 205 I=1,NS                                              243
                      DO 200 J=1,120                                             244
245                   ID=TMAT(I,J)                                               245
                      AID=IABS(ID)                                               246
                      IF(AID.EQ.0) GO TO 205                                     247
                      IF(INIQ.NE.0.AND.IUNIQ(AID,1).EQ.1) NUNIQ(I)=1             248
                      IRCODE(AID)=IRCODE(AID)+1                                  249
250                  200 CONTINUE                                                250
                     205 CONTINUE                                                251
                C                                                                252
                C ... PRINT OCCURRENCE TABULATION INDICATING THE NUMBER OF TIMES 253
                C     EACH CODED EVENT IN THE DICTIONARY OCCURS IN THE DATA SET  254
255             C                                                                255
                      CALL OCCTAB                                                256
                C                                                                257
                C                                                                258
                C ... LOW OCCURRENCE FILTERING AND RECODING OF DATA              259
260             C                                                                260
                C     ALL EVENTS IN DATA SET WHICH DO NOT OCCUR IN AT LEAST      261
                C     "IOCR" SEQUENCES ARE ELIMINATED AND DATA IS RECODED SUCH    262
                C     THAT IF MMAX OUT OF M EVENTS ARE RETAINED, THE NEW CODE NO.S 263
                C     WILL RUN FROM 1 TO MMAX.                                   264
265             C                                                                265
                      CALL HPFILT(TMAT,IOCR,INIQ,IOMAT)                          266
                C                                                                267
                C                                                                268
                C ... PRESORT OPTION;  A PRELIMINARY SEQUENCE IS DERIVED FROM    269
270             C     THE SORTING OF EVENT "SCORES" BASED ON THE FREQUENCIES     270
                C     OF ALL EVENTS, COMPARED WITH ALL OTHER EVENTS IN AN ORDER  271
                C     RELATION MATRIX.                                           272
                C                                                                273
                      IF(ISRT.EQ.1) CALL PRESRT(IOMAT)                           274
275             C                                                                275
                C                                                                276
                C                                                                277
                C     RANKING SOLUTION                                           278
                C     ----------------                                           279
280             C                                                                280
                C                                                                281
                C ... CREATION OF CUMULATIVE ORDER MATRIX                        282
                C                                                                283
                C     CUMULATIVE ORDER MATRIX C(I,J) IS CONSTRUCTED SUCH THAT    284
285             C     ELEMENTS C(I,J) CONTAIN THE NUMBER OF TIMES EVENT I        285
```

```
C     OCCURRED ABOVE/BEFORE EVENT J                                          286
C                                                                            287
      PRINT 3000                                                             288
      PRINT 3001                                                             289
 3000 FORMAT(1H1,4X,"RANKING SOLUTION")                                      290
 3001 FORMAT(5X,"----------------")                                          291
      MMX5=MMAX+5                                                            292
      MMX1=MMAX+1                                                            293
      DO 305 I=1,MMX5                                                        294
      DO 300 J=1,MMX5                                                        295
      C(I,J)=0                                                               296
  300 CONTINUE                                                               297
  305 CONTINUE                                                               298
      PRINT 3010,IOCR,ICRIT                                                  299
 3010 FORMAT(////"  RUN FOR",I2," OR MORE OCCURRENCES AND",I2," OR MORE     300
     XPAIRS")                                                                301
      DO 325 L=1,NS                                                          302
      DO 320 J=1,MAX                                                         303
      TEST=0                                                                 304
      K=J                                                                    305
      MM=X(L,K)                                                              306
      IF(MM.EQ.0) GO TO 325                                                  307
      I=IABS(MM)                                                             308
  310 K=K+1                                                                  309
      AA=X(L,K)                                                              310
      IF(AA.EQ.0) GO TO 320                                                  311
      KK=IABS(AA)                                                            312
      IF(AA.EQ.0) GO TO 320                                                  313
      IF(AA.LT.0.AND.TEST.LE.0) GO TO 315                                    314
      TEST=TEST+1                                                            315
      C(I,KK)=C(I,KK)+1                                                      316
      GO TO 310                                                              317
  315 C(I,KK)=C(I,KK)+.5                                                     318
      C(KK,I)=C(KK,I)+.5                                                     319
      GO TO 310                                                              320
  320 CONTINUE                                                               321
  325 CONTINUE                                                               322
      IF(IOMAT.NE.1) GO TO 335                                               323
      PRINT 3020                                                             324
 3020 FORMAT(/////,24H CUMULATIVE ORDER MATRIX/)                             325
      DO 330 I=1,MMAX                                                        326
      PRINT 3030                                                             327
 3030 FORMAT(//)                                                             328
      PRINT 3040,(C(I,J),J=1,MMAX)                                           329
  330 CONTINUE                                                               330
 3040 FORMAT(20F6.1)                                                         331
C                                                                            332
C ... MODIFICATION OF CUMULATIVE ORDER MATRIX                                333
C                                                                            334
C     THE TRANSPOSE ELEMENT PAIRS C(I,J) AND C(J,I)                          335
C     WHOSE SUM IS LESS THAN CRIT ARE ZEROED                                 336
C                                                                            337
  335 IKNT=0                                                                 338
      DO 345 I=1,MMAX                                                        339
      L=I+1
      DO 340 J=L,MMAX                                                        340
      IF((C(I,J)+C(J,I)).GE.CRIT) GO TO 340                                  341
```

```
                C(I,J)=0                                                          342
                C(J,I)=0                                                          343
      345       IKNT=IKNT+1                                                       344
          340 CONTINUE                                                          345
          345 CONTINUE                                                          346
                MMSQ=MMAX*MMAX                                                  348
                MMSQ=(MMSQ-MMAX)/2                                              349
      350       PRINT 3050                                                      350
          3050 FORMAT(//"  MODIFICATION OF ORDER MATRIX;")                      351
                PRINT 3060,CRIT,IKNT,MMSQ                                       352
          3060 FORMAT(/"  BASED ON CRIT =",F5.1,",",I5," PAIRS OUT OF",I6," HAVE 353
               1BEEN ZEROED")                                                   354
      355       IF(IOMAT.NE.1) GO TO 400                                        355
                PRINT 3070                                                      356
          3070 FORMAT(/////25H MODIFIED RELATION MATRIX/)                       357
                DO 350 I=1,MMAX                                                 358
                PRINT 3030                                                      359
      360       PRINT 3080,(C(I,J),J=1,MMAX)                                    360
           350 CONTINUE                                                         361
          3080 FORMAT(/20F6.1)                                                  362
              C                                                                 363
              C ... OPTIMUM SEQUENCE DETERMINED BY MATRIX TRANSFORMATION (RANKING) 364
      365     C                                                                 365
              C     AN OPTIMUM SEQUENCE IS DETERMINED BY EXAMINING THE ORDER MATRIX. 366
              C     FREQUENCIES (TRANSPOSE ELEMENTS C(I,J) AND C(J,I) ) ARE     367
              C     COMPARED AND ROWS AND COLUMNS I AND J ARE INTERCHANGED SUCH THAT 368
              C     ALL LARGER ELEMENTS APPEAR IN THE UPPER TRIANGLE OF THE MATRIX 369
      370     C                                                                 370
           400 CONTINUE                                                         371
                IA=1                                                            372
                S=0                                                             373
                DO 405 I=1,MMX5                                                 374
      375       S=S+1                                                           375
                C(I,MMX5)=S                                                     376
           405 CONTINUE                                                         377
                IF(ISKIP.NE.0) GO TO 480                                        378
                COUNT=0                                                         379
      380       ICORT=0                                                         380
                DO 470 I=1,MMAX                                                 381
           410 CONTINUE                                                         382
                IF(IA.LE.300) GO TO 415                                         383
                PRINT 4000                                                      384
      385       PRINT 4010                                                      385
          4000 FORMAT(" NO. OF CYCLES HAS EXCEEDED THE ALLOWED")                386
          4010 FORMAT(" MAXIMUM OF 300...RUN IS HEREBY TERMINATED")             387
                GO TO 9999                                                      388
           415 ICYC=0                                                           389
      390       ISUP=0                                                          390
                DO 420 J=1,10                                                   391
           420 WVEC(J)=0.0                                                      392
           425 CONTINUE                                                         393
                K=I+1                                                           394
      395       IF(K.GT.MMAX) GO TO 470                                         395
                DO 465 J=K,MMAX                                                 396
                IF(C(I,J).GE.(C(J,I)-TOL)) GO TO 465                            397
                DO 430 T=1,MMAX                                                 398
                C(MMX1,T)=C(I,T)                                                399
```

```
                C(I,T)=C(J,T)                                                   400
                C(J,T)=C(MMX1,T)                                                401
            430 CONTINUE                                                        402
                DO 435 T=1,MMAX                                                 403
                C(T,MMX1)=C(T,I)                                                404
                C(T,I)=C(T,J)                                                   405
                C(T,J)=C(T,MMX1)                                                406
            435 CONTINUE                                                        407
                PLC=C(I,MMX5)                                                   408
                C(I,MMX5)=C(J,MMX5)                                             409
                C(J,MMX5)=PLC                                                   410
                DO 440 T=1,9                                                    411
                WVEC(T)=WVEC(T+1)                                               412
            440 CONTINUE                                                        413
                WVEC(10)=C(I,MMX5)                                              414
                COUNT=COUNT+1                                                   415
                IF(COUNT.LT.ITER) GO TO 445                                     416
                PRINT 4020                                                      417
                PRINT 4030,ITER                                                 418
                PRINT 4040                                                      419
        4020 FORMAT(////" NO. OF ALLOWED MATRIX TRANSFORMATIONS,")              420
        4030 FORMAT(" ITER=",I5," EXCEEDED")                                    421
        4040 FORMAT(///" *****RUN IS HEREBY TERMINATED*****")                   422
                GO TO 9999                                                      423
         445 IF(IALPHA.LE.1) GO TO 450                                          424
                PRINT 4050                                                      425
        4050 FORMAT(//20H SEQUENCING PROGRESS)                                  426
                PRINT 4060,(C(R,MMX5),R=1,MMAX)                                 427
        4060 FORMAT(20F6.1)                                                     428
         450 CONTINUE                                                           429
        C                                                                       430
        C ... TEST AND CORRECT FOR CYCLICITY                                    431
        C                                                                       432
            ISUP=ISUP+1                                                         433
            IF(ISUP.LE.100.OR.WVEC(1).LE.0.0) GO TO 425                         434
            DO 455 T=4,10                                                       435
            IF(WVEC(T).EQ.WVEC(1)) GO TO 460                                    436
        455 CONTINUE                                                            437
            GO TO 425                                                           438
        460 ICYC=T-1                                                            439
            CALL CYCLE(ICORT,ICYC,WVEC,IA,A,B,CC)                               440
            GO TO 410                                                           441
        465 CONTINUE                                                            442
        470 CONTINUE                                                            443
        C                                                                       444
        C ... REPLACE ELEMENTS ZEROED IN CORRECTION OF CYCLICITY                445
        C                                                                       446
            ICORT=1                                                             447
            CALL CYCLE(ICORT,ICYC,WVEC,IA,A,B,CC)                               448
        C                                                                       449
        C                                                                       450
        C ... OUTPUT FINAL ORDER RELATION MATRIX, OPTIMUM SEQUENCE              451
        C     AND RUN CONDITIONS                                                452
        C                                                                       453
        C                                                                       454
            IF(IOMAT.NE.1) GO TO 480                                            455
            PRINT 4070                                                          456
```

```
                4070 FORMAT(28H FINAL ORDER RELATION MATRIX)                        457
                     DO 475 I=1,MMAX                                               458
                     PRINT 4080,I                                                  459
460             4080 FORMAT(//2X,I3)                                               460
                     PRINT 3080,(C(I,J),J=1,MMAX)                                  461
                 475 CONTINUE                                                      462
                 480 PRINT 4120                                                    463
                     PRINT 4090                                                    464
465             4090 FORMAT("  OPTIMUM SEQUENCE OBTAINED VIA RANKING"/)             465
                     PRINT 4060,(C(R,MMX5),R=1,MMAX)                               466
                     DO 485 I=1,MMAX                                               467
                     RIDX=C(I,MMX5)                                                468
                     ID=INT(RIDX)                                                  469
470                  IID=ICODE(ID)                                                 470
                     IRCODE(I)=IID                                                 471
                 485 CONTINUE                                                      472
                     PRINT 4120                                                    473
                     PRINT 4100                                                    474
475                  PRINT 4110,(IRCODE(I),I=1,MMAX)                               475
                     PRINT 4120                                                    476
                     PRINT 4130                                                    477
                     PRINT 4140,COUNT,ITER                                         478
                     PRINT 4150,CRIT                                               479
480                  PRINT 4160,TOL                                                480
                4100 FORMAT("  OPTIMUM SEQUENCE USING ORIGINAL CODE NUMBERS")      481
                4110 FORMAT(20I5)                                                  482
                4120 FORMAT(/////)                                                 483
                4130 FORMAT("  RANKING SOLUTION OBTAINED WITH:")                   484
485             4140 FORMAT(//10X,I5,23H ITERATIONS OUT OF MAX ,I5)                485
                4150 FORMAT(//10X,34H CRITICAL TRANSPOSE ELEMENT SUM OF ,F5.1)     486
                4160 FORMAT(//10X,13H TOLERANCE OF ,F5.1)                          487
                 490 CONTINUE                                                      488
               C                                                                   489
490            C                                                                   490
               C     EVENT RANGES                                                  491
               C     ------------                                                  492
               C                                                                   493
               C ... PRINT SEQUENCE WITH NAMES (EVENT LABELS) AND RANGES          494
495            C                                                                   495
               C                                                                   496
                     DO 520 I=1,MMAX                                               497
                     K=I                                                           498
                 500 K=K-1                                                         499
500                  IF(K.EQ.0) GO TO 505                                          500
                     ARG=C(K,I)-C(I,K)                                             501
                     IF(ARG.LE.0.0) GO TO 500                                      502
                 505 INK=K                                                         503
                     K=I                                                           504
505              510 K=K+1                                                         505
                     IF(K.EQ.(MMAX+1)) GO TO 515                                   506
                     ARG=C(I,K)-C(K,I)                                             507
                     IF(ARG.LE.0.0) GO TO 510                                      508
                 515 JNK=K                                                         509
510                  IRANGE(I,1) =INK                                              510
                     IRANGE(I,2)=JNK                                               511
                 520 CONTINUE                                                      512
                     REWIND 99                                                     513
```

```
      PRINT 7040                                                        514
515   7040 FORMAT(////10X,"NUMERICAL LISTING"//)                        515
      DO 525 I=1,N                                                      516
      READ(99,5000) (ITITLE(I,J),J=1,10)                                517
   5000 FORMAT(10A4)                                                    518
      PRINT 7050,I,(ITITLE(I,J),J=1,10)                                 519
520   7050 FORMAT(I6,10A4)                                              520
    525 CONTINUE                                                        521
      CALL ASORT(ITITLE,N,10)                                           522
      PRINT 5010                                                        523
      PRINT 5020                                                        524
525   PRINT 5030                                                        525
      PRINT 5040                                                        526
   5010 FORMAT("1  OPTIMUM SEQUENCE TABULATED WITH EVENT RANGES AND LABELS 527
     1;"///)                                                            528
   5020 FORMAT(5X,"  SEQUENCE  FOSSIL  RANGE   FOSSIL    - RANGES DEFINE O 529
530  1UTER LIMITS IN THE POSITION SEQUENCE.  EVENTS CAN OCCUR ANYWHERE")  530
   5030 FORMAT(5X,"  POSITION  NUMBER          NAME        WITHIN THESE LI 531
     1MITS. (NOTE: THIS RANGE IS NOT STRATIGRAPHIC)")                   532
   5040 FORMAT(//)                                                      533
      DO 530 I=1,MMAX                                                   534
535   ID=IRCODE(I)                                                      535
      JIRCOD(I)=IRCODE(I)                                               536
      PRINT 5050,I,IRCODE(I),IRANGE(I,1),IRANGE(I,2),(ITITLE(ID,J),J=1, 537
     110)                                                               538
   5050 FORMAT(5X,I4,5X,I4,5X,I3,1H-,I3,3X,10A4)                        539
540   530 CONTINUE                                                      540
      IF(IALPHA.NE.1) GO TO 9999                                        541
C                                                                       542
C                                                                       543
C     SCALING ANALYSIS                                                  544
545   C     ---------------                                             545
C                                                                       546
      LLL=2                                                             547
      LLL = INOSC                                                       548
      IF(INOSC.EQ.1) LLL = 0                                            549
550   ISIM=2                                                            550
      PRINT 6000                                                        551
C     PRINT 6010                                                        552
    6000 FORMAT(1H1,4X,"SCALING ANALYSIS")                              553
    6010 FORMAT(5X,"----------------")                                  554
555   C ... EVALUATION OF OPTIMUM SEQUENCE BASED ON UNWEIGHTED AND WEIGHTED 555
C     DISTANCE ANALYSIS                                                 556
C                                                                       557
      PRINT 6020                                                        558
    6020 FORMAT(//"  EVALUATION BASED ON UNWEIGHTED AND WEIGHTED DISTANCE A 559
560    1NALYSIS;")                                                      560
C ... COMPUTE NORMAL Z VALUES OF FREQUENCIES CALCULATED FROM ORDER      561
C     MATRIX                                                            562
C                                                                       563
      CALL NORMZ(AAA,LLL,IOMAT)                                         564
565   C                                                                 565
C ... COMPUTE "DISTANCES" BETWEEN EVENTS AND CONSTRUCT DENDROGRAM       566
C                                                                       567
C                                                                       568
      CALL DIST(QDAR,MPAIR,AAA,LLL)                                     569
570   CALL ORDER(QDAR,IPAIR,XLEV,LLL,0)                                 570
```

```
                IF(LLL.NE.0) PRINT 7010                                          571
 7010 FORMAT(//5X,"DENDROGRAM OF UNWEIGHTED INTERFOSSIL DISTANCES"//)             572
                IF(LLL.NE.0) CALL DENDRO(IPAIR,XLEV,ISIM)                        573
              C                                                                  574
  575         C ... REPEAT DISTANCE ANALYSIS WITH WEIGHTED DIFFERENCES           575
              C                                                                  576
                LLL = INOSC                                                      577
                CALL WDIST(JIRCOD,QDAR,MPAIR,AAA,LLL)                            578
                CALL ORDER(QDAR,IPAIR,XLEV,LLL,1)                                579
  580           IF(LLL.NE.0) PRINT 7020                                          580
 7020 FORMAT(//5X,"DENDROGRAM OF WEIGHTED INTERFOSSIL DISTANCES"//)               581
                IF(LLL.NE.0) CALL DENDRO(IPAIR,XLEV,ISIM)                        582
              C                                                                  583
              C ... REORDER FINAL RELATION MATRIX AND REPEAT CLUSTER ANALYSIS    584
  585         C     FOR UNWEIGHTED AND WEIGHTED DIFFERENCES                      585
              C                                                                  586
                WRITE(55,*)"..IFIN =", IFIN                                      587
                IF(IFIN.EQ.0) GO TO 700                                          588
                DO 625 KKK=1,5                                                   589
  590           IRET =1                                                          590
                DO 600 I=1,MMAX                                                  591
                IF(JIRCOD(I).NE.IRCODE(I)) IRET=0                                592
  600 CONTINUE                                                                   593
                WRITE(55,*)"... KKK = ", KKK                                     594
  595           IF(KKK.EQ.5) IRET=1                                              595
                LLL=IRET                                                         596
                IF(IRET.NE.1) GO TO 610                                          597
                PRINT 6030                                                       598
 6030 FORMAT(1H1)                                                                599
  600           PRINT 6040                                                       600
 6040 FORMAT(/"  APPLICATION OF FINAL REORDERING;"//)                            601
                PRINT 6050                                                       602
 6050 FORMAT("  DISTANCES ESTIMATED FROM SUCCESSIVE EVENTS"///)                   603
                PRINT 6051                                                       604
  605           6051 FORMAT(/"    TO RECALCULATE STANDARD DEVIATIONS , DISTANCE VALUES  605
                1AVE TO BE RECALCULATED STARTING WITH THE NEW SEQUENCE"//)       606
                IF(IOMAT.NE.1) GO TO 620                                         607
                PRINT 6060                                                       608
 6060 FORMAT(////"  UPPER TRIANGLE OF NORMAL Z VALUES")                          609
  610           DO 605 I=1,MMAX                                                  610
                PRINT 6070                                                       611
 6070 FORMAT(///)                                                                612
                PRINT 6080,(C(I,J),J=1,MMAX)                                     613
 6080 FORMAT(1X,15F8.3)                                                          614
  615 605 CONTINUE                                                              615
                GO TO 620                                                        616
  610 CONTINUE                                                                  617
                CALL REORD(IRET,AAA)                                             618
                DO 615 I=1,MMAX                                                  619
  620           JIRCOD(I)=IRCODE(I)                                              620
  615 CONTINUE                                                                  621
                LLL = 0                                                          622
                IF(INOSC.GT.1.AND.IRET.EQ.1) LLL = 1                             623
              C                                                                  624
  625         C ... COMPUTE NORMAL Z VALUES                                      625
              C                                                                  626
                CALL NORMZ(AAA,LLL,IOMAT)                                        627
```

```
                C                                                                628
                C ... COMPUTE DISTANCES BETWEEN FOSSIL EVENTS                    629
      630       C                                                                630
                 620  LLL = 0                                                    631
                      IF(INOSC.GT.1.AND.IRET.EQ.1) LLL = 1                       632
                      CALL DIST(QDAR,MPAIR,AAA,LLL)                              633
                      CALL ORDER(QDAR,IPAIR,XLEV,LLL,0)                          634
      635             IF(LLL.NE.0) PRINT 7010                                    635
                      IF(LLL.NE.0) CALL DENDRO(IPAIR,XLEV,ISIM)                  636
                C                                                                637
                C ... REPEAT DISTANCE CALCULATION WITH WEIGHTED DIFFERENCES      638
                C                                                                639
      640             LLL = 0                                                    640
                      IF(INOSC.GE.1.AND.IRET.EQ.1) LLL = 1                       641
                      CALL WDIST(JIRCOD,QDAR,MPAIR,AAA,LLL)                      642
                      CALL ORDER(QDAR,IPAIR,XLEV,LLL,1)                          643
                      IF(LLL.NE.0) PRINT 7020                                    644
      645             IF(LLL.NE.0) CALL DENDRO(IPAIR,XLEV,ISIM)                  645
                      IF(IRET.EQ.1) GO TO 630                                    646
                  625 CONTINUE                                                   647
                  630 PRINT 6090, KKK                                            648
                 6090 FORMAT(///" SOLUTION AFTER ",I3," ITERATIONS"///)          649
      650       C                                                                650
                C                                                                651
                C                                                                652
                C     FINAL PROCESSING OPTIONS                                   653
                C     ------------------------                                   654
      655       C                                                                655
                C                                                                656
                C ... CONSTRUCT OCCURRENCE TABLE FOR WELLS                       657
                C                                                                658
                  700 IF(ITAB1.EQ.1) CALL TAB1                                   659
      660       C                                                                660
                C ... STEP MODEL FOR INDIVIDUAL WELLS                            661
                C                                                                662
                      IF(ISCORE.EQ.1) CALL SCORE                                 663
                C                                                                664
      665       C ... PERFORM NORMALITY TEST ON INDIVIDUAL WELLS                 665
                C                                                                666
                      IF(ICOMP.EQ.1) CALL COMP(QDAR,INIQ)                        667
                C                                                                668
                C ... ENTER UNIQUE EVENTS INTO SEQUENCE AND PRINT FINAL DENDROGRAM 669
      670       C                                                                670
                      IF(INIQ.NE.1.OR.ICOMP.NE.1) GO TO 9999                     671
                      PRINT 7000                                                 672
                 7000 FORMAT("1POSITIONING OF UNIQUE EVENTS IN FINAL SEQUENCE;") 673
                      CALL ORDER(QDAR,IPAIR,XLEV,LLL,0)                          674
      675             CALL DENDRO(IPAIR,XLEV,ISIM)                               675
                C                                                                676
                 9999 STOP                                                       677
                      END                                                        678
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
12350 RASC 1

VARIABLES	SN	TYPE	RELOCATION							
20372 A		REAL	ARRAY	REFS	131	440	448			
15314 AA		INTEGER		REFS	135	311	312	313	314	
				DEFINED	310					
15326 AAA		REAL		REFS	160	564	569	578	618	627 633
				642	DEFINED	151				
15321 AID		INTEGER		REFS	135	247	248	2*249	DEFINED	246
15371 ARG		REAL		REFS	502	508	DEFINED	501	507	
21046 B		REAL	ARRAY	REFS	131	440	448			
14200 C		REAL	ARRAY / /	REFS	128	133	316	318	319	329 2*342
				360	2*397	399	400	401	404	405 406
				408	409	414	427	461	466	468 2*501
				2*507	613	DEFINED	296	316	318	319 343
				344	376	399	400	401	404	405 406
				409	410					
21522 CC		REAL	ARRAY	REFS	131	440	448			
15317 COUNT		INTEGER		REFS	135	415	416	478	DEFINED	379 415
15324 CRIT		REAL		REFS	160	174	342	352	479	
				DEFINED	151					
15345 I		INTEGER		REFS	176	177	178	188	198	208 210
				211	2*217	219	2*224	245	248	296 2*316
				2*318	2*319	329	340	2*342	343	344 360
				376	394	2*397	399	400	404	405 408
				409	414	459	461	468	471	475 498
				2*501	504	2*507	510	511	517	2*519 535
				2*536	4*537	2*592	613	2*620	DEFINED	175 187
				197	207	216	222	243	294	308 326
				339	358	374	381	458	467	475 497
				516	534	591	610	619		
15361 IA		INTEGER		REFS	383	440	448	DEFINED	372	
15335 IALPHA		INTEGER		REFS	164	424	541	DEFINED	155	
6120 ICODE		INTEGER	ARRAY / /	REFS	127	133	470			
15340 ICOMP		INTEGER		REFS	164	667	671	DEFINED	155	
15363 ICORT		INTEGER		REFS	440	448	DEFINED	380	447	
15344 ICRIT		INTEGER		REFS	299	DEFINED	174			
15364 ICYC		INTEGER		REFS	440	448	DEFINED	389	439	
15347 ID		INTEGER		REFS	189	190	191	199	200	201 246
				470	537	DEFINED	188	198	245	469 535
15342 IFIN		INTEGER		REFS	164	587	588	DEFINED	155	
15370 IID		INTEGER		REFS	471	DEFINED	470			
15357 IKNT		INTEGER		REFS	345	352	DEFINED	338	345	
15323 INIQ		INTEGER		REFS	160	185	195	248	266	667 671
				DEFINED	151					
15372 INK		INTEGER		REFS	510	DEFINED	503			
15343 INOSC		INTEGER		REFS	164	548	549	577	623	632 641
				DEFINED	155					
15322 IOCR		INTEGER		REFS	160	266	299	DEFINED	151	
15350 IODATA		INTEGER		DEFINED	214	215	I/O REFS	217	219	
15333 IOMAT		INTEGER		REFS	164	266	274	323	355	455 564
				607	627	DEFINED	155			
17470 IPAIR		INTEGER	ARRAY	REFS	130	570	573	579	582	634 636

VARIABLES	SN	TYPE	RELOCATION									
					643	645	674	675				
15400	IRANGE	INTEGER	ARRAY		REFS	129	2*537	DEFINED	510	511		
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	127	133	249	475	535	536	537
					592	620	DEFINED	176	249	471		
15377	IRET	INTEGER			REFS	596	597	618	623	632	641	646
					DEFINED	590	592	595				
15337	ISCORE	INTEGER			REFS	164	663	DEFINED	155			
15375	ISIM	INTEGER			REFS	573	582	636	645	675		
					DEFINED	550						
15341	ISKIP	INTEGER			REFS	164	378	DEFINED	155			
15334	ISRT	INTEGER			REFS	164	274	DEFINED	155			
15365	ISUP	INTEGER			REFS	433	434	DEFINED	390	433		
15336	ITAB1	INTEGER			REFS	164	659	DEFINED	155			
15332	ITAPE	INTEGER			REFS	164	215	DEFINED	155			
15331	ITER	INTEGER			REFS	162	416	418	478	DEFINED	153	
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	128	133	519	522	537		
					DEFINED	517						
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	132	134	203	248	DEFINED	177	178
					190	200						
15346	J	INTEGER			REFS	183	194	210	211	2*217	219	2*224
					245	296	305	329	2*342	343	344	360
					392	2*397	400	401	405	406	409	410
					461	517	519	537	613	DEFINED	183	194
					209	2*217	219	223	244	295	303	329
					341	360	391	396	461	517	519	537
					613							
16410	JIRCOD	INTEGER	ARRAY		REFS	129	578	592	642	DEFINED	536	620
15373	JNK	INTEGER			REFS	511	DEFINED	509				
15354	K	INTEGER			REFS	306	309	310	395	396	499	500
					2*501	503	505	506	2*507	509		
					DEFINED	305	309	394	498	499	504	505
15356	KK	INTEGER			REFS	2*316	2*318	2*319	DEFINED	312		
15376	KKK	INTEGER			REFS	594	595	648	DEFINED	589		
15353	L	INTEGER			REFS	306	310	341	DEFINED	302	340	
15374	LLL	INTEGER			REFS	564	569	570	571	573	578	579
					580	582	627	633	634	635	636	642
					643	644	645	674	DEFINED	547	548	549
					577	596	622	623	631	632	640	641
15330	MAX	INTEGER			REFS	162	303	DEFINED	153			
15355	MM	INTEGER			REFS	307	308	DEFINED	306			
1	MMAX	INTEGER		/ /	REFS	133	292	293	326	329	339	341
					2*348	349	358	360	381	395	396	398
					403	427	458	461	466	467	475	497
					506	534	591	610	613	619		
15360	MMSQ	INTEGER			REFS	349	352	DEFINED	348	349		
15352	MMX1	INTEGER			REFS	399	401	404	406	DEFINED	293	
15351	MMX5	INTEGER			REFS	294	295	374	376	408	2*409	410
					414	427	466	468	DEFINED	292		
20144	MPAIR	INTEGER	ARRAY		REFS	130	569	578	633	642		
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	132	134					
15327	N	INTEGER			REFS	162	516	522	DEFINED	153		
2	NAM	INTEGER	ARRAY	/ /	REFS	127	133	DEFINED	217			
115	NAMA	INTEGER	ARRAY	/ /	REFS	127	133	DEFINED	217			
0	NS	INTEGER		/ /	REFS	133	160	207	216	222	243	302
					DEFINED	151						
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	132	134	188	198	DEFINED	183	194
					208	248						

VARIABLES	SN	TYPE	RELOCATION								
15366	PLC	REAL		REFS	410	DEFINED	408				
17014	QDAR	REAL	ARRAY	REFS	129	569	570	578	579	633	634
				642	643	667	674				
15320	R	INTEGER		REFS	135	427	466	DEFINED	427	466	
15367	RIDX	REAL		REFS	469	DEFINED	468				
15362	S	REAL		REFS	375	376	DEFINED	373	375		
15316	T	INTEGER		REFS	135	2*399	2*400	2*401	2*404	2*405	2*406
				2*412	436	439	DEFINED	398	403	411	435
15315	TEST	INTEGER		REFS	135	314	315	DEFINED	304	315	
22664	TMAT	INTEGER	ARRAY	REFS	132	135	224	245	266		
				DEFINED	210	219					
15325	TOL	REAL		REFS	160	397	480	DEFINED	151		
22652	WVEC	REAL	ARRAY	REFS	131	412	434	2*436	440	448	
				DEFINED	392	412	414				
230	X	INTEGER	ARRAY / /	REFS	127	133	135	306	310		
				DEFINED	211	224					
17242	XLEV	REAL	ARRAY	REFS	129	570	573	579	582	634	636
				643	645	674	675				

FILE NAMES		MODE								
0	INPUT	FMT	READS	151	153	155	183	194		
2054	OUTPUT	FMT	WRITES	136	137	138	139	158	159	160	161
			162	163	164	185	191	195	201	227	239
			240	288	289	299	324	327	329	350	352
			356	359	360	384	385	417	418	419	425
			427	456	459	461	463	464	466	473	474
			475	476	477	478	479	480	514	519	523
			524	525	526	537	551	558	571	580	598
			600	602	604	608	611	613	635	644	648
			672								
4130	TAPE10										
0	TAPE5										
10260	TAPE55	FREE	WRITES	203	587	594					
2054	TAPE6										
6204	TAPE99	FMT	READS	517	MOTION	513					

VARIABLES USED AS FILE NAMES, SEE ABOVE

EXTERNALS	TYPE	ARGS	REFERENCES				
ASORT		3	522				
COMP		2	667				
CYCLE		7	440	448			
DENDRO		3	573	582	636	645	675
DIST		4	569	633			
ECHO		0	232				
HPFILT		4	266				
NORMZ		3	564	627			
OCCTAB		0	256				
ORDER		5	570	579	634	643	674
PRESRT		1	274				
REORD		2	618				
SCORE		0	663				
TAB1		0	659				
WDIST		5	578	642			

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
IABS	INTEGER	1	INTRIN		246	308	312
INT	INTEGER	1	INTRIN		469		

STATEMENT LABELS		DEF LINE	REFERENCES		
0	100	179	175		
0	105	193	187		
12434	110	194	189		
0	115	202	197		
12453	120	203	199		
0	125	212	209		
0	130	213	207		
0	135	221	216		
0	140	225	223		
0	145	226	222		
0	200	250	244		
12612	205	251	243	247	
0	300	297	295		
0	305	298	294		
12661	310	309	317	320	
12676	315	318	314		
12705	320	321	303	311	313
12710	325	322	302	307	
0	330	330	326		
12741	335	338	323		
12760	340	346	341	342	
0	345	347	339		
0	350	361	358		
13022	400	371	355		
0	405	377	374		
13037	410	382	441		
13046	415	389	383		
0	420	392	391		
13055	425	393	434	438	
0	430	402	398		
0	435	407	403		
0	440	413	411		
13151	445	424	416		
13164	450	429	424		
0	455	437	435		
13177	460	439	436		
13204	465	442	396	397	
13207	470	443	381	395	
0	475	462	458		
13243	480	463	378	455	
0	485	472	467		
0	490	INACTIVE 488			
13317	500	499	502		
13327	505	503	500		
13332	510	505	508		
13343	515	509	506		
0	520	512	497		
0	525	521	516		
0	530	540	534		
0	600	593	591		
0	605	615	610		
13575	610	617	597		
0	615	621	619		
13615	620	631	607	616	
0	625	647	589		
13660	630	648	646		

STATEMENT LABELS			DEF LINE	REFERENCES		
13662	700		659	588		
14004	1000	FMT	140	136		
14013	1001	FMT	141	137		
14021	1002	FMT	142	138		
14026	1003	FMT	143	139		
14043	1010	FMT	152	151		
14055	1020	FMT	154	153		
14075	1030	FMT	157	155		
14147	1040	FMT	166	158		
14154	1041	FMT	167	159		
14163	1042	FMT	168	160		
14170	1043	FMT	169	161		
14176	1044	FMT	170	162		
14201	1045	FMT	171	163		
14213	1046	FMT	173	164		
14226	1050	FMT	184	183	194	
14233	1060	FMT	186	185		
14246	1070	FMT	192	191	201	
14260	1080	FMT	196	195		
14310	1090	FMT	218	217		
14322	1100	FMT	220	219		
14327	1110	FMT	228	227		
14342	2000	FMT	241	239		
14347	2001	FMT	242	240		
14362	3000	FMT	290	288		
14366	3001	FMT	291	289		
14377	3010	FMT	300	299		
14413	3020	FMT	325	324		
14423	3030	FMT	328	327	359	
14433	3040	FMT	331	329		
14440	3050	FMT	351	350		
14453	3060	FMT	353	352		
14467	3070	FMT	357	356		
14505	3080	FMT	362	360	461	
14515	4000	FMT	386	384		
14523	4010	FMT	387	385		
14543	4020	FMT	420	417		
14551	4030	FMT	421	418		
14555	4040	FMT	422	419		
14566	4050	FMT	426	425		
14576	4060	FMT	428	427	466	
14603	4070	FMT	457	456		
14614	4080	FMT	460	459		
14632	4090	FMT	465	464		
14701	4100	FMT	481	474		
14710	4110	FMT	482	475		
14712	4120	FMT	483	463	473	476
14714	4130	FMT	484	477		
14721	4140	FMT	485	478		
14726	4150	FMT	486	479		
14734	4160	FMT	487	480		
14760	5000	FMT	518	517		
15007	5010	FMT	527	523		
15017	5020	FMT	529	524		
15036	5030	FMT	531	525		
15053	5040	FMT	533	526		
15067	5050	FMT	539	537		

STATEMENT LABELS				DEF LINE	REFERENCES			
15076	6000	FMT		553	551			
15102	6010	FMT	NO REFS	554				
15111	6020	FMT		559	558			
15161	6030	FMT		599	598			
15166	6040	FMT		601	600			
15177	6050	FMT		603	602			
15211	6051	FMT		605	604			
15232	6060	FMT		609	608			
15243	6070	FMT		612	611			
15253	6080	FMT		614	613			
15267	6090	FMT		649	648			
15300	7000	FMT		673	672			
15125	7010	FMT		572	571	635		
15137	7020	FMT		581	580	644		
14744	7040	FMT		515	514			
14771	7050	FMT		520	519			
13706	9999			677	388	423	541	671

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES			
12411	100	I	175 179	3B	INSTACK			
12424	105	I	187 193	10B		EXT REFS	EXITS	
12443	115	I	197 202	10B		EXT REFS	EXITS	
12456	130	I	207 213	15B		NOT INNER		
12464	125	J	209 212	3B	INSTACK			
12500	135	I	216 221	47B		EXT REFS	NOT INNER	
12503		J	217 217	11B		EXT REFS		
12515		J	217 217	11B		EXT REFS		
12532		J	219 219	11B		EXT REFS		
12550	145	I	222 226	13B		NOT INNER		
12554	140	J	223 225	3B	INSTACK			
12572	205	I	243 251	23B		NOT INNER		
12573	200	J	244 250	17B	OPT	EXITS		
12634	305	I	294 298	13B		NOT INNER		
12641	300	J	295 297	2B	INSTACK			
12651	325	L	302 322	42B		NOT INNER		
12652	320	J	303 321	36B		EXITS		
12717	330	I	326 330	22B		EXT REFS	NOT INNER	
12724		J	329 329	11B		EXT REFS		
12743	345	I	339 347	22B		NOT INNER		
12753	340	J	341 346	7B	INSTACK			
13000	350	I	358 361	22B		EXT REFS	NOT INNER	
13005		J	360 360	11B		EXT REFS		
13030	405	I	374 377	3B	INSTACK			
13037	470	I	381 443	153B		EXT REFS	EXITS	NOT INNER
13052	420	J	391 392	2B	INSTACK			
13061	465	J	396 442	126B		EXT REFS	EXITS	NOT INNER
13077	430	T	398 402	4B	INSTACK			
13114	435	T	403 407	4B	INSTACK			
13131	440	T	411 413	3B	INSTACK			
13172	455	T	435 437	5B	INSTACK	EXITS		
13221	475	I	458 462	22B		EXT REFS	NOT INNER	
13226		J	461 461	11B		EXT REFS		
13263	485	I	467 472	6B	INSTACK			
13315	520	I	497 512	34B				
13355	525	I	516 521	35B		EXT REFS	NOT INNER	
13360		J	517 517	11B		EXT REFS		
13375		J	519 519	11B		EXT REFS		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
13424	530	I	534 540	27B	EXT REFS NOT INNER
13436		J	537 537	11B	EXT REFS
13517	625	KKK	589 647	141B	EXT REFS EXITS NOT INNER
13522	600	I	591 593	4B	INSTACK
13553	605	I	610 615	22B	EXT REFS NOT INNER
13560		J	613 613	11B	EXT REFS
13602	615	I	619 621	3B	INSTACK

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)							
/ /	27297	0	NS	(1)	1	MMAX	(1)	2	NAM	(75)	
		77	NAMA	(75)	152	X	(3000)	3152	ICODE	(260)	
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272	C	(21025)	
BETA	1545	0	IUNIQ	(520)	520	NUNIQ	(25)	545	MUNIQ	(1000)	

STATISTICS

PROGRAM LENGTH	16666B	7606
BUFFER LENGTH	11675B	5053
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE ASORT(IX,NR,NC)                                        679
C- - -ALPHABETIZES ARRAY ITITLE                                         680
C- - -ASSUMES CHARACTER DATA ONLY AND SORTS FROM FIRST COLUMN            681
      DIMENSION IX(260,10),IY(260,10),IP(260)                           682
      DO 10 I = 1,NR                                                    683
      IP(I) = I                                                         684
      DO 10 J = 1,NC                                                    685
   10 IY(I,J) = IX(I,J)                                                 686
      NRM1 = NR - 1                                                     687
      DO 20 JJ = 1,NC                                                   688
      J = NC + 1 - JJ                                                   689
      DO 30 I = 1,NRM1                                                  690
      IP1 = I + 1                                                       691
      DO 40 K = IP1,NR                                                  692
      IF(IY(I,J).LE.IY(K,J)) GO TO 40                                   693
      IT = IP(I)                                                        694
      IP(I) = IP(K)                                                     695
      IP(K) = IT                                                        696
      DO 50 L = 1,NC                                                    697
      IT = IY(I,L)                                                      698
      IY(I,L) = IY(K,L)                                                 699
      IY(K,L) = IT                                                      700
   50 CONTINUE                                                          701
   40 CONTINUE                                                          702
   30 CONTINUE                                                          703
   20 CONTINUE                                                          704
      WRITE(6,100)                                                      705
  100 FORMAT(////10X,"ALPHABETIC LISTING",//)                           706
      DO 60 I = 1,NR                                                    707
      WRITE(6,600) IP(I),(IY(I,J),J=1,NC)                               708
  600 FORMAT(I6,"    ",20A4)                                            709
   60 CONTINUE                                                          710
      RETURN                                                            711
      END                                                               712
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 ASORT 1 33

VARIABLES	SN	TYPE	RELOCATION								
142	I	INTEGER		REFS	2*6	2*8	13	15	16	17	20
				21	2*30	DEFINED	5	12	29		
5222	IP	INTEGER	ARRAY	REFS	4	16	17	30	DEFINED	6	17
				18							
146	IP1	INTEGER		REFS	14	DEFINED	13				
150	IT	INTEGER		REFS	18	22	DEFINED	16	20		
0	IX	INTEGER	ARRAY F.P.	REFS	4	8	DEFINED	1			
152	IY	INTEGER	ARRAY	REFS	4	2*15	20	21	30		
				DEFINED	8	21	22				
143	J	INTEGER		REFS	2*8	2*15	30	DEFINED	7	11	30
145	JJ	INTEGER		REFS	11	DEFINED	10				
147	K	INTEGER		REFS	15	17	18	21	22		
				DEFINED	14						
151	L	INTEGER		REFS	20	2*21	22	DEFINED	19		
0	NC	INTEGER	F.P.	REFS	7	10	11	19	30		
				DEFINED	1						
0	NR	INTEGER	F.P.	REFS	5	9	14	29	DEFINED	1	
144	NRM1	INTEGER		REFS	12	DEFINED	9				

FILE NAMES	MODE			
TAPE6	FMT	WRITES	27	30

STATEMENT LABELS			DEF LINE	REFERENCES	
0	10		8	5	7
0	20		26	10	
0	30		25	12	
63	40		24	14	15
0	50		23	19	
0	60		32	29	
123	100	FMT	28	27	
137	600	FMT	31	30	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
7	10	I	5 8	16B	NOT INNER
17	10	J	7 8	3B	INSTACK
30	20	JJ	10 26	43B	NOT INNER
34	30	I	12 25	34B	NOT INNER
37	40	K	14 24	27B	NOT INNER
56	50	L	19 23	4B	INSTACK
75	60	I	29 32	23B	EXT REFS NOT INNER
103		J	30 30	11B	EXT REFS

STATISTICS
PROGRAM LENGTH 5641B 2977
52000B CM USED

```
      SUBROUTINE COMP(QDAR,INIQ)                                        713
C                                                                       714
C ... SUBROUTINE TO PERFORM NORMALITY TEST ON INDIVIDUAL                715
C     WELLS AND FIT UNIQUE EVENTS INTO OPTIMUM SEQUENCE                 716
C                                                                       717
      DIMENSION NAM(25,3),NAMA(25,3),IX(25,120),ICODE(260),IRCODE(260)  718
      DIMENSION RMAT(260,3),ITITLE(260,10),C(145,145),QDAR(150)         719
      DIMENSION IVEC(260),ISYM(260),CLASS(10),CLAS(10)                  720
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40),RUNIQ(260,2)        721
      COMMON NS,MMAX,NAM,NAMA,IX,ICODE,IRCODE,ITITLE,C                  722
      COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                    723
      NMAX=MMAX-1                                                       724
      DO 10 K=1,10                                                      725
      CLASS(K)=0.0                                                      726
      CLAS(K)=0.0                                                       727
   10 CONTINUE                                                          728
      DO 20 I=1,260                                                     729
      RUNIQ(I,1)=0.0                                                    730
      RUNIQ(I,2)=0.0                                                    731
   20 CONTINUE                                                          732
      KK=0                                                              733
      IBLK=3H                                                           734
      IASK1=3H *                                                        735
      IASK2=3H **                                                       736
      DO 150 I=1,NS                                                     737
      RSTEP=0.0                                                         738
      DO 30 J=1,MMAX                                                    739
      ID=IX(I,J)                                                        740
      IF(ID.GT.0) RSTEP=RSTEP+1.0                                       741
      IF(ID.EQ.0) GO TO 40                                              742
   30 CONTINUE                                                          743
   40 RSTEP=RSTEP-1.0                                                   744
      DO 50 K=1,MMAX                                                    745
      RMAT(K,1)=0.0                                                     746
      RMAT(K,2)=0.0                                                     747
      RMAT(K,3)=0.0                                                     748
      IVEC(K)=0                                                         749
      ISYM(K)=IBLK                                                      750
   50 CONTINUE                                                          751
      ICNT=0                                                            752
      DO 80 J=1,MMAX                                                    753
      ID=IX(I,J)                                                        754
      IF(ID.EQ.0) GO TO 90                                              755
      IAD=IABS(ID)                                                      756
      ICD=ICODE(IAD)                                                    757
      DO 60 K=1,MMAX                                                    758
      IF(IRCODE(K).EQ.ICD) GO TO 70                                     759
   60 CONTINUE                                                          760
   70 ID2=K                                                             761
      IF(J.EQ.1) IMIN=ID2                                               762
      IF(ID.LT.0) ICD=ICD*(-1)                                          763
      IVEC(J)=ICD                                                       764
      RMAT(J,1)=QDAR(ID2)                                               765
      ICNT=ICNT+1                                                       766
   80 CONTINUE                                                          767
   90 IMAX=ID2                                                          768
      ICN=ICNT-1                                                        769
```

```
                DO 100 J=1,ICN                                                  770
                QRAY=RMAT(J+1,1)-RMAT(J,1)                                      771
     60         AVEINC=(QDAR(IMAX)-QDAR(IMIN))/RSTEP                            772
                IF(IVEC(J+1).GT.0) QRAY=QRAY-AVEINC                             773
                RMAT(J,2)=QRAY                                                  774
            100 CONTINUE                                                        775
                DO 110 J=2,ICN                                                  776
     65         JM1=J-1                                                         777
                RMAT(J,3)=RMAT(J,2)-RMAT(JM1,2)                                 778
                RMA=RMAT(J,3)                                                   779
                AQRAY=ABS(RMA)                                                  780
                IF(AQRAY.GT.2.3264) ISYM(J)=IASK1                               781
     70         IF(AQRAY.GT.3.2895) ISYM(J)=IASK2                               782
            110 CONTINUE                                                        783
                PRINT 1000                                                      784
                PRINT 1010                                                      785
                PRINT 1020,(NAM(I,J),J=1,3),(NAMA(I,J),J=1,3)                   786
     75    1000 FORMAT(1H1)                                                     787
           1010 FORMAT("     NORMALITY TEST "//)                               788
           1020 FORMAT(5X,2A4,A2,2A4,A2///)                                     789
                PRINT 1025                                                      790
           1025 FORMAT( 50X,"CUM. DIST.  2ND ORDER DIFF."/)                     791
     80         C                                                               792
                ID=IABS(IVEC(1))                                                793
                PRINT 1030,(ITITLE(ID,L),L=1,10),IVEC(1),RMAT(1,1)              794
           1030 FORMAT(1X,10A4,I4,5X,F10.4)                                     795
                DO 120 J=2,ICN                                                  796
     85         ID=IABS(IVEC(J))                                                797
                PRINT 1040,(ITITLE(ID,L),L=1,10),IVEC(J),RMAT(J,1),             798
               XRMAT(J,3),ISYM(J)                                               799
           1040 FORMAT(1X,10A4,I4,5X,2F10.4,A3)                                 800
                A=0.7071*RMAT(J,3)                                              801
     90         CALL ZTOF(A,B)                                                  802
                RMAT(J,3)=B                                                     803
                KK=KK+1                                                         804
            120 CONTINUE                                                        805
                ID=IABS(IVEC(ICNT))                                             806
     95         PRINT 1030,(ITITLE(ID,L),L=1,10),IVEC(ICNT),RMAT(ICNT,1)        807
                PRINT 1080                                                      808
           1080 FORMAT(/10X,"*  -GREATER THAN 95% PROB. EVENT OUT OF POSITION") 809
                PRINT 1090                                                      810
           1090 FORMAT(10X,"** -GREATER THAN 99% PROB. EVENT OUT OF POSITION")  811
    100         DO 140 K=1,10                                                   812
                DO 130 J=2,ICN                                                  813
                XK=K                                                            814
                XK=XK/10.                                                       815
                IF(RMAT(J,3).LT.XK) CLASS(K)=CLASS(K)+1.0                       816
    105     130 CONTINUE                                                        817
            140 CONTINUE                                                        818
                IF(INIQ.NE.1) GO TO 150                                         819
                IF(NUNIQ(I).EQ.1) CALL XUNIQ2(I,ICNT,IVEC,RMAT,RUNIQ)           820
            150 CONTINUE                                                        821
    110         PRINT 1000                                                      822
                PRINT 1010                                                      823
                PRINT 1070                                                      824
                PRINT 1060                                                      825
                TCL=KK                                                          826
```

```
      TCL=TCL/10.                                                        827
      CLAS(1)=CLASS(1)                                                   828
      DO 160 K=2,10                                                      829
      KM1=K-1                                                            830
      CLAS(K)=CLASS(K)-CLASS(KM1)                                        831
  160 CONTINUE                                                           832
      DO 170 K=1,10                                                      833
      DIFF=CLAS(K)-TCL                                                   834
      ICL=CLAS(K)                                                        835
      PRINT 1050,K,ICL,TCL,DIFF                                          836
  170 CONTINUE                                                           837
 1050 FORMAT(1X,I6,I10,2X,2F10.3)                                        838
 1060 FORMAT(1X," CLASS NO. OBSERVED  EXPECTED DIFFERENCE"//)            839
 1070 FORMAT(1X,"COMPARISON OF OBSERVED AND EXPECTED OCCURRENCES OF SECO 840
     1ND ORDER DIFFERENCE VALUES"///)                                    841
      IF(INIQ.NE.1) GO TO 190                                            842
      DO 180 I=1,260                                                     843
      IF(RUNIQ(I,2).LE.0.0) GO TO 180                                    844
      RUNIQ(I,1)=RUNIQ(I,1)/RUNIQ(I,2)                                   845
      MMAX=MMAX+1                                                        846
      QDAR(MMAX)=RUNIQ(I,1)                                              847
      IRCODE(MMAX)=I                                                     848
  180 CONTINUE                                                           849
  190 RETURN                                                             850
      END                                                                851
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 COMP 1 138

VARIABLES	SN	TYPE	RELOCATION								
701 A		REAL		REFS	90	DEFINED	89				
677 AQRAY		REAL		REFS	69	70	DEFINED	68			
674 AVEINC		REAL		REFS	61	DEFINED	60				
702 B		REAL		REFS	90	91					
14200 C		REAL	ARRAY / /	REFS	7	10					
3346 CLAS		REAL	ARRAY	REFS	8	122	123	DEFINED	15	116	119
3334 CLASS		REAL	ARRAY	REFS	8	104	116	2*119	DEFINED	14	104
706 DIFF		REAL		REFS	124	DEFINED	122				
654 I		INTEGER		REFS	18	19	28	42	2*74	2*108	132
				3*133	135	136	DEFINED	17	25	131	
665 IAD		INTEGER		REFS	45	DEFINED	44				
657 IASK1		INTEGER		REFS	69	DEFINED	23				
660 IASK2		INTEGER		REFS	70	DEFINED	24				
656 IBLK		INTEGER		REFS	38	DEFINED	22				
666 ICD		INTEGER		REFS	47	51	52	DEFINED	45	51	
707 ICL		INTEGER		REFS	124	DEFINED	123				
672 ICN		INTEGER		REFS	58	64	84	101	DEFINED	57	
664 ICNT		INTEGER		REFS	54	57	94	2*95	108		
				DEFINED	40	54					
6120 ICODE		INTEGER	ARRAY / /	REFS	6	10	45				
663 ID		INTEGER		REFS	29	30	43	44	51	82	86
				95	DEFINED	28	42	81	85	94	
667 ID2		INTEGER		REFS	50	53	56	DEFINED	49		
671 IMAX		INTEGER		REFS	60	DEFINED	56				
670 IMIN		INTEGER		REFS	60	DEFINED	50				
0 INIQ		INTEGER	F.P.	REFS	107	130	DEFINED	1			
6524 IRCODE		INTEGER	ARRAY / /	REFS	6	10	47	DEFINED	136		
2730 ISYM		INTEGER	ARRAY	REFS	8	86	DEFINED	38	69	70	
7130 ITITLE		INTEGER	ARRAY / /	REFS	7	10	82	86	95		
0 IUNIQ		INTEGER	ARRAY BETA	REFS	9	11					
2324 IVEC		INTEGER	ARRAY	REFS	8	61	81	82	85	86	94
				95	108	DEFINED	37	52			
230 IX		INTEGER	ARRAY / /	REFS	6	10	28	42			
662 J		INTEGER		REFS	28	42	50	52	53	2*59	61
				62	65	2*66	67	69	70	2*74	85
				4*86	89	91	104	DEFINED	27	41	58
				64	2*74	84	101				
675 JM1		INTEGER		REFS	66	DEFINED	65				
653 K		INTEGER		REFS	14	15	34	35	36	37	38
				47	49	102	2*104	118	2*119	122	123
				124	DEFINED	13	33	46	100	117	121
655 KK		INTEGER		REFS	92	114	DEFINED	21	92		
705 KM1		INTEGER		REFS	119	DEFINED	118				
700 L		INTEGER		REFS	82	86	95	DEFINED	82	86	95
1 MMAX		INTEGER	/ /	REFS	10	12	27	33	41	46	134
				135	136	DEFINED	134				
1041 MUNIQ		INTEGER	ARRAY BETA	REFS	9	11					
2 NAM		INTEGER	ARRAY / /	REFS	6	10	74				
115 NAMA		INTEGER	ARRAY / /	REFS	6	10	74				
652 NMAX	*	INTEGER		DEFINED	12						

VARIABLES	SN	TYPE		RELOCATION								
0	NS	INTEGER		/ /	REFS	10	25					
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	9	11	108				
0	QDAR	REAL	ARRAY	F.P.	REFS	7	53	2*60	DEFINED	1	135	
673	QRAY	REAL			REFS	61	62	DEFINED	59	61		
676	RMA	REAL			REFS	68	DEFINED	67				
710	RMAT	REAL	ARRAY		REFS	7	2*59	2*66	67	82	2*86	89
						95	104	108	DEFINED	34	35	36	53
						62	66	91				
661	RSTEP	REAL			REFS	29	32	60	DEFINED	26	29	32
3360	RUNIQ	REAL	ARRAY		REFS	9	108	132	2*133	135		
					DEFINED	18	19	133				
704	TCL	REAL			REFS	115	122	124	DEFINED	114	115	
703	XK	REAL			REFS	103	104	DEFINED	102	103		

FILE NAMES	MODE									
OUTPUT	FMT	WRITES	72	73	74	78	82	86	95	96
			98	110	111	112	113	124		

EXTERNALS	TYPE	ARGS	REFERENCES
XUNIQ2		5	108
ZTOF		2	90

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES			
ABS	REAL	1	INTRIN		68			
IABS	INTEGER	1	INTRIN		44	81	85	94

STATEMENT LABELS			DEF LINE	REFERENCES	
0	10		16	13	
0	20		20	17	
0	30		31	27	
47	40		32	30	
0	50		39	33	
0	60		48	46	
101	70		49	47	
0	80		55	41	
120	90		56	43	
0	100		63	58	
0	110		71	64	
0	120		93	84	
0	130		105	101	
0	140		106	100	
356	150		109	25	107
0	160		120	117	
0	170		125	121	
431	180		137	131	132
434	190		138	130	
465	1000	FMT	75	72	110
467	1010	FMT	76	73	111
473	1020	FMT	77	74	
501	1025	FMT	79	78	
516	1030	FMT	83	82	95
533	1040	FMT	88	86	
616	1050	FMT	126	124	
621	1060	FMT	127	113	
627	1070	FMT	128	112	
552	1080	FMT	97	96	
564	1090	FMT	99	98	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES		
12	10	K	13 16	3B	INSTACK		
20	20	I	17 20	3B	INSTACK		
32	150	I	25 109	327B		EXT REFS	NOT INNER
34	30	J	27 31	13B	OPT	EXITS	
54	50	K	33 39	5B	INSTACK		
64	80	J	41 55	34B		EXITS	NOT INNER
74	60	K	46 48	5B	INSTACK	EXITS	
132	100	J	58 63	11B	OPT		
150	110	J	64 71	14B	OPT		
173		J	74 74	11B		EXT REFS	
205		J	74 74	11B		EXT REFS	
226		L	82 82	11B		EXT REFS	
241	120	J	84 93	40B		EXT REFS	NOT INNER
246		L	86 86	11B		EXT REFS	
306		L	95 95	11B		EXT REFS	
331	140	K	100 106	20B		NOT INNER	
337	130	J	101 105	6B	INSTACK		
377	160	K	117 120	5B	INSTACK		
406	170	K	121 125	11B		EXT REFS	
425	180	I	131 137	5B	INSTACK		

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
/ /	27297	0 NS	(1)	1 MMAX	(1)	2 NAM	(75)
		77 NAMA	(75)	152 IX	(3000)	3152 ICODE	(260)
		3412 IRCODE	(260)	3672 ITITLE	(2600)	6272 C	(21025)
BETA	1545	0 IUNIQ	(520)	520 NUNIQ	(25)	545 MUNIQ	(1000)

STATISTICS

PROGRAM LENGTH	4375B	2301
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

520008 CM USED

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      SUBROUTINE CYCLE(ICORT,ICYC,WVEC,IA,A,B,CC)                          852
C                                                                          853
C ... SUBROUTINE CYCLE IS USED BY RASC TO ARTIFICIALLY CORRECT             854
C     FOR CYCLICITY IN RANKING SOLUTION.  ALL EVENT PAIRS INVOLVED         855
C     IN A CYCLE ARE EXAMINED AND THE ELEMENT PAIR WITH THE                856
C     SMALLEST ABSOLUTE DIFFERENCE IS ZEROED.                              857
C                                                                          858
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)      859
      DIMENSION ITITLE(260,10),C(145,145),A(300),B(300),CC(600)            860
      DIMENSION WVEC(10),IRC(10),RDIF(10)                                  861
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                      862
      INTEGER X                                                            863
      MMX5=MMAX+5                                                          864
      IF(ICORT.EQ.1) GO TO 60                                              865
C                                                                          866
C ... DETERMINE POSITIONS OF EVENTS INVOLVED IN CYCLE                      867
C                                                                          868
      DO 20 L=1,MMAX                                                       869
      RCID=C(L,MMX5)                                                       870
      DO 10 J=1,ICYC                                                       871
      IF(WVEC(J).EQ.RCID) IRC(J)=L                                         872
   10 CONTINUE                                                             873
   20 CONTINUE                                                             874
C                                                                          875
C ... DETERMINE MINIMUM OF ELEMENT DIFFERENCES                             876
C                                                                          877
      ICYCM1=ICYC-1                                                        878
      DO 30 J=1,ICYCM1                                                     879
      RDIF(J)=ABS(C(IRC(J),IRC(J+1))-C(IRC(J+1),IRC(J)))                   880
   30 CONTINUE                                                             881
      RDIF(ICYC)=ABS(C(IRC(ICYC),IRC(1))-C(IRC(1),IRC(ICYC)))              882
      DIFMIN=RDIF(1)                                                       883
      MIN=1                                                                884
      DO 40 J=2,ICYC                                                       885
      IF(RDIF(J).GE.DIFMIN) GO TO 40                                       886
      DIFMIN=RDIF(J)                                                       887
      MIN=J                                                                888
   40 CONTINUE                                                             889
      MIN2=MIN+1                                                           890
      IF(MIN.EQ.ICYC) MIN2=1                                               891
C                                                                          892
C ... PRINT CYCLING EVENTS (NEW CODE NO.S), POSITIONS                      893
C     AND MATRIX ELEMENTS                                                  894
C                                                                          895
      PRINT 1000,(WVEC(J),J=1,ICYC)                                        896
      PRINT 1001,(IRC(J),J=1,ICYC)                                         897
      PRINT 1002                                                           898
      DO 50 I=1,ICYC                                                       899
      PRINT 1003,(C(IRC(I),IRC(J)),J=1,ICYC)                               900
   50 CONTINUE                                                             901
      PRINT 1004,IRC(MIN),IRC(MIN2),IRC(MIN2),IRC(MIN)                     902
C                                                                          903
C ... ZERO ELEMENT PAIR WITH SMALLEST DIFFERENCE                           904
C                                                                          905
      A(IA)=WVEC(MIN)                                                      906
      B(IA)=WVEC(MIN2)                                                     907
      CC(IA)=C(IRC(MIN),IRC(MIN2))                                         908
```

```
                IA=IA+1                                                          909
                CC(IA)=C(IRC(MIN2),IRC(MIN))                                     910
   60           IA=IA+1                                                          911
                C(IRC(MIN),IRC(MIN2))=0.0                                        912
                C(IRC(MIN2),IRC(MIN))=0.0                                        913
              C                                                                  914
               1000 FORMAT(///10X," CYCLING EVENTS:",9F6.0)                      915
   65          1001 FORMAT(/10X,"EVENT POSITIONS:",9I6)                          916
               1002 FORMAT(/10X,"MATRIX ELEMENTS:")                              917
               1003 FORMAT(10X,9F5.1)                                            918
               1004 FORMAT("  C(",I3,",",I3,") AND C(",I3,",",I3,")  ZEROED - BASED ON  919
                   1 LEAST DIFFERENCE BETWEEN PAIRS IN THE CYCLING MATRIX")      920
   70          GO TO 90                                                          921
              C                                                                  922
              C ... REPLACE ELEMENTS ZEROED IN CORRECTION OF CYCLICITY           923
              C                                                                  924
                 60 IAM=IA-2                                                     925
   75            DO 80 I=1,IAM,2                                                926
                 DO 70 J=1,MMAX                                                 927
                 IF(A(I).EQ.C(J,MMX5)) IA1=J                                    928
                 IF(B(I).EQ.C(J,MMX5)) IB1=J                                    929
                 70 CONTINUE                                                    930
   80            C(IA1,IB1)=CC(I)                                               931
                 C(IB1,IA1)=CC(I+1)                                             932
                 80 CONTINUE                                                    933
                 90 RETURN                                                      934
                 END                                                            935
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 CYCLE 1 83

VARIABLES	SN	TYPE		RELOCATION								
0	A	REAL	ARRAY	F.P.	REFS	9	77	DEFINED	1	55		
0	B	REAL	ARRAY	F.P.	REFS	9	78	DEFINED	1	56		
14200	C	REAL	ARRAY	/ /	REFS	9	11	19	2*29	2*31	49	57
						59	77	78	DEFINED	61	62	80	81
0	CC	REAL	ARRAY	F.P.	REFS	9	80	81	DEFINED	1	57	59
317	DIFMIN	REAL			REFS	35	DEFINED	32	36			
322	I	INTEGER			REFS	49	77	78	80	81		
					DEFINED	48	75					
0	IA	INTEGER		F.P.	REFS	55	56	57	58	59	60	74
					DEFINED	1	58	60				
323	IAM	INTEGER			REFS	75	DEFINED	74				
324	IA1	INTEGER			REFS	80	81	DEFINED	77			
325	IB1	INTEGER			REFS	80	81	DEFINED	78			
6120	ICODE	INTEGER	ARRAY	/ /	REFS	8	11					
0	ICORT	INTEGER		F.P.	REFS	14	DEFINED	1				
0	ICYC	INTEGER		F.P.	REFS	20	27	3*31	34	40	45	46
						48	49	DEFINED	1			
316	ICYCM1	INTEGER			REFS	28	DEFINED	27				
326	IRC	INTEGER	ARRAY		REFS	10	4*29	4*31	46	2*49	4*51	2*57
						2*59	2*61	2*62	DEFINED	21		
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	8	11					
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	9	11					
315	J	INTEGER			REFS	2*21	5*29	35	36	37	45	46
						49	2*77	2*78	DEFINED	20	28	34	45
						46	49	76				
313	L	INTEGER			REFS	19	21	DEFINED	18			
320	MIN	INTEGER			REFS	39	40	2*51	55	57	59	61
						62	DEFINED	33	37			
321	MIN2	INTEGER			REFS	2*51	56	57	59	61	62	
					DEFINED	39	40					
1	MMAX	INTEGER		/ /	REFS	11	13	18	76			
312	MMX5	INTEGER			REFS	19	77	78	DEFINED	13		
2	NAM	INTEGER	ARRAY	/ /	REFS	8	11					
115	NAMA	INTEGER	ARRAY	/ /	REFS	8	11					
0	NS	INTEGER		/ /	REFS	11						
314	RCID	REAL			REFS	21	DEFINED	19				
340	RDIF	REAL	ARRAY		REFS	10	32	35	36	DEFINED	29	31
0	WVEC	REAL	ARRAY	F.P.	REFS	10	21	45	55	56		
					DEFINED	1						
230	X	INTEGER	ARRAY	/ /	REFS	8	11	12				

FILE NAMES MODE
OUTPUT FMT WRITES 45 46 47 49 51

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES
ABS	REAL	1	INTRIN		29 31

STATEMENT LABELS	DEF LINE	REFERENCES
0 10	22	20
0 20	23	18

STATEMENT LABELS			DEF LINE	REFERENCES	
0	30		30	28	
70	40		38	34	35
0	50		50	48	
170	60		74	14	
0	70		79	76	
0	80		82	75	
223	90		83	70	
255	1000	FMT	64	45	
262	1001	FMT	65	46	
266	1002	FMT	66	47	
272	1003	FMT	67	49	
274	1004	FMT	68	51	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
13	20	L	18 23	20B	NOT INNER
22	10	J	20 22	5B	INSTACK
40	30	J	28 30	7B	INSTACK
64	40	J	34 38	5B	INSTACK
115	50	I	48 50	21B	EXT REFS NOT INNER
120		J	49 49	12B	EXT REFS
173	80	I	75 82	30B	NOT INNER
203	70	J	76 79	7B	INSTACK

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)		
/ /	27297	0 NS (1)	1 MMAX (1)	2 NAM (75)
		77 NAMA (75)	152 X (3000)	3152 ICODE (260)
		3412 IRCODE (260)	3672 ITITLE (2600)	6272 C (21025)

STATISTICS

PROGRAM LENGTH	362B	242
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE DENDRO(IPAIR,XLEV,ISIM)                                936
C                                                                       937
C ... SUBROUTINE TO PRINT A DENDROGRAM                                  938
C                                                                       939
C     ADAPTED FOR PROGRAM RASC FROM PROGRAM 7.8 IN J.C. DAVIS           940
C     ---STATISTICS AND DATA ANALYSIS IN GEOLOGY---                     941
C                                                                       942
C                                                                       943
      DIMENSION IPAIR(2,150),XLEV(150),IOUT(61),XX(13)                  944
      DIMENSION NAM(25,3),NAMA(25,3),IX(25,120),ICODE(260),IRCODE(260)  945
      DIMENSION ITITLE(260,10),C(145,145)                               946
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40)                     947
      COMMON NS,MMAX,NAM,NAMA,IX,ICODE,IRCODE,ITITLE,C                  948
      COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                    949
      INTEGER IX,NS,MMAX                                                950
      LOGICAL MARKON,NODON                                              951
      DATA IBLNK,ICI,ICP,ICM,ISTAR,ISTAR2/1H ,1HI,1H.,1H-,3H * ,3H** /  952
      M=MMAX                                                            953
      M2=M-1                                                            954
C                                                                       955
C ... FIND LARGEST AND SMALLEST SIMILARITY COEFFICIENT                  956
C                                                                       957
      XMIN=XLEV(1)                                                      958
      XMAX=XMIN                                                         959
      DO 10 I=1,M2                                                      960
      IF (XLEV(I) .LT. XMIN) XMIN=XLEV(I)                               961
      IF (XLEV(I) .GT. XMAX) XMAX=XLEV(I)                               962
   10 CONTINUE                                                          963
      DX=(XMAX-XMIN)/25.0                                               964
      XMIN=XMIN-DX                                                      965
      XMAX=XMAX+DX                                                      966
      DX=(XMAX-XMIN)/60.0                                               967
      IF (ISIM .NE. 2) GO TO 20                                         968
      DX=-DX                                                            969
      XMIN=XMAX                                                         970
C                                                                       971
C ... BLANK OUT PRINT LINE ARRAY                                        972
C                                                                       973
   20 DO 30 I=1,61                                                      974
      IOUT(I)=IBLNK                                                     975
   30 CONTINUE                                                          976
C                                                                       977
C ... PRINT DENDROGRAM                                                  978
C                                                                       979
      X=XMIN                                                            980
      DO 40 I=1,13                                                      981
      XX(I)=X                                                           982
      X=X+DX*5.0                                                        983
   40 CONTINUE                                                          984
      WRITE (6,2000)                                                    985
      WRITE (6,2001) (XX(I),I=2,12,2)                                   986
      WRITE (6,2002) (XX(I),I=1,13,2)                                   987
      WRITE (6,2003)                                                    988
      JS=1                                                              989
      MARKON = .FALSE.                                                  990
      NODON = .FALSE.                                                   991
      NODE=IPAIR(1,1)                                                   992
```

```
                50 X=XMIN                                                          993
                   IF (JS .NE. M) X=XLEV(JS)                                       994
60                 IS=IFIX((X-XMIN)/DX)+1                                          995
                   DO 60 I=IS,61                                                   996
                   IOUT(I)=ICM                                                     997
                60 CONTINUE                                                        998
                   LOGO=IBLNK                                                      999
65                 WRITE(55,*)"IUNIQ PRINT AT 919",IUNIQ                           1000
                   IF(IUNIQ(NODE,2).EQ.1) LOGO=ISTAR                               1001
                   IF(IUNIQ(NODE,2).EQ.1) MARKON = .TRUE.                          1002
                   IF(IUNIQ(NODE,1).EQ.1) LOGO=ISTAR2                              1003
                   IF(IUNIQ(NODE,1).EQ.1) NODON = .TRUE.                           1004
70                 IF(JS.NE.M) WRITE(6,2004) IOUT,NODE,X,LOGO,(ITITLE(NODE,J),J=1,10) 1005
                   IF(JS.EQ.M) WRITE(6,2006) IOUT,NODE,LOGO,(ITITLE(NODE,J),J=1,10) 1006
                   IF(JS.EQ.M) GO TO 80                                            1007
                   DO 70 I=IS,61                                                   1008
                   IOUT(I)=IBLNK                                                   1009
75              70 CONTINUE                                                        1010
                   IOUT(IS)=ICI                                                    1011
                   WRITE (6,2004) (IOUT(I),I=1,IS)                                 1012
                   NODE=IPAIR(2,JS)                                                1013
                   JS=JS+1                                                         1014
80                 GO TO 50                                                        1015
                80 WRITE (6,2003)                                                  1016
                   WRITE (6,2002) (XX(I),I=1,13,2)                                 1017
                   WRITE (6,2001) (XX(I),I=2,12,2)                                 1018
                   WRITE (6,2005)                                                  1019
85                 IF(MARKON) WRITE(6,2007)                                        1020
                   IF(NODON) WRITE(6,2008)                                         1021
             2007 FORMAT(/5X,"* INDICATES A MARKER HORIZON")                       1022
             2008 FORMAT(/5X,"** INDICATES A UNIQUE EVENT")                        1023
             2000 FORMAT (1H1)                                                     1024
90           2001 FORMAT (6X,6F10.4)                                               1025
             2002 FORMAT (1X,7F10.4)                                               1026
             2003 FORMAT (6X,"+",12("----+"))                                      1027
             2004 FORMAT(6X,61A1,1X,I3,F10.4,3X,1A3,10A4)                          1028
             2006 FORMAT(6X,61A1,1X,I3,13X,1A3,10A4)                               1029
95           2005 FORMAT (1HO,4X,"DENDROGRAM - ",1X,                               1030
                 1 45HVALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES,/19X,"VALUES ALO 1031
                 1NG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR")     1032
                  RETURN                                                           1033
                  END                                                              1034
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 DENDRO 1 98

VARIABLES	SN	TYPE	RELOCATION									
14200 C		REAL	ARRAY / /	REFS	11	13						
503 DX		REAL		REFS	30	31	34	48	60			
				DEFINED	29	32	34					
502 I		INTEGER		REFS	2*26	2*27	40	47	51	52	62	
				74	77	82	83	DEFINED	25	39	46	
				51	52	61	73	77	82	83		
302 IBLNK		INTEGER		REFS	40	64	74	DEFINED	17			
303 ICI		INTEGER		REFS	76	DEFINED	17					
305 ICM		INTEGER		REFS	62	DEFINED	17					
6120 ICODE		INTEGER	ARRAY / /	REFS	10	13						
304 ICP	*	INTEGER		DEFINED	17							
512 IOUT		INTEGER	ARRAY	REFS	9	70	71	77	DEFINED	40	62	
				74	76							
0 IPAIR		INTEGER	ARRAY F.P.	REFS	9	57	78	DEFINED	1			
6524 IRCODE		INTEGER	ARRAY / /	REFS	10	13						
507 IS		INTEGER		REFS	61	73	76	77	DEFINED	60		
0 ISIM		INTEGER	F.P.	REFS	33	DEFINED	1					
306 ISTAR		INTEGER		REFS	66	DEFINED	17					
307 ISTAR2		INTEGER		REFS	68	DEFINED	17					
7130 ITITLE		INTEGER	ARRAY / /	REFS	11	13	70	71				
0 IUNIQ		INTEGER	ARRAY BETA	REFS	12	14	65	66	67	68	69	
230 IX		INTEGER	ARRAY / /	REFS	10	13	15					
511 J		INTEGER		REFS	70	71	DEFINED	70	71			
505 JS		INTEGER		REFS	2*59	70	71	72	78	79		
				DEFINED	54	79						
510 LOGO		INTEGER		REFS	70	71	DEFINED	64	66	68		
476 M		INTEGER		REFS	19	59	70	71	72			
				DEFINED	18							
474 MARKON		LOGICAL		REFS	16	85	DEFINED	55	67			
1 MMAX		INTEGER	/ /	REFS	13	15	18					
1041 MUNIQ		INTEGER	ARRAY BETA	REFS	12	14						
477 M2		INTEGER		REFS	25	DEFINED	19					
2 NAM		INTEGER	ARRAY / /	REFS	10	13						
115 NAMA		INTEGER	ARRAY / /	REFS	10	13						
506 NODE		INTEGER		REFS	66	67	68	69	2*70	2*71		
				DEFINED	57	78						
475 NODON		LOGICAL		REFS	16	86	DEFINED	56	69			
0 NS		INTEGER	/ /	REFS	13	15						
1010 NUNIQ		INTEGER	ARRAY BETA	REFS	12	14						
504 X		REAL		REFS	47	48	60	70	DEFINED	45	48	
				58	59							
0 XLEV		REAL	ARRAY F.P.	REFS	9	23	2*26	2*27	59			
				DEFINED	1							
501 XMAX		REAL		REFS	27	29	31	32	35			
				DEFINED	24	27	31					
500 XMIN		REAL		REFS	24	26	29	30	32	45	58	
				60	DEFINED	23	26	30	35			
607 XX		REAL	ARRAY	REFS	9	51	52	82	83			
				DEFINED	47							

```
FILE NAMES          MODE
      TAPE55        FREE                WRITES      65
      TAPE6         FMT                 WRITES      50     51     52     53     70     71     77     81
                                            82      83     84     85     86

INLINE FUNCTIONS    TYPE    ARGS        DEF LINE  REFERENCES
      IFIX          INTEGER    1 INTRIN               60

STATEMENT LABELS                        DEF LINE   REFERENCES
    0  10                                   28        25
   36  20                                   39        33
    0  30                                   41        39
    0  40                                   49        46
  114  50                                   58        80
    0  60                                   63        61
    0  70                                   75        73
  240  80                                   81        72
  427  2000     FMT                         89        50
  431  2001     FMT                         90        51        83
  433  2002     FMT                         91        52        82
  435  2003     FMT                         92        53        81
  441  2004     FMT                         93        70        77
  451  2005     FMT                         95        84
  445  2006     FMT                         94        71
  415  2007     FMT                         87        85
  422  2008     FMT                         88        86

LOOPS  LABEL    INDEX      FROM-TO     LENGTH    PROPERTIES
   15  10       I            25 28        78     INSTACK
   41  30       I            39 41        38     INSTACK
   52  40       I            46 49        48     INSTACK
   63           I            51 51        78              EXT REFS
   76           I            52 52        78              EXT REFS
  127  60       I            61 63        38     INSTACK
  163           J            70 70       118              EXT REFS
  202           J            71 71       118              EXT REFS
  221  70       I            73 75        38     INSTACK
  245           I            82 82        78              EXT REFS
  260           I            83 83        78              EXT REFS

COMMON BLOCKS    LENGTH     MEMBERS - BIAS NAME(LENGTH)
      / /         27297            0 NS      (1)          1 MMAX    (1)          2 NAM     (75)
                                  77 NAMA    (75)       152 IX      (3000)    3152 ICODE   (260)
                                3412 IRCODE  (260)     3672 ITITLE  (2600)    6272 C       (21025)
      BETA         1545            0 IUNIQ  (520)      520 NUNIQ   (25)       545 MUNIQ   (1000)

STATISTICS
  PROGRAM LENGTH                 627B      407
  CM LABELED COMMON LENGTH      3011B     1545
  CM BLANK COMMON LENGTH       65241B    27297
        52000B CM USED
```

```
      SUBROUTINE DIST(QDAR,MPAIR,AAA,LLL)                                1035
C                                                                        1036
C ... SUBROUTINE TO COMPUTE INTER-EVENT "DISTANCES" FOR                  1037
C     UNWEIGHTED DIFFERENCES                                             1038
C                                                                        1039
C                                                                        1040
C     THIS SIMPLE TECHNIQUE FOR SCALING RESULTS IN DISTANCES             1041
C     BETWEEN THE FOSSIL EVENTS WHICH ARE CLUSTERED BY MEANS             1042
C     OF SUBROUTINE DENDRO.                                              1043
C                                                                        1044
C                                                                        1045
C     SUBSEQUENTLY, THE DISTANCES ARE RECALCULATED BY MEANS OF           1046
C     SUBROUTINE WDIST IN WHICH THE FREQUENCIES ARE WEIGHTED             1047
C     ACCORDING TO SAMPLE SIZE.                                          1048
C     ALL REMAINING OPTIONS WILL USE THE RESULTS OF WDIST                1049
C     AND NOT THOSE OF THE PRESENT SIMPLE TECHNIQUE (DIST).              1050
C                                                                        1051
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)    1052
      DIMENSION ITITLE(260,10),C(145,145),QDAR(150),MPAIR(150)           1053
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40)                      1054
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                    1055
      COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                     1056
      INTEGER X                                                          1057
      CSUM=0.0                                                           1058
      NMAX=MMAX-1                                                        1059
      IF(LLL.EQ.0) GO TO 10                                              1060
      PRINT 1000                                                         1061
      PRINT 1010                                                         1062
      PRINT 1020                                                         1063
 1000 FORMAT(//" UNWEIGHTED DISTANCE ANALYSIS"//)                        1064
 1010 FORMAT(" POSITION   FOSSIL     FOSSIL     CUMULATIVE    SUM DIFF   1065
     1 NO.")                                                             1066
 1020 FORMAT("              PAIRS     DISTANCE     DISTANCE    Z VALUES   1067
     1 PAIRS")                                                           1068
   10 CONTINUE                                                           1069
      DO 100 I=1,NMAX                                                    1070
      RCONT=0.0                                                          1071
      SDIFF=0.0                                                          1072
      ISTP=0                                                             1073
      K=I-1                                                              1074
   20 CONTINUE                                                           1075
      IF(K.EQ.0) GO TO 40                                                1076
      RCOL1=C(K,I)                                                       1077
      RCOL2=C(K,I+1)                                                     1078
      IF(RCOL1.LT.-3.0.OR.RCOL1.GT.3.0) GO TO 30                         1079
      IF(RCOL2.LT.-3.0.OR.RCOL2.GT.3.0) GO TO 30                         1080
      RCONT=RCONT+1.0                                                    1081
      RDIFF=RCOL2-RCOL1                                                  1082
      IF(RCOL1.EQ.AAA.AND.RCOL2.EQ.AAA) ISTP=ISTP+1                      1083
      IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) ISTP=0                            1084
      IF(ISTP.EQ.5) RCONT=RCONT-5.0                                      1085
      IF(ISTP.EQ.5) GO TO 40                                             1086
      SDIFF=SDIFF+RDIFF                                                  1087
   30 CONTINUE                                                           1088
      K=K-1                                                              1089
      GO TO 20                                                           1090
   40 CONTINUE                                                           1091
```

```
                      IF(ISTP.GT.0.AND.ISTP.LT.5) RCONT=RCONT-ISTP                    1092
                      CAA=C(I,I+1)                                                    1093
   60                 RFAC=1.0                                                        1094
                      IF(CAA.GE.-AAA.AND.CAA.LE.AAA) SDIFF=SDIFF+CAA*RFAC             1095
                      IF(CAA.GE.-AAA.AND.CAA.LE.AAA) RCONT=RCONT+1.0                  1096
                      ISTP=0                                                          1097
                      K=I+2                                                           1098
   65              50 IF(K.GT.MMAX) GO TO 70                                          1099
                      RCOL1=C(I,K)                                                    1100
                      RCOL2=C(I+1,K)                                                  1101
                      IF(RCOL1.LT.-3.0.OR.RCOL1.GT.3.0) GO TO 60                      1102
                      IF(RCOL2.LT.-3.0.OR.RCOL2.GT.3.0) GO TO 60                      1103
   70                 RCONT=RCONT+1.0                                                 1104
                      IF(RCOL1.EQ.AAA.AND.RCOL2.EQ.AAA) ISTP=ISTP+1                   1105
                      IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) ISTP=0                         1106
                      IF(ISTP.EQ.5) RCONT=RCONT-5.0                                   1107
                      IF(ISTP.EQ.5) GO TO 70                                          1108
   75                 RDIFF=RCOL1-RCOL2                                               1109
                      RFAC=1.0                                                        1110
                      SDIFF=SDIFF+RDIFF                                               1111
                   60 CONTINUE                                                        1112
                      K=K+1                                                           1113
   80                 GO TO 50                                                        1114
                   70 CONTINUE                                                        1115
                      IF(ISTP.GT.0.AND.ISTP.LT.5) RCONT=RCONT-ISTP                    1116
                      IF(RCONT.EQ.0.0) GO TO 80                                       1117
                      QDIFF=SDIFF/RCONT                                               1118
   85                 GO TO 90                                                        1119
                   80 QDIFF=0.0                                                       1120
                   90 CSUM=CSUM+QDIFF                                                 1121
                      QDAR(I+1)=CSUM                                                  1122
                      MPAIR(I)=RCONT                                                  1123
   90                 IF(LLL.EQ.0) GO TO 100                                          1124
                      PRINT 2000,I,IRCODE(I),IRCODE(I+1),QDIFF,QDAR(I+1),SDIFF,RCONT  1125
                 2000 FORMAT(5X,I4,2X,I3,1H-,I3,3X,F8.4,5X,F8.4,6X,F7.2,2X,F5.0)      1126
                  100 CONTINUE                                                        1127
                      RETURN                                                          1128
   95                 END                                                             1129
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES							
3	DIST	1	94							

VARIABLES	SN	TYPE		RELOCATION								
0	AAA	REAL		F.P.	REFS	2*49	2*50	2*61	2*62	2*71	2*72	
					DEFINED	1						
14200	C	REAL	ARRAY	/ /	REFS	19	21	43	44	59	66	67
306	CAA	REAL			REFS	3*61	2*62	DEFINED	59			
274	CSUM	REAL			REFS	87	88	DEFINED	24	87		
276	I	INTEGER			REFS	40	43	44	2*59	64	66	67
					88	89	4*91	DEFINED	36			
6120	ICODE	INTEGER	ARRAY	/ /	REFS	18	21					
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	18	21	2*91				
301	ISTP	INTEGER			REFS	49	51	52	3*58	71	73	74
					3*82	DEFINED	39	49	50	63	71	72
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	19	21					
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	20	22					
302	K	INTEGER			REFS	42	43	44	55	65	66	67
					79	DEFINED	40	55	64	79		
0	LLL	INTEGER		F.P.	REFS	26	90	DEFINED	1			
1	MMAX	INTEGER		/ /	REFS	21	25	65				
0	MPAIR	INTEGER	ARRAY	F.P.	REFS	19	DEFINED	1	89			
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	20	22					
2	NAM	INTEGER	ARRAY	/ /	REFS	18	21					
115	NAMA	INTEGER	ARRAY	/ /	REFS	18	21					
275	NMAX	INTEGER			REFS	36	DEFINED	25				
0	NS	INTEGER		/ /	REFS	21						
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	20	22					
0	QDAR	REAL	ARRAY	F.P.	REFS	19	91	DEFINED	1	88		
310	QDIFF	REAL			REFS	87	91	DEFINED	84	86		
303	RCOL1	REAL			REFS	2*45	48	49	50	2*68	71	72
					75	DEFINED	43	66				
304	RCOL2	REAL			REFS	2*46	48	49	50	2*69	71	72
					75	DEFINED	44	67				
277	RCONT	REAL			REFS	47	51	58	62	70	73	82
					83	84	89	91	DEFINED	37	47	51
					58	62	70	73	82			
305	RDIFF	REAL			REFS	53	77	DEFINED	48	75		
307	RFAC	REAL			REFS	61	DEFINED	60	76			
300	SDIFF	REAL			REFS	53	61	77	84	91		
					DEFINED	38	53	61	77			
230	X	INTEGER	ARRAY	/ /	REFS	18	21	23				

FILE NAMES	MODE					
OUTPUT	FMT	WRITES	27	28	29	91

STATEMENT LABELS		DEF LINE	REFERENCES		
20	10	35	26		
25	20	41	56		
65	30	54	45	46	
67	40	57	42	52	
115	50	65	80		
157	60	78	68	69	
161	70	81	65	74	

STATEMENT LABELS			DEF LINE	REFERENCES	
171	80		86	83	
172	90		87	85	
207	100		93	36	90
223	1000	FMT	30	27	
230	1010	FMT	31	28	
240	1020	FMT	33	29	
262	2000	FMT	92	91	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	EXT REFS
21	100	I	36 93	171B		

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)							
/ /	27297	0	NS	(1)	1	MMAX	(1)	2	NAM	(75)	
		77	NAMA	(75)	152	X	(3000)	3152	ICODE	(260)	
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272	C	(21025)	
BETA	1545	0	IUNIQ	(520)	520	NUNIQ	(25)	545	MUNIQ	(1000)	

STATISTICS

PROGRAM LENGTH	324B	212
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE ECHO                                                    1130
C                                                                        1131
C ... SUBROUTINE TO PRINT DATA SET                                       1132
C                                                                        1133
      DIMENSION NAM1(25,3),NAM2(25,3),IDATA(25,120),MM(260),M(260)       1134
      DIMENSION ITITLE(260,10),RMAT(145,145)                             1135
      COMMON NS,MMAX,NAM1,NAM2,IDATA,MM,M,ITITLE,RMAT                    1136
      DO 30 I=1,NS                                                       1137
      ILIMIT=0                                                           1138
      DO 10 J=1,120                                                      1139
      IF(IDATA(I,J).EQ.0)  GO TO 20                                      1140
      ILIMIT=ILIMIT+1                                                    1141
   10 CONTINUE                                                           1142
   20 CONTINUE                                                           1143
      PRINT 1000, (NAM1(I,J),J=1,3),(NAM2(I,J),J=1,3)                    1144
 1000 FORMAT(///2X,2A4,A2,2A4,A2)                                        1145
      PRINT 2000,(IDATA(I,J),J=1,ILIMIT)                                 1146
 2000 FORMAT(20I5)                                                       1147
   30 CONTINUE                                                           1148
      RETURN                                                             1149
      END                                                                1150
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
1 ECHO 1 20

VARIABLES SN TYPE RELOCATION
106 I INTEGER REFS 11 2*15 17 DEFINED 8
230 IDATA INTEGER ARRAY / / REFS 5 7 11 17
107 ILIMIT INTEGER REFS 12 17 DEFINED 9 12
7130 ITITLE INTEGER ARRAY / / REFS 6 7
110 J INTEGER REFS 11 2*15 17 DEFINED 10 2*15 17
6524 M INTEGER ARRAY / / REFS 5 7
6120 MM INTEGER ARRAY / / REFS 5 7
1 MMAX INTEGER / / REFS 7
2 NAM1 INTEGER ARRAY / / REFS 5 7 15
115 NAM2 INTEGER ARRAY / / REFS 5 7 15
0 NS INTEGER / / REFS 7 8
14200 RMAT REAL ARRAY / / REFS 6 7

FILE NAMES MODE
OUTPUT FMT WRITES 15 17

STATEMENT LABELS DEF LINE REFERENCES
0 10 13 10
14 20 14 11
0 30 19 8
73 1000 FMT 16 15
104 2000 FMT 18 17

LOOPS LABEL INDEX FROM-TO LENGTH PROPERTIES
3 30 I 8 19 60B EXT REFS NOT INNER
5 10 J 10 13 7B INSTACK EXITS
17 J 15 15 11B EXT REFS
31 J 15 15 11B EXT REFS
46 J 17 17 11B EXT REFS

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)
/ / 27297 0 NS (1) 1 MMAX (1) 2 NAM1 (75)
77 NAM2 (75) 152 IDATA (3000) 3152 MM (260)
3412 M (260) 3672 ITITLE (2600) 6272 RMAT (21025)

STATISTICS
PROGRAM LENGTH 111B 73
CM BLANK COMMON LENGTH 65241B 27297
520008 CM USED

```
      SUBROUTINE FTOZ(P,ZP)                                              1151
C     COMPUTE Z FROM FREQUENCY                                           1152
C     M.ABRAMOWITZ AND I.A.STEGUN,1964,EQ.26.2.23                        1153
      Q=P                                                                1154
      IF(P.GT.0.5) Q=1.0-P                                               1155
      C0=2.515517                                                        1156
      C1=0.802853                                                        1157
      C2=0.010328                                                        1158
      D1=1.432788                                                        1159
      D2=0.189269                                                        1160
      D3=0.001308                                                        1161
      TT=1.0/(Q*Q)                                                       1162
      TT=ALOG(TT)                                                        1163
      T=SQRT(TT)                                                         1164
      UP=C0+C1*T+C2*T*T                                                  1165
      DN=1.0+D1*T+D2*T*T+D3*T**3                                         1166
      ZP=T-UP/DN                                                         1167
      IF(P.LE.0.5) ZP=-ZP                                                1168
      RETURN                                                             1169
      END                                                                1170
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
3	FTOZ	1	19

VARIABLES	SN	TYPE	RELOCATION							
57	C0	REAL		REFS	15	DEFINED	6			
60	C1	REAL		REFS	15	DEFINED	7			
61	C2	REAL		REFS	15	DEFINED	8			
70	DN	REAL		REFS	17	DEFINED	16			
62	D1	REAL		REFS	16	DEFINED	9			
63	D2	REAL		REFS	16	DEFINED	10			
64	D3	REAL		REFS	16	DEFINED	11			
0	P	REAL	F.P.	REFS	4	2*5	18	DEFINED	1	
56	Q	REAL		REFS	2*12	DEFINED	4	5		
66	T	REAL		REFS	3*15	4*16	17	DEFINED	14	
65	TT	REAL		REFS	13	14	DEFINED	12	13	
67	UP	REAL		REFS	17	DEFINED	15			
0	ZP	REAL	F.P.	REFS	18	DEFINED	1	17	18	

EXTERNALS	TYPE	ARGS	REFERENCES
ALOG	REAL	1 LIBRARY	13
SQRT	REAL	1 LIBRARY	14

STATISTICS

PROGRAM LENGTH 718 57

520008 CM USED

```
      SUBROUTINE HPFILT(C,IOCR,INIQ,IOMAT)                                  1171
C                                                                           1172
C ... SUBROUTINE HPFILT REMOVES FROM THE DATA SET ALL                       1173
C     EVENTS WHICH DO NOT OCCUR AT LEAST "IOCR" TIMES                       1174
C     AND RECODES MODIFIED DATA WITH CODE NUMBERS RUNNING                   1175
C     FROM 1 TO MMAX                                                        1176
C                                                                           1177
      DIMENSION NAM(25,3),NAMA(25,3),CC(25,120),MM(260),M(260)              1178
      DIMENSION ITITLE(260,10),RMAT(145,145),C(25,120)                      1179
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40)                         1180
      COMMON/BETA/IUNIQ,NUNIQ,MUNIQ                                         1181
      COMMON NS,MMAX,NAM,NAMA,CC,MM,M,ITITLE,RMAT                           1182
      INTEGER C,CC,AID                                                      1183
      DO 30 I=1,NS                                                          1184
      DO 10 J=1,120                                                         1185
      CC(I,J)=0                                                             1186
   10 CONTINUE                                                              1187
      IF(INIQ.NE.1) GO TO 30                                                1188
      DO 20 J=1,40                                                          1189
      MUNIQ(I,J)=0                                                          1190
   20 CONTINUE                                                              1191
   30 CONTINUE                                                              1192
C                                                                           1193
C ... ELIMINATE EVENTS WHICH OCCUR LESS THAN IOCR TIMES                     1194
C                                                                           1195
      DO 60 I=1,NS                                                          1196
      INDIC=0                                                               1197
      K=1                                                                   1198
      DO 50 J=1,120                                                         1199
      ID=C(I,J)                                                             1200
      IF(ID.EQ.0) GO TO 60                                                  1201
      AID=IABS(ID)                                                          1202
      IF(INIQ.EQ.1.AND.IUNIQ(AID,1).EQ.1) M(AID)=0                          1203
      IF(M(AID).LT.IOCR) GO TO 40                                           1204
      IF(INDIC.EQ.1.AND.ID.LT.0) ID=ID*(-1)                                 1205
      CC(I,K)=ID                                                            1206
      K=K+1                                                                 1207
      INDIC=0                                                               1208
      GO TO 50                                                              1209
   40 IF(ID.GT.0.AND.INDIC.EQ.0) INDIC=1                                    1210
   50 CONTINUE                                                              1211
   60 CONTINUE                                                              1212
      PRINT 1000                                                            1213
 1000 FORMAT(///"   SEQUENCE DATA MODIFIED TO INCLUDE ONLY")                 1214
      PRINT 1010,IOCR                                                       1215
 1010 FORMAT("   THOSE EVENTS WHICH OCCUR AT LEAST",I3," TIMES")            1216
      CALL ECHO                                                             1217
C                                                                           1218
C ... RECODE MODIFIED DATA SET                                              1219
C                                                                           1220
      DO 70 I=1,260                                                         1221
      M(I)=0                                                                1222
      MM(I)=0                                                               1223
   70 CONTINUE                                                              1224
      DO 90 I=1,NS                                                          1225
      DO 80 J=1,120                                                         1226
      ID=CC(I,J)                                                            1227
```

```
                      IF(ID.EQ.0) GO TO 90                                    1228
                      AID=IABS(ID)                                            1229
60                    M(AID)=M(AID)+1                                         1230
                   80 CONTINUE                                                1231
                   90 CONTINUE                                                1232
                      IF(IOMAT.EQ.1) PRINT 1020                               1233
                 1020 FORMAT(////"   RECODE REFERENCE TABLE, OLD CODE VS. NEW CODE")  1234
65                    K=1                                                     1235
                      DO 100 I=1,260                                          1236
                      ID=M(I)                                                 1237
                      IF(ID.EQ.0) GO TO 100                                   1238
                      M(I)=K                                                  1239
70                    K=K+1                                                   1240
                      IF(IOMAT.EQ.1) PRINT 1030,I,M(I)                        1241
                 1030 FORMAT(2I6)                                             1242
                  100 CONTINUE                                                1243
                      IF(INIQ.NE.1) GO TO 120                                 1244
75                    DO 110 I=1,NS                                           1245
                      IF(NUNIQ(I).EQ.1) CALL XUNIQ1(I,C)                      1246
                  110 CONTINUE                                                1247
                  120 MMAX=K-1                                                1248
                      DO 140 I=1,NS                                           1249
80                    DO 130 J=1,120                                          1250
                      ID=CC(I,J)                                              1251
                      IF(ID.EQ.0) GO TO 140                                   1252
                      AID=IABS(ID)                                            1253
                      IDD=M(AID)                                              1254
85                    IF(ID.LT.0) IDD=IDD*(-1)                                1255
                      CC(I,J)=IDD                                             1256
                  130 CONTINUE                                                1257
                  140 CONTINUE                                                1258
                      PRINT 1040                                              1259
90                1040 FORMAT(////"   RECODED SEQUENCE DATA")                 1260
                      CALL ECHO                                               1261
                      DO 150 I=1,260                                          1262
                      ID=M(I)                                                 1263
                      IF(ID.EQ.0) GO TO 150                                   1264
95                    MM(ID)=I                                                1265
                  150 CONTINUE                                                1266
                      IF(IOMAT.EQ.1) PRINT 1050                               1267
                 1050 FORMAT(///"   CROSS REFERENCE TABLE, NEW CODE VS. OLD CODE")  1268
                      DO 160 I=1,MMAX                                         1269
100                   IF(IOMAT.EQ.1) PRINT 1060,I,MM(I)                       1270
                 1060 FORMAT(2I6)                                             1271
                  160 CONTINUE                                                1272
                      PRINT 1070,NS,MMAX                                      1273
                 1070 FORMAT(////"   NS=",I4," MMAX=",I4)                     1274
105                   RETURN                                                  1275
                      END                                                     1276
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 HPFILT 1 105

VARIABLES.	SN	TYPE			RELOCATION								
360	AID	INTEGER			REFS	13	2*33	34	2*60	84			
					DEFINED	32	59	83					
0	C	INTEGER	ARRAY	F.P.	REFS	9	13	30	76	DEFINED	1		
230	CC	INTEGER	ARRAY	/ /	REFS	8	12	13	57	81			
					DEFINED	16	36	86					
361	I	INTEGER			REFS	16	20	30	36	52	53	57	
						67	69	2*71	2*76	81	86	93	95
						2*100	DEFINED	14	26	51	55	66	75
						79	92	99					
365	ID	INTEGER			REFS	31	32	2*35	36	40	58	59	
						68	82	83	85	94	95		
					DEFINED	30	35	57	67	81	93		
366	IDD	INTEGER			REFS	85	86	DEFINED	84	85			
363	INDIC	INTEGER			REFS	35	40	DEFINED	27	38	40		
0	INIQ	INTEGER		F.P.	REFS	18	33	74	DEFINED	1			
0	IOCR	INTEGER		F.P.	REFS	34	45	DEFINED	1				
0	IOMAT	INTEGER		F.P.	REFS	63	71	97	100	DEFINED	1		
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	9	12						
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	10	11	33					
362	J	INTEGER			REFS	16	20	30	57	81	86		
					DEFINED	15	19	29	56	80			
364	K	INTEGER			REFS	36	37	69	70	78			
					DEFINED	28	37	65	70				
6524	M	INTEGER	ARRAY	/ /	REFS	8	12	34	60	67	71	84	
						93	DEFINED	33	52	60	69		
6120	MM	INTEGER	ARRAY	/ /	REFS	8	12	100	DEFINED	53	95		
1	MMAX	INTEGER		/ /	REFS	12	99	103	DEFINED	78			
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	10	11	DEFINED	20				
2	NAM	INTEGER	ARRAY	/ /	REFS	8	12						
115	NAMA	INTEGER	ARRAY	/ /	REFS	8	12						
0	NS	INTEGER		/ /	REFS	12	14	26	55	75	79	103	
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	10	11	76					
14200	RMAT	REAL	ARRAY	/ /	REFS	9	12						

FILE NAMES	MODE									
OUTPUT	FMT	WRITES	43	45	63	71	89	97	100	103

EXTERNALS	TYPE	ARGS	REFERENCES	
ECHO		0	47	91
XUNIQ1		2	76	

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
IABS	INTEGER	1	INTRIN		32	59	83

STATEMENT LABELS		DEF LINE	REFERENCES	
0	10	17	15	
0	20	21	19	
30	30	22	14	18
67	40	40	34	
73	50	41	29	39

STATEMENT LABELS			DEF LINE	REFERENCES	
76	60		42	26	31
0	70		54	51	
0	80		61	56	
127	90		62	55	58
151	100		73	66	68
0	110		77	75	
166	120		78	74	
0	130		87	80	
207	140		88	79	82
222	150		96	92	94
0	160		102	99	
253	1000	FMT	44	43	
265	1010	FMT	46	45	
277	1020	FMT	64	63	
313	1030	FMT	72	71	
320	1040	FMT	90	89	
330	1050	FMT	98	97	
344	1060	FMT	101	100	
353	1070	FMT	104	103	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
7	30	I	14 22	24B	NOT INNER
14	10	J	15 17	2B	INSTACK
25	20	J	19 21	2B	INSTACK
34	60	I	26 42	45B	NOT INNER
37	50	J	29 41	37B	OPT EXITS
110	70	I	51 54	3B	INSTACK
115	90	I	55 62	15B	NOT INNER
116	80	J	56 61	11B	OPT EXITS
137	100	I	66 73	15B	EXT REFS
156	110	I	75 77	10B	EXT REFS
171	140	I	79 88	21B	NOT INNER
172	130	J	80 87	15B	OPT EXITS
217	150	I	92 96	4B	INSTACK
231	160	I	99 102	12B	EXT REFS

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
BETA	1545	0 IUNIQ	(520)	520 NUNIQ	(25)	545 MUNIQ	(1000)
/ /	27297	0 NS	(1)	1 MMAX	(1)	2 NAM	(75)
		77 NAMA	(75)	152 CC	(3000)	3152 MM	(260)
		3412 M	(260)	3672 ITITLE	(2600)	6272 RMAT	(21025)

STATISTICS

PROGRAM LENGTH	377B	255
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE NORMZ(AAA,LLL,IOMAT)                                    1277
C                                                                        1278
C ... SUBROUTINE TO COMPUTE "Z" (NORMAL) VALUES OF FREQUENCIES           1279
C     C(I,J)/(C(I,J)+C(J,I)) FROM CUMULATIVE ORDER MATRIX               1280
C                                                                        1281
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)    1282
      DIMENSION ITITLE(260,10),C(145,145)                                1283
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                    1284
      INTEGER X                                                          1285
      BBB=AAA                                                            1286
      IF(BBB.EQ.0.0) AAA=1.645                                           1287
      DO 40 I=1,MMAX                                                     1288
      K=I+1                                                              1289
      DO 30 J=K,MMAX                                                     1290
      RCL1=C(I,J)                                                        1291
      RCL2=C(J,I)                                                        1292
      SRCL=RCL1+RCL2                                                     1293
      IF(SRCL.EQ.0.0) GO TO 20                                           1294
      QRCL=RCL1/SRCL                                                     1295
      IF(QRCL.LE.0.0.OR.QRCL.GE.1.0) GO TO 10                            1296
      CALL FTOZ(QRCL,QX)                                                 1297
      C(I,J)=QX                                                          1298
      GO TO 30                                                           1299
   10 IF(QRCL.EQ.1.0) C(I,J)=AAA                                         1300
      IF(QRCL.EQ.0.0) C(J,I)=0.95*SRCL                                   1301
      IF(QRCL.EQ.0.0) C(I,J)=-AAA                                        1302
      IF(QRCL.EQ.1.0) C(J,I)=0.05*SRCL                                   1303
      GO TO 30                                                           1304
   20 C(I,J)=9.0                                                         1305
   30 CONTINUE                                                           1306
   40 CONTINUE                                                           1307
      IF(LLL.EQ.0.OR.IOMAT.NE.1) GO TO 60                                1308
      PRINT 1000                                                         1309
 1000 FORMAT(////"  UPPER TRIANGLE OF NORMAL Z VALUES")                  1310
      DO 50 I=1,MMAX                                                     1311
      PRINT 1001                                                         1312
 1001 FORMAT(///)                                                        1313
      PRINT 1002,(C(I,J),J=1,MMAX)                                       1314
 1002 FORMAT(1X,15F8.3)                                                  1315
   50 CONTINUE                                                           1316
   60 RETURN                                                             1317
      END                                                                1318
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
3	NORMZ	1	41

VARIABLES	SN	TYPE		RELOCATION								
0	AAA	REAL		F.P.	REFS	10	24	26	DEFINED	1	11	
165	BBB	REAL			REFS	11	DEFINED	10				
14200	C	REAL	ARRAY	/ /	REFS	7	8	15	16	38		
					DEFINED	22	24	25	26	27	29	
166	I	INTEGER			REFS	13	15	16	22	24	25	26
					27	29	38	DEFINED	12	35		
6120	ICODE	INTEGER	ARRAY	/ /	REFS	6	8					
0	IOMAT	INTEGER		F.P.	REFS	32	DEFINED	1				
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	6	8					
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	7	8					
170	J	INTEGER			REFS	15	16	22	24	25	26	27
					29	38	DEFINED	14	38			
167	K	INTEGER			REFS	14	DEFINED	13				
0	LLL	INTEGER		F.P.	REFS	32	DEFINED	1				
1	MMAX	INTEGER		/ /	REFS	8	12	14	35	38		
2	NAM	INTEGER	ARRAY	/ /	REFS	6	8					
115	NAMA	INTEGER	ARRAY	/ /	REFS	6	8					
0	NS	INTEGER		/ /	REFS	8						
174	QRCL	REAL			REFS	2*20	21	24	25	26	27	
					DEFINED	19						
175	QX	REAL			REFS	21	22					
171	RCL1	REAL			REFS	17	19	DEFINED	15			
172	RCL2	REAL			REFS	17	DEFINED	16				
173	SRCL	REAL			REFS	18	19	25	27	DEFINED	17	
230	X	INTEGER	ARRAY	/ /	REFS	6	8	9				

FILE NAMES	MODE				
OUTPUT	FMT	WRITES	33	36	38

EXTERNALS	TYPE	ARGS	REFERENCES
FTOZ		2	21

STATEMENT LABELS			DEF LINE	REFERENCES		
35	10		24	20		
64	20		29	18		
70	30		30	14	23	28
0	40		31	12		
0	50		40	35		
126	60		41	32		
135	1000	FMT	34	33		
146	1001	FMT	37	36		
156	1002	FMT	39	38		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
12	40	I	12 31	63B	EXT REFS	NOT INNER
15	30	J	14 30	56B	EXT REFS	
104	50	I	35 40	22B	EXT REFS	NOT INNER
111		J	38 38	11B	EXT REFS	

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)

/ /	27297	0	NS	(1)	1	MMAX	(1)	2 NAM (75)
		77	NAMA	(75)	152	X	(3000)	3152 ICODE (260)
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272 C (21025)

STATISTICS

PROGRAM LENGTH	201B	129
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE OCCTAB                                                 1319
C                                                                       1320
C ... SUBROUTINE TO CONSTRUCT OCCURRENCE TABULATION INDICATING          1321
C     NO. OF TIMES EACH EVENT OCCURRED IN DATA SET                      1322
C                                                                       1323
      DIMENSION N1(25,3),N2(25,3),CC(25,120),MM(260),M(260)             1324
      DIMENSION ITITLE(260,10),RMAT(145,145),MCUM(260)                  1325
      COMMON NS,MMAX,N1,N2,CC,MM,M,ITITLE,RMAT                          1326
      INTEGER CC                                                        1327
      PRINT 1000                                                        1328
      PRINT 2000                                                        1329
      PRINT 3000                                                        1330
 1000 FORMAT(1H1,"TABULATION OF EVENT OCCURRENCES;")                    1331
 2000 FORMAT(" DICTIONARY CODE NUMBER VERSUS FREQUENCY OF OCCURRENCE")  1332
 3000 FORMAT(////)                                                      1333
      DO 10 I=1,52                                                      1334
      I1=I                                                              1335
      I2=52+I                                                           1336
      I3=104+I                                                          1337
      I4=156+I                                                          1338
      I5=208+I                                                          1339
      PRINT 4000,I1,M(I1),I2,M(I2),I3,M(I3),I4,M(I4),I5,M(I5)           1340
 4000 FORMAT(5(5H  *  ,2I5))                                            1341
   10 CONTINUE                                                          1342
      DO 20 I=1,260                                                     1343
      MM(I)=0                                                           1344
   20 CONTINUE                                                          1345
      DO 40 I=1,NS                                                      1346
      DO 30 J=1,260                                                     1347
      IF(M(J).EQ.I)  MM(I)=MM(I)+1                                      1348
   30 CONTINUE                                                          1349
   40 CONTINUE                                                          1350
      PRINT 1000                                                        1351
      PRINT 5000,(J,J=1,NS)                                             1352
      PRINT 6000,(MM(J),J=1,NS)                                         1353
 5000 FORMAT("  NO. OF WELLS  ",25(I4))                                 1354
 6000 FORMAT("  NO. OF EVENTS ",25(I4))                                 1355
      MCUM(NS) = MM(NS)                                                 1356
C- - -CUMULATE EVENT SEQUENCE                                           1357
      DO 50 J = 2,NS                                                    1358
      I = NS + 1 - J                                                    1359
      MCUM(I) = MCUM(I+1) + MM(I)                                       1360
   50 CONTINUE                                                          1361
      PRINT 7000,(MCUM(J),J=1,NS)                                       1362
 7000 FORMAT(" CUM. OF EVENTS ",25I4/////////)                          1363
      RETURN                                                            1364
      END                                                               1365
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
1 OCCTAB 1 46

VARIABLES	SN	TYPE		RELOCATION								
230	CC	INTEGER	ARRAY	/ /	REFS	6	8	9				
225	I	INTEGER			REFS	17	18	19	20	21	26	3*30
					3*42	DEFINED	16	25	28	41		
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	7	8					
226	I1	INTEGER			REFS	2*22	DEFINED	17				
227	I2	INTEGER			REFS	2*22	DEFINED	18				
230	I3	INTEGER			REFS	2*22	DEFINED	19				
231	I4	INTEGER			REFS	2*22	DEFINED	20				
232	I5	INTEGER			REFS	2*22	DEFINED	21				
233	J	INTEGER			REFS	30	34	35	41	44		
					DEFINED	29	34	35	40	44		
6524	M	INTEGER	ARRAY	/ /	REFS	6	8	5*22	30			
234	MCUM	INTEGER	ARRAY		REFS	7	42	44	DEFINED	38	42	
6120	MM	INTEGER	ARRAY	/ /	REFS	6	8	30	35	38	42	
					DEFINED	26	30					
1	MMAX	INTEGER		/ /	REFS	8						
0	NS	INTEGER		/ /	REFS	8	28	34	35	2*38	40	41
					44							
2	N1	INTEGER	ARRAY	/ /	REFS	6	8					
115	N2	INTEGER	ARRAY	/ /	REFS	6	8					
14200	RMAT	REAL	ARRAY	/ /	REFS	7	8					

FILE NAMES	MODE									
OUTPUT	FMT	WRITES	10	11	12	22	33	34	35	44

STATEMENT LABELS			DEF LINE	REFERENCES	
0	10		24	16	
0	20		27	25	
0	30		31	29	
0	40		32	28	
0	50		43	40	
130	1000	FMT	13	10	33
136	2000	FMT	14	11	
145	3000	FMT	15	12	
164	4000	FMT	23	22	
204	5000	FMT	36	34	
210	6000	FMT	37	35	
220	7000	FMT	45	44	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
11	10	I	16 24	24B	EXT REFS
37	20	I	25 27	2B	INSTACK
43	40	I	28 32	13B	NOT INNER
47	30	J	29 31	4B	INSTACK
63		J	34 34	4B	EXT REFS
104	50	J	40 43	4B	INSTACK

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
/ /	27297	0 NS	(1)	1 MMAX	(1)	2 N1	(75)
		77 N2	(75)	152 CC	(3000)	3152 MM	(260)

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)
3412 M (260) 3672 ITITLE (2600) 6272 RMAT (21025)

STATISTICS

PROGRAM LENGTH	640B	416
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE ORDER(QDAR,IPAIR,XLEV,LLL,LOUT)                        1366
C                                                                       1367
C ... SUBROUTINE ORDER IS A SUPPORT ROUTINE FOR DISTANCE CALCULATIONS   1368
C     TO REORDER OPTIMAL SEQUENCE ON BASIS OF CUMULATIVE INTER-EVENT    1369
C     "DISTANCES".                                                      1370
C                                                                       1371
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)   1372
      DIMENSION ITITLE(260,10),C(145,145),QDAR(150),IPAIR(2,150)        1373
      DIMENSION XLEV(150)                                               1374
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                   1375
      INTEGER X,COUNT                                                   1376
      NMAX=MMAX-1                                                       1377
C                                                                       1378
C ... SORT CUMULATIVE "DISTANCES" IN ASCENDING ORDER                    1379
C                                                                       1380
      QDAR(1)=0.0                                                       1381
   10 CONTINUE                                                          1382
      COUNT=0                                                           1383
      DO 20 I=1,NMAX                                                    1384
      SORT1=QDAR(I)                                                     1385
      SORT2=QDAR(I+1)                                                   1386
      IF(SORT1.LE.SORT2) GO TO 20                                       1387
      QDAR(I)=SORT2                                                     1388
      QDAR(I+1)=SORT1                                                   1389
      ITEMP=IRCODE(I)                                                   1390
      IRCODE(I)=IRCODE(I+1)                                             1391
      IRCODE(I+1)=ITEMP                                                 1392
      COUNT=COUNT+1                                                     1393
   20 CONTINUE                                                          1394
      IF(COUNT.GE.1) GO TO 10                                           1395
      DO 30 I=1,NMAX                                                    1396
      IPAIR(1,I)=IRCODE(I)                                              1397
      IPAIR(2,I)=IRCODE(I+1)                                            1398
      XLEV(I)=QDAR(I+1)-QDAR(I)                                         1399
   30 CONTINUE                                                          1400
      XLEV(MMAX)=0.0                                                    1401
      IF(LLL.EQ.0) GO TO 50                                             1402
      PRINT 1000                                                        1403
      IF(LOUT.EQ.1) PRINT 1010                                          1404
 1010 FORMAT(5X,"NOTE: AFTER SORTING, IN ORDER TO RECALCULATE STANDARD D 1405
     1EVIATIONS, DISTANCE VALUES MUST BE RECALCULATED"//)               1406
      PRINT 1001                                                        1407
      PRINT 1002                                                        1408
      PRINT 1003                                                        1409
 1000 FORMAT(///"  EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE 1410
     1 TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES")                  1411
 1001 FORMAT(" NEW        DISTANCE       FOSSIL     INTER")             1412
 1002 FORMAT(" SEQUENCE   FROM 1ST       PAIRS      FOSSIL")            1413
 1003 FORMAT("            POSITION                  DISTANCE")          1414
      DO 40 I=1,NMAX                                                    1415
      PRINT 1004,IRCODE(I),QDAR(I),IPAIR(1,I),IPAIR(2,I),XLEV(I)        1416
 1004 FORMAT(2X,I3,5X,F9.4,7X,I3,1H-,I3,2X,F8.4)                        1417
   40 CONTINUE                                                          1418
      PRINT 1005,IRCODE(MMAX),QDAR(MMAX)                                1419
 1005 FORMAT(2X,I3,7X,F9.4)                                             1420
   50 RETURN                                                            1421
      END                                                               1422
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
3	ORDER	1	56

VARIABLES	SN	TYPE	RELOCATION									
14200	C	REAL	ARRAY	/ /	REFS	8	10					
234	COUNT	INTEGER			REFS	11	28	30	DEFINED	18	28	
236	I	INTEGER			REFS	20	21	23	24	25	2*26	27
					2*32	2*33	3*34	5*51	DEFINED	19	31	50
6120	ICODE	INTEGER	ARRAY	/ /	REFS	7	10					
0	IPAIR	INTEGER	ARRAY	F.P.	REFS	8	2*51	DEFINED	1	32	33	
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	7	10	25	26	32	33	51
					54	DEFINED	26	27				
241	ITEMP	INTEGER			REFS	27	DEFINED	25				
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	8	10					
0	LLL	INTEGER		F.P.	REFS	37	DEFINED	1				
0	LOUT	INTEGER		F.P.	REFS	39	DEFINED	1				
1	MMAX	INTEGER		/ /	REFS	10	12	36	2*54			
2	NAM	INTEGER	ARRAY	/ /	REFS	7	10					
115	NAMA	INTEGER	ARRAY	/ /	REFS	7	10					
235	NMAX	INTEGER			REFS	19	31	50	DEFINED	12		
0	NS	INTEGER		/ /	REFS	10						
0	QDAR	REAL	ARRAY	F.P.	REFS	8	20	21	2*34	51	54	
					DEFINED	1	16	23	24			
237	SORT1	REAL			REFS	22	24	DEFINED	20			
240	SORT2	REAL			REFS	22	23	DEFINED	21			
230	X	INTEGER	ARRAY	/ /	REFS	7	10	11				
0	XLEV	REAL	ARRAY	F.P.	REFS	9	51	DEFINED	1	34	36	

FILE NAMES	MODE								
OUTPUT	FMT	WRITES	38	39	42	43	44	51	54

STATEMENT LABELS			DEF LINE	REFERENCES	
11	10		17	30	
26	20		29	19	22
0	30		35	31	
0	40		53	50	
112	50		56	37	
147	1000	FMT	45	38	
164	1001	FMT	47	42	
172	1002	FMT	48	43	
200	1003	FMT	49	44	
217	1004	FMT	52	51	
231	1005	FMT	55	54	
121	1010	FMT	40	39	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
17	20	I	19 29	10B	OPT
40	30	I	31 35	5B	INSTACK
66	40	I	50 53	16B	EXT REFS

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
/ /	27297	0 NS	(1)	1 MMAX	(1)	2 NAM	(75)
		77 NAMA	(75)	152 X	(3000)	3152 ICODE	(260)
		3412 IRCODE	(260)	3672 ITITLE	(2600)	6272 C	(21025)

STATISTICS

PROGRAM LENGTH	247B	167
CM BLANK COMMON LENGTH	65241B	27297

520008 CM USED

```
      SUBROUTINE PRESRT(IOMAT)                                          1423
C                                                                       1424
C ... SUBROUTINE FOR PRELIMINARY SEQUENCING OF DATA                     1425
C     TO OBTAIN AN OPTIMIZED STARTING SEQUENCE                          1426
C                                                                       1427
      DIMENSION NAM(25,3),NAMA(25,3),CC(25,120),MM(260),IGAD(260)       1428
      DIMENSION ITITLE(260,10),RMAT(145,145),SCORE(260,2)               1429
      DIMENSION MP(260,3)                                               1430
      COMMON NS,MMAX,NAM,NAMA,CC,MM,IGAD,ITITLE,RMAT                    1431
      INTEGER AID,CC                                                    1432
C                                                                       1433
C ... CREATE AN ORDER RELATION MATRIX                                   1434
C                                                                       1435
      PRINT 1000                                                        1436
 1000 FORMAT(1H1," PRESORT OPTION INITIATED")                           1437
      IF(IOMAT.EQ.1) PRINT 1010                                         1438
 1010 FORMAT(///" CUMULATIVE ORDER MATRIX"///)                          1439
      DO 20 I=1,MMAX                                                    1440
      DO 10 J=1,MMAX                                                    1441
      RMAT(I,J)=0.0                                                     1442
   10 CONTINUE                                                          1443
   20 CONTINUE                                                          1444
      DO 60 L=1,NS                                                      1445
      DO 50 J=1,MMAX                                                    1446
      ITEST=0                                                           1447
      K=J                                                               1448
      ID=CC(L,K)                                                        1449
      IF(ID.EQ.0) GO TO 60                                              1450
      I=IABS(ID)                                                        1451
   30 K=K+1                                                             1452
      IAA=CC(L,K)                                                       1453
      IF(IAA.EQ.0) GO TO 50                                             1454
      IKK=IABS(IAA)                                                     1455
      IF(IAA.LT.0.AND.ITEST.LE.0) GO TO 40                              1456
      ITEST=ITEST+1                                                     1457
      RMAT(I,IKK)=RMAT(I,IKK)+1.0                                       1458
      GO TO 30                                                          1459
   40 RMAT(I,IKK)=RMAT(I,IKK)+0.5                                       1460
      RMAT(IKK,I)=RMAT(IKK,I)+0.5                                       1461
      GO TO 30                                                          1462
   50 CONTINUE                                                          1463
   60 CONTINUE                                                          1464
      DO 70 I=1,MMAX                                                    1465
      SCORE(I,2)=0.0                                                    1466
      IF(IOMAT.EQ.1) PRINT 1020,(RMAT(I,J),J=1,MMAX)                    1467
 1020 FORMAT(20F5.1)                                                    1468
   70 CONTINUE                                                          1469
C                                                                       1470
C ... CALCULATE FOSSIL SCORES                                           1471
C                                                                       1472
      DO 90 I=1,MMAX                                                    1473
      RCOUNT=0.0                                                        1474
      DO 80 J=1,MMAX                                                    1475
      IF(I.EQ.J) GO TO 80                                               1476
      REL1=RMAT(I,J)                                                    1477
      REL2=RMAT(J,I)                                                    1478
      IF(REL1.EQ.0.0.AND.REL2.EQ.0.0) GO TO 80                          1479
```

```
                  RCOUNT=RCOUNT+1.0                                          1480
                  FREQ=REL1/(REL1+REL2)                                      1481
   60             IF(FREQ.LT.0.5) FREQ=0.0                                   1482
                  IF(FREQ.GT.0.5) FREQ=1.0                                   1483
                  SCORE(I,2)=SCORE(I,2)+FREQ                                 1484
                80 CONTINUE                                                  1485
                  SCORE(I,2)=SCORE(I,2)*(MMAX-1)/RCOUNT                      1486
   65            90 CONTINUE                                                 1487
                  IF(IOMAT.EQ.1) PRINT 1030                                  1488
              1030 FORMAT(///" CODE FOLLOWED BY SCORE")                      1489
                  Z=1.0                                                      1490
                  DO 100 I=1,MMAX                                            1491
   70             SCORE(I,1)=Z                                               1492
                  Z=Z+1                                                      1493
                  IF(IOMAT.EQ.1) PRINT 1040,SCORE(I,1),SCORE(I,2)            1494
              1040 FORMAT(2F10.1)                                            1495
               100 CONTINUE                                                  1496
   75          C                                                             1497
               C                                                             1498
               C  *** SORT SCORES    IN DESCENDING ORDER ***                 1499
               C                                                             1500
               C                                                             1501
   80             MM1=MMAX-1                                                 1502
                  DO 120 I=1,MM1                                             1503
                  MM2=I+1                                                    1504
                  DO 110 J=MM2,MMAX                                          1505
                  IF(SCORE(I,2).GE.SCORE(J,2)) GO TO 110                     1506
   85             TEMP2=SCORE(I,2)                                           1507
                  SCORE(I,2)=SCORE(J,2)                                      1508
                  SCORE(J,2)=TEMP2                                           1509
                  TEMP1=SCORE(I,1)                                           1510
                  SCORE(I,1)=SCORE(J,1)                                      1511
   90             SCORE(J,1)=TEMP1                                           1512
               110 CONTINUE                                                  1513
               120 CONTINUE                                                  1514
                  IF(IOMAT.EQ.1) PRINT 1050                                  1515
              1050 FORMAT(///" SCORES IN DESCENDING ORDER")                  1516
   95             DO 130 I=1,MMAX                                            1517
                  IF(IOMAT.EQ.1) PRINT 1040,SCORE(I,1),SCORE(I,2)            1518
               130 CONTINUE                                                  1519
               C                                                             1520
               C                                                             1521
  100          C                                                             1522
                  IF(IOMAT.EQ.1) PRINT 1060                                  1523
              1060 FORMAT(///" NEW CROSS REFERENCE TABLE")                   1524
                  DO 140 I=1,MMAX                                            1525
                  MP(I,1)=I                                                  1526
  105             MP(I,2)=MM(I)                                              1527
                  MP(I,3)=INT(SCORE(I,1))                                    1528
                  IF(IOMAT.EQ.1) PRINT 1070,MP(I,1),MP(I,3)                  1529
              1070 FORMAT(2I6)                                               1530
               140 CONTINUE                                                  1531
  110          C                                                             1532
               C                                                             1533
               C*****CONSTRUCT NEW CODE REFERENCE TABLE*****                 1534
                  DO 150 I=1,MMAX                                            1535
                  ID=MP(I,3)                                                 1536
```

```
                      MM(I)=MP(ID,2)                                          1537
                  150 CONTINUE                                                1538
                C                                                             1539
                C                                                             1540
                C  *** SORT NEW ORDER ***                                     1541
                C                                                             1542
                      DO 180 I=1,MM1                                          1543
                      MM2=I+1                                                 1544
                      DO 170 J=MM2,MMAX                                       1545
                      IF(MP(J,3).GT.MP(I,3)) GO TO 170                        1546
                      DO 160 K=1,3                                            1547
                      ITEMP=MP(I,K)                                           1548
                      MP(I,K)=MP(J,K)                                         1549
                      MP(J,K)=ITEMP                                           1550
                  160 CONTINUE                                                1551
                  170 CONTINUE                                                1552
                  180 CONTINUE                                                1553
                C                                                             1554
                C  *** RECODE DATA IN PRELIMINARY SEQUENCE ***                1555
                C                                                             1556
                      DO 200 I=1,NS                                           1557
                      DO 190 J=1,120                                          1558
                      ID=CC(I,J)                                              1559
                      IF(ID.EQ.0) GO TO 200                                   1560
                      AID=IABS(ID)                                            1561
                      IDD=MP(AID,1)                                           1562
                      IF(ID.LT.0) IDD=IDD*(-1)                                1563
                      CC(I,J)=IDD                                             1564
                  190 CONTINUE                                                1565
                  200 CONTINUE                                                1566
                      PRINT 3000                                              1567
                 3000 FORMAT(////"   RECODED AND PRESORTED DATA SET")         1568
                      CALL ECHO                                               1569
                      RETURN                                                  1570
                      END                                                     1571
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 PRESRT 1 148

VARIABLES	SN	TYPE	RELOCATION									
475	AID	INTEGER		REFS	10	140	DEFINED	139				
230	CC	INTEGER	ARRAY / /	REFS	6	9	10	27	31	137		
				DEFINED	142							
511	FREQ	REAL		REFS	60	61	62	DEFINED	59	60	61	
476	I	INTEGER		REFS	20	2*36	2*38	2*39	44	45	54	
					55	56	2*62	2*64	70	2*72	82	84
					85	86	88	89	2*96	2*104	2*105	2*106
					2*107	114	115	122	124	126	127	137
					142	DEFINED	18	29	43	51	69	81
					95	103	113	121	135			
504	IAA	INTEGER		REFS	32	33	34	DEFINED	31			
503	ID	INTEGER		REFS	28	29	115	138	139	141		
				DEFINED	27	114	137					
520	IDD	INTEGER		REFS	141	142	DEFINED	140	141			
6524	IGAD	INTEGER	ARRAY / /	REFS	6	9						
505	IKK	INTEGER		REFS	2*36	2*38	2*39	DEFINED	33			
0	IOMAT	INTEGER	F.P.	REFS	16	45	66	72	93	96	101	
					107	DEFINED	1					
517	ITEMP	INTEGER		REFS	128	DEFINED	126					
501	ITEST	INTEGER		REFS	34	35	DEFINED	25	35			
7130	ITITLE	INTEGER	ARRAY / /	REFS	7	9						
477	J	INTEGER		REFS	20	26	45	54	55	56	84	
					86	87	89	90	124	127	128	137
					142	DEFINED	19	24	45	53	83	123
					136							
502	K	INTEGER		REFS	27	30	31	126	2*127	128		
				DEFINED	26	30	125					
500	L	INTEGER		REFS	27	31	DEFINED	23				
6120	MM	INTEGER	ARRAY / /	REFS	6	9	105	DEFINED	115			
1	MMAX	INTEGER	/ /	REFS	9	18	19	24	43	45	51	
					53	64	69	80	83	95	103	113
					123							
513	MM1	INTEGER		REFS	81	121	DEFINED	80				
514	MM2	INTEGER		REFS	83	123	DEFINED	82	122			
1531	MP	INTEGER	ARRAY	REFS	8	2*107	114	115	2*124	126	127	
					140	DEFINED	104	105	106	127	128	
2	NAM	INTEGER	ARRAY / /	REFS	6	9						
115	NAMA	INTEGER	ARRAY / /	REFS	6	9						
0	NS	INTEGER	/ /	REFS	9	23	135					
506	RCOUNT	REAL		REFS	58	64	DEFINED	52	58			
507	REL1	REAL		REFS	57	2*59	DEFINED	55				
510	REL2	REAL		REFS	57	59	DEFINED	56				
14200	RMAT	REAL	ARRAY / /	REFS	7	9	36	38	39	45	55	
					56	DEFINED	20	36	38	39		
521	SCORE	REAL	ARRAY	REFS	7	62	64	2*72	2*84	85	86	
					88	89	2*96	106	DEFINED	44	62	64
					70	86	87	89	90			
516	TEMP1	REAL		REFS	90	DEFINED	88					
515	TEMP2	REAL		REFS	87	DEFINED	85					
512	Z	REAL		REFS	70	71	DEFINED	68	71			

FILE NAMES	MODE								
OUTPUT	FMT	WRITES	14	16	45	66	72	93	96	101
			107	145						

EXTERNALS	TYPE	ARGS	REFERENCES
ECHO		0	147

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
IABS	INTEGER	1	INTRIN	29	33	139	
INT	INTEGER	1	INTRIN	106			

	STATEMENT LABELS		DEF LINE	REFERENCES		
0	10		21	19		
0	20		22	18		
41	30		30	37	40	
56	40		38	34		
65	50		41	24	32	
70	60		42	23	28	
0	70		47	43		
153	80		63	53	54	57
0	90		65	51		
0	100		74	69		
225	110		91	83	84	
0	120		92	81		
0	130		97	95		
0	140		109	103		
0	150		116	113		
0	160		129	125		
325	170		130	123	124	
0	180		131	121		
0	190		143	136		
351	200		144	135	138	
362	1000	FMT	15	14		
372	1010	FMT	17	16		
405	1020	FMT	46	45		
412	1030	FMT	67	66		
424	1040	FMT	73	72	96	
431	1050	FMT	94	93		
446	1060	FMT	102	101		
460	1070	FMT	108	107		
465	3000	FMT	146	145		

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
15	20	I	18 22	13B	NOT INNER
22	10	J	19 21	2B	INSTACK
31	60	L	23 42	42B	NOT INNER
32	50	J	24 41	36B	EXITS
74	70	I	43 47	23B	EXT REFS NOT INNER
102		J	45 45	11B	EXT REFS
120	90	I	51 65	43B	NOT INNER
131	80	J	53 63	24B	OPT
172	100	I	69 74	15B	EXT REFS
211	120	I	81 92	21B	NOT INNER
220	110	J	83 91	6B	INSTACK
236	130	I	95 97	13B	EXT REFS
255	140	I	103 109	16B	EXT REFS
275	150	I	113 116	4B	INSTACK

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
303	180	I	121 131	27B	NOT INNER
306	170	J	123 130	22B	NOT INNER
320	160	K	125 129	4B	INSTACK
333	200	I	135 144	21B	NOT INNER
334	190	J	136 143	15B	OPT EXITS

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)					
/ /	27297	0 NS	(1)	1 MMAX	(1)	2 NAM	(75)
		77 NAMA	(75)	152 CC	(3000)	3152 MM	(260)
		3412 IGAD	(260)	3672 ITITLE	(2600)	6272 RMAT	(21025)

STATISTICS

PROGRAM LENGTH	3152B	1642
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE REORD(IRET,AAA)                                        1572
C                                                                       1573
C ... SUBROUTINE TO REORDER CUMULATIVE ORDER MATRIX DURING              1574
C     FINAL REORDERING OPTION                                           1575
C                                                                       1576
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)   1577
      DIMENSION ITITLE(260,10),C(145,145)                               1578
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                   1579
      INTEGER X                                                         1580
C                                                                       1581
C ... RECOMPUTE FREQUENCIES FROM Z VALUES                               1582
C                                                                       1583
      MMX5=MMAX+5                                                       1584
      DO 50 I=1,MMAX                                                    1585
      K=I+1                                                             1586
      DO 40 J=K,MMAX                                                    1587
      ZED=C(I,J)                                                        1588
      IF(ZED.GE.3.0) GO TO 10                                           1589
      IF(ZED.EQ.AAA) GO TO 20                                           1590
      IF(ZED.EQ.-AAA) GO TO 30                                          1591
      CALL ZTOF(ZED,FREQ)                                               1592
      C(I,J)=C(J,I)*FREQ/(1.0-FREQ)                                     1593
      GO TO 40                                                          1594
   10 CONTINUE                                                          1595
      C(I,J)=0.0                                                        1596
      C(J,I)=0.0                                                        1597
      GO TO 40                                                          1598
   20 CONTINUE                                                          1599
      C(I,J)=C(J,I)/0.05                                                1600
      C(J,I)=0.0                                                        1601
      GO TO 40                                                          1602
   30 CONTINUE                                                          1603
      C(J,I)=C(J,I)/0.95                                                1604
      C(I,J)=0.0                                                        1605
   40 CONTINUE                                                          1606
   50 CONTINUE                                                          1607
C                                                                       1608
C ... REORDER FINAL RELATION MATRIX                                     1609
C                                                                       1610
      DO 120 I=1,MMAX                                                   1611
      IFOS=IRCODE(I)                                                    1612
      DO 60 L=1,MMAX                                                    1613
      IF(ICODE(L).EQ.IFOS) GO TO 70                                     1614
   60 CONTINUE                                                          1615
   70 INEW=L                                                            1616
      DO 80 K=1,MMAX                                                    1617
      IAB=INT(C(K,MMX5))                                                1618
      IF(IAB.EQ.INEW) GO TO 90                                          1619
   80 CONTINUE                                                          1620
   90 II2=K                                                             1621
      IF(I.EQ.II2) GO TO 120                                            1622
      DO 100 L=1,MMAX                                                   1623
      TEMP=C(I,L)                                                       1624
      C(I,L)=C(II2,L)                                                   1625
      C(II2,L)=TEMP                                                     1626
  100 CONTINUE                                                          1627
      TEMP=C(I,MMX5)                                                    1628
```

```
                      C(I,MMX5)=C(II2,MMX5)                                  1629
                      C(II2,MMX5)=TEMP                                       1630
60                    DO 110 L=1,MMAX                                        1631
                      TEMP=C(L,I)                                            1632
                      C(L,I)=C(L,II2)                                        1633
                      C(L,II2)=TEMP                                          1634
                  110 CONTINUE                                               1635
65                120 CONTINUE                                               1636
                      RETURN                                                 1637
                      END                                                    1638
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES							
3	REORD	1	66							
VARIABLES	**SN**	**TYPE**	**RELOCATION**							
0	AAA	REAL	F.P.	REFS	19	20	DEFINED	1		
14200	C	REAL	ARRAY / /	REFS	7	8	17	22	29	33	47
				53	54	57	58	61	62		
				DEFINED	22	25	26	29	30	33	34
				54	55	58	59	62	63		
160	FREQ	REAL		REFS	21	2*22					
154	I	INTEGER		REFS	15	17	2*22	25	26	2*29	30
				2*33	34	41	51	53	54	57	58
				61	62	DEFINED	14	40			
164	IAB	INTEGER		REFS	48	DEFINED	47				
6120	ICODE	INTEGER	ARRAY / /	REFS	6	8	43				
161	IFOS	INTEGER		REFS	43	DEFINED	41				
165	II2	INTEGER		REFS	51	54	55	58	59	62	63
				DEFINED	50						
163	INEW	INTEGER		REFS	48	DEFINED	45				
6524	IRCODE	INTEGER	ARRAY / /	REFS	6	8	41				
0	IRET	INTEGER	*UNUSED F.P.	DEFINED	1						
7130	ITITLE	INTEGER	ARRAY / /	REFS	7	8					
156	J	INTEGER		REFS	17	2*22	25	26	2*29	30	2*33
				34	DEFINED	16					
155	K	INTEGER		REFS	16	47	50	DEFINED	15	46	
162	L	INTEGER		REFS	43	45	53	2*54	55	61	2*62
				63	DEFINED	42	52	60			
1	MMAX	INTEGER	/ /	REFS	8	13	14	16	40	42	46
				52	60						
153	MMX5	INTEGER		REFS	47	57	2*58	59	DEFINED	13	
2	NAM	INTEGER	ARRAY / /	REFS	6	8					
115	NAMA	INTEGER	ARRAY / /	REFS	6	8					
0	NS	INTEGER	/ /	REFS	8						
166	TEMP	REAL		REFS	55	59	63	DEFINED	53	57	61
230	X	INTEGER	ARRAY / /	REFS	6	8	9				
157	ZED	REAL		REFS	18	19	20	21	DEFINED	17	

EXTERNALS	TYPE	ARGS	REFERENCES
ZTOF		2	21

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES
INT	INTEGER	1	INTRIN		47

STATEMENT LABELS		DEF LINE	REFERENCES				
33	10	24	18				
40	20	28	19				
46	30	32	20				
53	40	35	16	23	27	31	
0	50	36	14				
0	60	44	42				
71	70	45	43				
0	80	49	46				
103	90	50	48				
0	100	56	52				

STATEMENT LABELS

		DEF LINE	REFERENCES	
0	110	64	60	
141	120	65	40	51

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
11	50	I	14 36	47B		EXT REFS NOT INNER
14	40	J	16 35	42B		EXT REFS
61	120	I	40 65	63B		NOT INNER
64	60	L	42 44	5B	INSTACK	EXITS
74	80	K	46 49	7B	INSTACK	EXITS
114	100	L	52 56	4B	INSTACK	
135	110	L	60 64	3B	INSTACK	

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)

/ /	27297	0	NS	(1)	1	MMAX	(1)	2 NAM (75)
		77	NAMA	(75)	152	X	(3000)	3152 ICODE (260)
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272 C (21025)

STATISTICS

PROGRAM LENGTH	1718	121
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE SCORE                                                  1639
C                                                                       1640
C ... SUBROUTINE TO CALCULATE STEP MODEL SCORES FOR                     1641
C     INDIVIDUAL WELLS                                                  1642
C                                                                       1643
      DIMENSION NAM(25,3),NAMA(25,3),IX(25,120),ICODE(260),IRCODE(260)  1644
      DIMENSION ITITLE(260,10),C(145,145),RSCORE(120,25)                1645
      COMMON NS,MMAX,NAM,NAMA,IX,ICODE,IRCODE,ITITLE,C                  1646
      DO 20 I=1,MMAX                                                    1647
      DO 10 J=1,NS                                                      1648
      RSCORE(I,J)=0.0                                                   1649
   10 CONTINUE                                                          1650
   20 CONTINUE                                                          1651
C                                                                       1652
C                                                                       1653
      DO 150 I=1,NS                                                     1654
      DO 140 J=1,MMAX                                                   1655
      ID=IX(I,J)                                                        1656
      IF(ID.EQ.0) GO TO 150                                             1657
      IAD=IABS(ID)                                                      1658
      IELMT=ICODE(IAD)                                                  1659
C                                                                       1660
C                                                                       1661
      DO 30 K=1,MMAX                                                    1662
      IF(IRCODE(K).EQ.IELMT) GO TO 40                                   1663
   30 CONTINUE                                                          1664
   40 IOP=K                                                             1665
C                                                                       1666
C                                                                       1667
      K=J                                                               1668
      IF(ID.LT.0) ITEST=1                                               1669
   50 CONTINUE                                                          1670
      K=K-1                                                             1671
      IF(K.LT.1) GO TO 90                                               1672
      ID2=IX(I,K)                                                       1673
      IF(ITEST.EQ.1) GO TO 80                                           1674
      IAD2=IABS(ID2)                                                    1675
      IELMT2=ICODE(IAD2)                                                1676
      DO 60 L=1,MMAX                                                    1677
      IF(IRCODE(L).EQ.IELMT2) GO TO 70                                  1678
   60 CONTINUE                                                          1679
   70 IOP2=L                                                            1680
      IF(IOP2.LT.IOP) GO TO 50                                          1681
      RSCORE(IOP,I)=RSCORE(IOP,I)+1.0                                   1682
      GO TO 50                                                          1683
   80 RSCORE(IOP,I)=RSCORE(IOP,I)+0.5                                   1684
      IF(ID2.GT.0) ITEST=0                                              1685
      GO TO 50                                                          1686
C                                                                       1687
C                                                                       1688
   90 K=J                                                               1689
      ITEST=1                                                           1690
  100 CONTINUE                                                          1691
      K=K+1                                                             1692
      ID2=IX(I,K)                                                       1693
      IF(ID2.EQ.0) GO TO 140                                            1694
      IAD2=IABS(ID2)                                                    1695
```

```
                IELMT2=ICODE(IAD2)                                                1696
                IF(ITEST.NE.1) GO TO 110                                          1697
   60           IF(ID2.LT.0) RSCORE(IOP,I)=RSCORE(IOP,I)+0.5                      1698
                IF(ID2.GT.0) ITEST=0                                              1699
                IF(ID2.LT.0) GO TO 100                                            1700
            110 CONTINUE                                                          1701
                DO 120 L=1,MMAX                                                   1702
   65           IF(IRCODE(L).EQ.IELMT2) GO TO 130                                 1703
            120 CONTINUE                                                          1704
            130 IOP2=L                                                            1705
                IF(IOP2.GT.IOP) GO TO 100                                         1706
                RSCORE(IOP,I)=RSCORE(IOP,I)+1.0                                   1707
   70           GO TO 100                                                         1708
            140 CONTINUE                                                          1709
            150 CONTINUE                                                          1710
              C                                                                   1711
              C                                                                   1712
   75           PRINT 1000                                                        1713
                PRINT 1010                                                        1714
                PRINT 1020                                                        1715
                PRINT 1030,(I,I=1,NS)                                             1716
                PRINT 1040                                                        1717
   80       1000 FORMAT(1H1)                                                      1718
            1010 FORMAT("  STEP MODEL "///)                                       1719
            1020 FORMAT(10X,10H     NAME ,21X,3HNO.,5X,10H WELL NO. )             1720
            1030 FORMAT(49X,17I5)                                                 1721
            1040 FORMAT(//)                                                       1722
   85           DO 160 I=1,MMAX                                                   1723
                ID=IRCODE(I)                                                      1724
                PRINT 1050, (ITITLE(ID,J),J=1,10),ID,(RSCORE(I,K),K=1,NS)         1725
            1050 FORMAT(1X,10A4,I3,5X,17F5.1/49X,17F5.1)                          1726
             160 CONTINUE                                                         1727
   90           RETURN                                                            1728
                END                                                               1729
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
1 SCORE 1 90

VARIABLES	SN	TYPE		RELOCATION								
14200	C	REAL	ARRAY	/ /	REFS	7	8					
311	I	INTEGER			REFS	11	18	35	2*44	2*46	55	2*60
					2*69	78	86	87	DEFINED	9	16	78
					85							
314	IAD	INTEGER			REFS	21	DEFINED	20				
322	IAD2	INTEGER			REFS	38	58	DEFINED	37	57		
6120	ICODE	INTEGER	ARRAY	/ /	REFS	6	8	21	38	58		
313	ID	INTEGER			REFS	19	20	31	2*87	DEFINED	18	86
321	ID2	INTEGER			REFS	37	47	56	57	60	61	62
					DEFINED	35	55					
315	IELMT	INTEGER			REFS	25	DEFINED	21				
323	IELMT2	INTEGER			REFS	40	65	DEFINED	38	58		
317	IOP	INTEGER			REFS	43	2*44	2*46	2*60	68	2*69	
					DEFINED	27						
325	IOP2	INTEGER			REFS	43	68	DEFINED	42	67		
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	6	8	25	40	65	86	
320	ITEST	INTEGER			REFS	36	59	DEFINED	31	47	52	61
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	7	8	87				
230	IX	INTEGER	ARRAY	/ /	REFS	6	8	18	35	55		
312	J	INTEGER			REFS	11	18	30	51	87		
					DEFINED	10	17	87				
316	K	INTEGER			REFS	25	27	33	34	35	54	55
					87	DEFINED	24	30	33	51	54	87
324	L	INTEGER			REFS	40	42	65	67	DEFINED	39	64
1	MMAX	INTEGER		/ /	REFS	8	9	17	24	39	64	85
2	NAM	INTEGER	ARRAY	/ /	REFS	6	8					
115	NAMA	INTEGER	ARRAY	/ /	REFS	6	8					
0	NS	INTEGER		/ /	REFS	8	10	16	78	87		
326	RSCORE	REAL	ARRAY		REFS	7	44	46	60	69	87	
					DEFINED	11	44	46	60	69		

FILE NAMES	MODE								
OUTPUT	FMT	WRITES	75	76	77	78	79	87	

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
IABS	INTEGER	1	INTRIN		20	37	57

STATEMENT LABELS		DEF LINE	REFERENCES		
0	10	12	10		
0	20	13	9		
0	30	26	24		
35	40	27	25		
42	50	32	43	45	48
0	60	41	39		
61	70	42	40		
71	80	46	36		
101	90	51	34		
104	100	53	62	68	70
126	110	63	59		
0	120	66	64		

STATEMENT LABELS			DEF LINE	REFERENCES	
134	130		67	65	
144	140		71	17	56
147	150		72	16	19
0	160		89	85	
251	1000	FMT	80	75	
253	1010	FMT	81	76	
257	1020	FMT	82	77	
265	1030	FMT	83	78	
267	1040	FMT	84	79	
303	1050	FMT	88	87	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES		
3	20	I	9 13	13B		NOT INNER	
10	10	J	10 12	2B	INSTACK		
17	150	I	16 72	133B		NOT INNER	
20	140	J	17 71	127B		EXITS	NOT INNER
30	30	K	24 26	5B	INSTACK	EXITS	
54	60	L	39 41	5B	INSTACK	EXITS	
127	120	L	64 66	5B	INSTACK	EXITS	
162		I	78 78	4B		EXT REFS	
172	160	I	85 89	35B		EXT REFS	NOT INNER
177		J	87 87	11B		EXT REFS	
212		K	87 87	11B		EXT REFS	

COMMON BLOCKS	LENGTH	MEMBERS - BIAS NAME(LENGTH)		
/ /	27297	0 NS (1)	1 MMAX (1)	2 NAM (75)
		77 NAMA (75)	152 IX (3000)	3152 ICODE (260)
		3412 IRCODE (260)	3672 ITITLE (2600)	6272 C (21025)

STATISTICS

PROGRAM LENGTH	6216B	3214
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE TAB1                                                   1730
C                                                                       1731
C ... SUBROUTINE TAB1 CONSTRUCTS AN OCCURRENCE TABLE SHOWING THE        1732
C     OCCURRENCE OF OPTIMUM SEQUENCE EVENTS IN EACH WELL                1733
C                                                                       1734
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)   1735
      DIMENSION ITITLE(260,10),C(145,145),ITAB(260,25)                  1736
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                   1737
      INTEGER X,BLK                                                     1738
      BLK=3H                                                            1739
      IEX=3H  X                                                         1740
      DO 20 I=1,MMAX                                                    1741
      DO 10 J=1,NS                                                      1742
      ITAB(I,J)=BLK                                                     1743
   10 CONTINUE                                                          1744
   20 CONTINUE                                                          1745
      DO 50 I=1,NS                                                      1746
      DO 40 J=1,120                                                     1747
      IOC=X(I,J)                                                        1748
      IF(IOC.EQ.0) GO TO 50                                             1749
      IAD=IABS(IOC)                                                     1750
      ID=ICODE(IAD)                                                     1751
      DO 30 K=1,MMAX                                                    1752
      IF(ID.NE.IRCODE(K)) GO TO 30                                      1753
      ITAB(K,I)=IEX                                                     1754
      GO TO 40                                                          1755
   30 CONTINUE                                                          1756
   40 CONTINUE                                                          1757
   50 CONTINUE                                                          1758
      PRINT 1000                                                        1759
      PRINT 6000                                                        1760
      PRINT 2000                                                        1761
      PRINT 3000,(I,I=1,NS)                                             1762
      PRINT 4000                                                        1763
 1000 FORMAT(1H1)                                                       1764
 2000 FORMAT(10X,10H     NAME ,27X,3HNO.,5X,10H WELL NO. )              1765
 3000 FORMAT(55X,25I3)                                                  1766
 4000 FORMAT(///)                                                       1767
      DO 60 I=1,MMAX                                                    1768
      ID=IRCODE(I)                                                      1769
      PRINT 5000,(ITITLE(ID,J),J=1,10),ID,(ITAB(I,K),K=1,NS)            1770
 5000 FORMAT(2X,10A4,5X,I3,5X,25A3)                                     1771
 6000 FORMAT("   OCCURRENCE TABLE"//)                                   1772
   60 CONTINUE                                                          1773
      RETURN                                                            1774
      END                                                               1775
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
1	TAB1	1	45

VARIABLES	SN	TYPE		RELOCATION								
210	BLK	INTEGER			REFS	9	14	DEFINED	10			
14200	C	REAL	ARRAY	/ /	REFS	7	8					
212	I	INTEGER			REFS	14	19	25	33	40	41	
					DEFINED	12	17	33	39			
215	IAD	INTEGER			REFS	22	DEFINED	21				
6120	ICODE	INTEGER	ARRAY	/ /	REFS	6	8	22				
216	ID	INTEGER			REFS	24	2*41	DEFINED	22	40		
211	IEX	INTEGER			REFS	25	DEFINED	11				
214	IOC	INTEGER			REFS	20	21	DEFINED	19			
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	6	8	24	40			
220	ITAB	INTEGER	ARRAY		REFS	7	41	DEFINED	14	25		
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	7	8	41				
213	J	INTEGER			REFS	14	19	41	DEFINED	13	18	41
217	K	INTEGER			REFS	24	25	41	DEFINED	23	41	
1	MMAX	INTEGER		/ /	REFS	8	12	23	39			
2	NAM	INTEGER	ARRAY	/ /	REFS	6	8					
115	NAMA	INTEGER	ARRAY	/ /	REFS	6	8					
0	NS	INTEGER		/ /	REFS	8	13	17	33	41		
230	X	INTEGER	ARRAY	/ /	REFS	6	8	9	19			

FILE NAMES	MODE								
OUTPUT	FMT	WRITES	30	31	32	33	34	41	

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES
IABS	INTEGER	1	INTRIN		21

STATEMENT LABELS			DEF LINE	REFERENCES	
0	10		15	13	
0	20		16	12	
41	30		27	23	24
44	40		28	18	26
47	50		29	17	20
0	60		44	39	
151	1000	FMT	35	30	
153	2000	FMT	36	32	
161	3000	FMT	37	33	
163	4000	FMT	38	34	
177	5000	FMT	42	41	
202	6000	FMT	43	31	

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES		
6	20	I	12 16	13B		NOT INNER	
13	10	J	13 15	3B	INSTACK		
22	50	I	17 29	30B		NOT INNER	
23	40	J	18 28	24B		EXITS	NOT INNER
33	30	K	23 27	11B	OPT	EXITS	
62		I	33 33	4B		EXT REFS	
72	60	I	39 44	35B		EXT REFS	NOT INNER
77		J	41 41	11B		EXT REFS	
112		K	41 41	11B		EXT REFS	

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)

/ /	27297	0	NS	(1)	1	MMAX	(1)	2 NAM (75)
		77	NAMA	(75)	152	X	(3000)	3152 ICODE (260)
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272 C (21025)

STATISTICS

PROGRAM LENGTH	14764B	6644
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE WDIST(JIRCOD,QDAR,MPAIR,AAA,LLL)                          1776
C                                                                          1777
C ... SUBROUTINE TO CALCULATE INTER-EVENT "DISTANCES" FOR                  1778
C     WEIGHTED DIFFERENCES                                                 1779
C                                                                          1780
      DIMENSION NAM(25,3),NAMA(25,3),X(25,120),ICODE(260),IRCODE(260)      1781
      DIMENSION ITITLE(260,10),C(145,145),JIRCOD(260),QDAR(150)            1782
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40),MPAIR(150)             1783
      COMMON NS,MMAX,NAM,NAMA,X,ICODE,IRCODE,ITITLE,C                      1784
      COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                       1785
      INTEGER X                                                            1786
      CSUM=0.0                                                             1787
      NMAX=MMAX-1                                                          1788
      IF(LLL.EQ.0) GO TO 10                                                1789
      PRINT 1000                                                           1790
      PRINT 1010                                                           1791
      PRINT 1020                                                           1792
      PRINT 1030                                                           1793
 1000 FORMAT(1H1)                                                          1794
 1010 FORMAT(53H DISTANCE ANALYSIS REPEATED WITH WEIGHTED DIFFERENCES//)   1795
 1020 FORMAT(  " POSITION    FOSSIL      FOSSIL      CUMULATIVE    SUM DIFF 1796
     1 WEIGHT      S.D.")                                                  1797
 1030 FORMAT(55H              PAIRS      DISTANCE      DISTANCE     Z VALUES) 1798
   10 CONTINUE                                                            1799
      PI=3.141592654                                                       1800
      DO 20 I=1,MMAX                                                       1801
      IRCODE(I)=JIRCOD(I)                                                  1802
   20 CONTINUE                                                            1803
      DO 190 I=1,NMAX                                                      1804
      RCONT=0.0                                                            1805
      RCONT2=0.0                                                           1806
      SDIFF=0.0                                                            1807
      SDIF2=0.0                                                            1808
      ISTP=0                                                               1809
      K=I-1                                                                1810
   30 CONTINUE                                                            1811
      IF(K.EQ.0) GO TO 70                                                  1812
      RCOL1=C(K,I)                                                         1813
      RCOL2=C(K,I+1)                                                       1814
      MARK1=IRCODE(K)                                                      1815
      MARK2=IRCODE(I)                                                      1816
      MARK3=IRCODE(I+1)                                                    1817
      MARKER=0                                                             1818
      MARKA=0                                                              1819
      IF(IUNIQ(MARK1,2).EQ.1) MARKER=1                                     1820
      IF(IUNIQ(MARK2,2).EQ.1.OR.IUNIQ(MARK3,2).EQ.1) MARKA=1               1821
      IF(MARKER.EQ.1.AND.MARKA.EQ.1) GO TO 60                              1822
      IF(RCOL1.LT.-3.0.OR.RCOL1.GT.3.0) GO TO 60                           1823
      IF(RCOL2.LT.-3.0.OR.RCOL2.GT.3.0) GO TO 60                           1824
      QRCOL1=RCOL1                                                         1825
      CALL ZTOF(QRCOL1,P)                                                  1826
      RFAC=1.0                                                             1827
      IF(MARKER.EQ.1.OR.IUNIQ(MARK2,2).EQ.1) RFAC=0.5                      1828
      W1=((C(I,K)/(1.0-P))*EXP(-RCOL1**2)/RFAC)/(2.0*PI*P*(1.0-P))         1829
      RCOL1=RCOL1*SQRT(RFAC)                                               1830
      QRCOL2=RCOL2                                                         1831
      CALL ZTOF(QRCOL2,P)                                                  1832
```

```
                      RFAC=1.0                                                          1833
                      IF(IUNIQ(MARK3,2).EQ.1.OR.MARKER.EQ.1) RFAC=0.5                   1834
   60                 W2=((C(I+1,K)/(1.0-P))*EXP(-RCOL2**2)/RFAC)/(2.0*PI*P*(1.0-P))    1835
                      RCOL2=RCOL2*SQRT(RFAC)                                            1836
                      WW=(W1*W2)/(W1+W2)                                                1837
                      RCONT=RCONT+WW                                                    1838
                      RDIFF=(RCOL2-RCOL1)*WW                                            1839
   65                 RDIF2=(RCOL2-RCOL1)**2*WW                                         1840
                      IF(RCOL1.EQ.AAA.AND.RDIFF.EQ.0.0) GO TO 40                        1841
                      GO TO 50                                                          1842
                   40 ISTP=ISTP+1                                                       1843
                      RCONT2=RCONT2+(W1*W2)/(W1+W2)                                     1844
   70              50 IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) ISTP=0                           1845
                      IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) RCONT2=0.0                       1846
                      IF(ISTP.EQ.5) RCONT=RCONT-RCONT2                                  1847
                      IF(ISTP.EQ.5) GO TO 70                                            1848
                      SDIFF=SDIFF+RDIFF                                                 1849
   75                 SDIF2=SDIF2+RDIF2                                                 1850
                   60 CONTINUE                                                          1851
                      K=K-1                                                             1852
                      GO TO 30                                                          1853
                   70 CONTINUE                                                          1854
   80                 IF(ISTP.GT.0.AND.ISTP.LT.5) RCONT=RCONT-RCONT2                    1855
                      CAA=C(I,I+1)                                                      1856
                      IF(IUNIQ(MARK2,2).EQ.1.AND.IUNIQ(MARK3,2).EQ.1) PRINT 1040        1857
                 1040 FORMAT(//" WARNING  ***ADJOINING MARKER HORIZONS***"//)           1858
                      IF(CAA.GE.-AAA.AND.CAA.LE.AAA) GO TO 80                           1859
   85                 GO TO 90                                                          1860
                   80 QCAA=CAA                                                          1861
                      CALL ZTOF(QCAA,P)                                                 1862
                      W1=(C(I+1,I)*EXP(-CAA**2))/(2.0*PI*P*(1.0-P)**2)                  1863
                      RFAC=1.0                                                          1864
   90                 IF(IUNIQ(MARK3,2).EQ.1) RFAC=0.5                                  1865
                      RCONT=RCONT+W1/RFAC                                               1866
                      SDIFF=SDIFF+W1*CAA*SQRT(RFAC)                                     1867
                      SDIF2=SDIF2+W1*(CAA*RFAC)**2                                      1868
                   90 ISTP=0                                                            1869
   95                 RCONT2=0.0                                                        1870
                      K=I+2                                                             1871
                  100 IF(K.GT.MMAX) GO TO 140                                           1872
                      RCOL1=C(I,K)                                                      1873
                      RCOL2=C(I+1,K)                                                    1874
  100                 MARK1=IRCODE(K)                                                   1875
                      MARKER=0                                                          1876
                      IF(IUNIQ(MARK1,2).EQ.1) MARKER=1                                  1877
                      IF(MARKER.EQ.1.AND.MARKA.EQ.1) GO TO 130                          1878
                      IF(RCOL1.LT.-3.0.OR.RCOL1.GT.3.0) GO TO 130                       1879
  105                 IF(RCOL2.LT.-3.0.OR.RCOL2.GT.3.0) GO TO 130                       1880
                      QRCOL1=RCOL1                                                      1881
                      CALL ZTOF(QRCOL1,P)                                               1882
                      RFAC=1.0                                                          1883
                      IF(MARKER.EQ.1.OR.IUNIQ(MARK2,2).EQ.1) RFAC=0.5                   1884
  110                 W1=((C(K,I)/(1.0-P))*EXP(-RCOL1**2)/RFAC)/(2.0*PI*P*(1.0-P))      1885
                      RCOL1=RCOL1*SQRT(RFAC)                                            1886
                      QRCOL2=RCOL2                                                      1887
                      CALL ZTOF(QRCOL2,P)                                               1888
                      RFAC=1.0                                                          1889
```

```
                IF(IUNIQ(MARK3,2).EQ.1.OR.MARKER.EQ.1) RFAC=0.5                    1890
115             W2=((C(K,I+1)/(1.0-P))*EXP(-RCOL2**2)/RFAC)/(2.0*PI*P*(1.0-P))     1891
                RCOL2=RCOL2*SQRT(RFAC)                                             1892
                WW=(W1*W2)/(W1+W2)                                                 1893
                RCONT=RCONT+WW                                                     1894
120             RDIFF=(RCOL1-RCOL2)*WW                                             1895
                RDIF2=(RCOL1-RCOL2)**2*WW                                          1896
                IF(RCOL1.EQ.AAA.AND.RDIFF.EQ.0.0) GO TO 110                        1897
                GO TO 120                                                          1898
            110 ISTP=ISTP+1                                                        1899
125             RCONT2=RCONT2+(W1*W2)/(W1+W2)                                      1900
            120 IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) ISTP=0                            1901
                IF(RCOL1.NE.AAA.OR.RCOL2.NE.AAA) RCONT2=0.0                        1902
                IF(ISTP.EQ.5) RCONT=RCONT-RCONT2                                   1903
                IF(ISTP.EQ.5) GO TO 140                                            1904
130             SDIFF=SDIFF+RDIFF                                                  1905
                SDIF2=SDIF2+RDIF2                                                  1906
            130 CONTINUE                                                           1907
                K=K+1                                                              1908
                GO TO 100                                                          1909
135         140 CONTINUE                                                           1910
                IF(ISTP.GT.0.AND.ISTP.LT.5) RCONT=RCONT-RCONT2                     1911
                IF(RCONT.EQ.0.0) GO TO 150                                         1912
                QDIFF=SDIFF/RCONT                                                  1913
                GO TO 160                                                          1914
140         150 QDIFF=0.0                                                          1915
            160 CSUM=CSUM+QDIFF                                                    1916
                QDAR(I+1)=CSUM                                                     1917
                VARX=0.0                                                           1918
                IF(MPAIR(I).EQ.1) GO TO 170                                        1919
145             RDENO=(MPAIR(I)-1.0)*RCONT                                         1920
                IF(RDENO.EQ.0.0) GO TO 180                                         1921
                VARX=(SDIF2-QDIFF**2*RCONT)/RDENO                                  1922
            170 CONTINUE                                                           1923
                STDDEV=-111.1111                                                   1924
150             IF(VARX.GE.0.0) STDDEV=VARX**0.5                                   1925
            180 IF(RDENO.EQ.0.0.OR.MPAIR(I).EQ.1) STDDEV=999.9999                  1926
                IF(LLL.EQ.0) GO TO 190                                             1927
                PRINT 2000,I,IRCODE(I),IRCODE(I+1),QDIFF,QDAR(I+1),SDIFF,          1928
               XRCONT,STDDEV                                                       1929
155         2000 FORMAT(5X,I4,2X,I3,1H-,I3,3X,F8.4,5X,F8.4,F14.4,F7.1,F10.4)       1930
            190 CONTINUE                                                           1931
                RETURN                                                             1932
                END                                                                1933
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 WDIST 1 157

VARIABLES	SN	TYPE		RELOCATION								
0	AAA	REAL		F.P.	REFS	66	2*70	2*71	2*84	122	2*126	2*127
					DEFINED	1						
14200	C	REAL	ARRAY	/ /	REFS	7	9	38	39	54	60	81
						88	98	99	110	116		
666	CAA	REAL			REFS	2*84	86	88	92	93		
					DEFINED	81						
634	CSUM	REAL			REFS	141	142	DEFINED	12	141		
637	I	INTEGER			REFS	2*27	35	38	39	41	42	54
						60	2*81	2*88	96	98	99	110	116
						142	144	145	151	4*153	DEFINED	26	29
6120	ICODE	INTEGER	ARRAY	/ /	REFS	6	9					
6524	IRCODE	INTEGER	ARRAY	/ /	REFS	6	9	40	41	42	100	2*153
					DEFINED	27						
644	ISTP	INTEGER			REFS	68	72	73	2*80	124	128	129
						2*136	DEFINED	34	68	70	94	124	126
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	7	9					
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	8	10	45	2*46	53	59	2*82
						90	102	109	115			
0	JIRCOD	INTEGER	ARRAY	F.P.	REFS	7	27	DEFINED	1			
645	K	INTEGER			REFS	37	38	39	40	54	60	77
						97	98	99	100	110	116	133	
					DEFINED	35	77	96	133			
0	LLL	INTEGER		F.P.	REFS	14	152	DEFINED	1			
654	MARKA	INTEGER			REFS	47	103	DEFINED	44	46		
653	MARKER	INTEGER			REFS	47	53	59	103	109	115	
					DEFINED	43	45	101	102			
650	MARK1	INTEGER			REFS	45	102	DEFINED	40	100		
651	MARK2	INTEGER			REFS	46	53	82	109	DEFINED	41	
652	MARK3	INTEGER			REFS	46	59	82	90	115		
					DEFINED	42						
1	MMAX	INTEGER		/ /	REFS	9	13	26	97			
0	MPAIR	INTEGER	ARRAY	F.P.	REFS	8	144	145	151	DEFINED	1	
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	8	10					
2	NAM	INTEGER	ARRAY	/ /	REFS	6	9					
115	NAMA	INTEGER	ARRAY	/ /	REFS	6	9					
635	NMAX	INTEGER			REFS	29	DEFINED	13				
0	NS	INTEGER		/ /	REFS	9						
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	8	10					
656	P	REAL			REFS	51	3*54	57	3*60	87	2*88	107
						3*110	113	3*116				
636	PI	REAL			REFS	54	60	88	110	116		
					DEFINED	25						
667	QCAA	REAL			REFS	87	DEFINED	86				
0	QDAR	REAL	ARRAY	F.P.	REFS	7	153	DEFINED	1	142		
670	QDIFF	REAL			REFS	141	147	153	DEFINED	138	140	
655	QRCOL1	REAL			REFS	51	107	DEFINED	50	106		
661	QRCOL2	REAL			REFS	57	113	DEFINED	56	112		
646	RCOL1	REAL			REFS	2*48	50	54	55	64	65	66
						70	71	2*104	106	110	111	120	121
						122	126	127	DEFINED	38	55	98	111

VARIABLES	SN	TYPE	RELOCATION							
647	RCOL2	REAL		REFS	2*49	56	60	61	64	65	70
					71	2*105	112	116	117	120	121	126
					127	DEFINED	39	61	99	117		
640	RCONT	REAL		REFS	63	72	80	91	119	128	136	
					137	138	145	147	153	DEFINED	30	63
					72	80	91	119	128	136		
641	RCONT2	REAL		REFS	69	72	80	125	128	136		
				DEFINED	31	69	71	95	125	127		
672	RDEND	REAL		REFS	146	147	151	DEFINED	145			
664	RDIFF	REAL		REFS	66	74	122	130	DEFINED	64	120	
665	RDIF2	REAL		REFS	75	131	DEFINED	65	121			
657	RFAC	REAL		REFS	54	55	60	61	91	92	93	
					110	111	116	117	DEFINED	52	53	58
					59	89	90	108	109	114	115	
642	SDIFF	REAL		REFS	74	92	130	138	153			
				DEFINED	32	74	92	130				
643	SDIF2	REAL		REFS	75	93	131	147	DEFINED	33	75	
					93	131						
673	STDDEV	REAL		REFS	153	DEFINED	149	150	151			
671	VARX	REAL		REFS	2*150	DEFINED	143	147				
663	WW	REAL		REFS	63	64	65	119	120	121		
				DEFINED	62	118						
660	W1	REAL		REFS	2*62	2*69	91	92	93	2*118	2*125	
				DEFINED	54	88	110					
662	W2	REAL		REFS	2*62	2*69	2*118	2*125	DEFINED	60	116	
230	X	INTEGER	ARRAY / /	REFS	6	9	11					

FILE NAMES	MODE							
OUTPUT	FMT	WRITES	15	16	17	18	82	153

EXTERNALS	TYPE	ARGS	REFERENCES				
EXP	REAL	1 LIBRARY	54	60	88	110	116
SQRT	REAL	1 LIBRARY	55	61	92	111	117
ZTOF		2	51	57	87	107	113

STATEMENT LABELS			DEF LINE	REFERENCES			
22	10		24	14			
0	20		28	26			
40	30		36	78			
161	40		68	66			
166	50		70	67			
212	60		76	47	48	49	
214	70		79	37	73		
236	80		86	84			
266	90		94	85			
271	100		97	134			
403	110		124	122			
410	120		126	123			
434	130		132	103	104	105	
436	140		135	97	129		
446	150		140	137			
447	160		141	139			
462	170		148	144			
467	180		151	146			
507	190		156	29	152		
537	1000	FMT	19	15			
541	1010	FMT	20	16			

STATEMENT LABELS

			DEF LINE	REFERENCES
550	1020	FMT	21	17
561	1030	FMT	23	18
573	1040	FMT	83	82
615	2000	FMT	155	153

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES
27	20	I	26 28	2B	INSTACK
33	190	I	29 156	457B	EXT REFS

COMMON BLOCKS	LENGTH	MEMBERS - BIAS	NAME	(LENGTH)						
/ /	27297	0	NS	(1)	1	MMAX	(1)	2	NAM	(75)
		77	NAMA	(75)	152	X	(3000)	3152	ICODE	(260)
		3412	IRCODE	(260)	3672	ITITLE	(2600)	6272	C	(21025)
BETA	1545	0	IUNIQ	(520)	520	NUNIQ	(25)	545	MUNIQ	(1000)

STATISTICS

PROGRAM LENGTH	711B	457
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE XUNIQ1(I,X1)                                                1934
C                                                                            1935
C ... SUBROUTINE XUNIQ1 IS USED WITH SUBROUTINE HPFILT TO                    1936
C     CONSTRUCT A MATRIX OF POSITION REFERENCES FOR ALL                      1937
C     SELECTED UNIQUE EVENTS.  THIS MATRIX IS USED BY                        1938
C     SUBROUTINE XUNIQ2 TO PLACE UNIQUE EVENTS IN FINAL                      1939
C     SEQUENCE                                                               1940
C                                                                            1941
      DIMENSION NAM(25,3),NAMA(25,3),X2(25,120),MM(260),M(260)               1942
      DIMENSION ITITLE(260,10),RMAT(145,145),X1(25,120)                      1943
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40)                          1944
      COMMON NS,MMAX,NAM,NAMA,X2,MM,M,ITITLE,RMAT                            1945
      COMMON/BETA/IUNIQ,NUNIQ,MUNIQ                                          1946
      INTEGER X1,X2                                                          1947
      DO 10 J=1,260                                                          1948
      ITITLE(J,1)=0                                                          1949
      ITITLE(J,2)=0                                                          1950
   10 CONTINUE                                                               1951
      KK=0                                                                   1952
      DO 30 J=1,120                                                          1953
      ID=X1(I,J)                                                             1954
      IF(ID.EQ.0) GO TO 40                                                   1955
      IF(ID.LT.0) GO TO 20                                                   1956
      KK=KK+1                                                                1957
   20 ITITLE(IABS(ID),1)=KK                                                  1958
   30 CONTINUE                                                               1959
   40 MAXTET=KK                                                              1960
      KK=0                                                                   1961
      DO 60 J=1,120                                                          1962
      ID=X2(I,J)                                                             1963
      IF(ID.EQ.0) GO TO 70                                                   1964
      IF(ID.LT.0) GO TO 50                                                   1965
      KK=KK+1                                                                1966
   50 ITITLE(IABS(ID),2)=KK                                                  1967
   60 CONTINUE                                                               1968
   70 CONTINUE                                                               1969
      KKK=1                                                                  1970
      DO 120 J=1,120                                                         1971
      ID=X1(I,J)                                                             1972
      IF(ID.EQ.0) GO TO 900                                                  1973
      IDA=IABS(ID)                                                           1974
      IF(IUNIQ(IDA,1).NE.1) GO TO 120                                        1975
      LEV1=ITITLE(IDA,1)                                                     1976
      MFLAG=0                                                                1977
C                                                                            1978
      DO 80 JJ=1,260                                                         1979
      IF(ITITLE(JJ,1).NE.LEV1) GO TO 80                                      1980
      IF(ITITLE(JJ,2).EQ.0) GO TO 80                                         1981
      MFLAG=1                                                                1982
      MUNIQ(I,KKK)=IDA                                                       1983
      KKK=KKK+1                                                              1984
      MUNIQ(I,KKK)=-JJ                                                       1985
      KKK=KKK+1                                                              1986
      GO TO 120                                                              1987
   80 CONTINUE                                                               1988
      ISTEP=LEV1                                                             1989
      ISTEM=LEV1                                                             1990
```

```
     90 ISTEP=ISTEP+1                                                    1991
        ISTEM=ISTEM-1                                                    1992
60      DO 110 JJ=1,260                                                 1993
        IDSTP=ITITLE(JJ,1)                                              1994
        IF(ISTEM.LE.0.OR.IDSTP.NE.ISTEM) GO TO 100                      1995
        IF(ITITLE(JJ,2).EQ.0) GO TO 100                                 1996
        MUNIQ(I,KKK)=-IDA                                               1997
65      KKK=KKK+1                                                       1998
        MUNIQ(I,KKK)=JJ                                                 1999
        KKK=KKK+1                                                       2000
        GO TO 120                                                       2001
    100 IF(ISTEP.GT.MAXTET.OR.ISTEP.NE.IDSTP) GO TO 110                 2002
70      IF(ITITLE(JJ,2).EQ.0) GO TO 110                                 2003
        MUNIQ(I,KKK)=IDA                                                2004
        KKK=KKK+1                                                       2005
        MUNIQ(I,KKK)=JJ                                                 2006
        KKK=KKK+1                                                       2007
75      GO TO 120                                                       2008
    110 CONTINUE                                                        2009
        IF(ISTEP.LE.MAXTET.OR.ISTEM.GT.0) GO TO 90                      2010
    120 CONTINUE                                                        2011
    900 RETURN                                                          2012
80      END                                                             2013
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES							
3	XUNIQ1	1	79							

VARIABLES	SN	TYPE		RELOCATION								
0	I	INTEGER		F.P.	REFS	21	30	39	50	52	64	66
					71	73	DEFINED	1				
156	ID	INTEGER			REFS	22	23	25	31	32	34	40
					41	DEFINED	21	30	39			
161	IDA	INTEGER			REFS	42	43	50	64	71		
					DEFINED	41						
167	IDSTP	INTEGER			REFS	62	69	DEFINED	61			
166	ISTEM	INTEGER			REFS	59	2*62	77	DEFINED	57	59	
165	ISTEP	INTEGER			REFS	58	2*69	77	DEFINED	56	58	
7130	ITITLE	INTEGER	ARRAY	/ /	REFS	10	12	43	47	48	61	63
					70	DEFINED	16	17	25	34		
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	11	13	42				
154	J	INTEGER			REFS	16	17	21	30	39		
					DEFINED	15	20	29	38			
164	JJ	INTEGER			REFS	47	48	52	61	63	66	70
					73	DEFINED	46	60				
155	KK	INTEGER			REFS	24	25	27	33	34		
					DEFINED	19	24	28	33			
160	KKK	INTEGER			REFS	50	51	52	53	64	65	66
					67	71	72	73	74	DEFINED	37	51
					53	65	67	72	74			
162	LEV1	INTEGER			REFS	47	56	57	DEFINED	43		
6524	M	INTEGER	ARRAY	/ /	REFS	9	12					
157	MAXTET	INTEGER			REFS	69	77	DEFINED	27			
163	MFLAG	INTEGER			DEFINED	44	49					
6120	MM	INTEGER	ARRAY	/ /	REFS	9	12					
1	MMAX	INTEGER		/ /	REFS	12						
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	11	13	DEFINED	50	52	64	66
					71	73						
2	NAM	INTEGER	ARRAY	/ /	REFS	9	12					
115	NAMA	INTEGER	ARRAY	/ /	REFS	9	12					
0	NS	INTEGER		/ /	REFS	12						
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	11	13					
14200	RMAT	REAL	ARRAY	/ /	REFS	10	12					
0	X1	INTEGER	ARRAY	F.P.	REFS	10	14	21	39	DEFINED	1	
230	X2	INTEGER	ARRAY	/ /	REFS	9	12	14	30			

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES		
IABS	INTEGER	1	INTRIN		25	34	41

STATEMENT LABELS		DEF LINE	REFERENCES		
0	10	18	15		
26	20	25	23		
0	30	26	20		
33	40	27	22		
45	50	34	32		
0	60	35	29		
52	70	36	31		
101	80	55	46	47	48
106	90	58	77		

STATEMENT LABELS

		DEF LINE	REFERENCES					
126	100	69	62	63				
142	110	76	60	69	70			
150	120	78	38	42	54	68	75	
153	900	79	40					

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES		
11	10	J	15 18	3B	INSTACK		
17	30	J	20 26	14B	OPT	EXITS	
36	60	J	29 35	14B	OPT	EXITS	
54	120	J	38 78	77B		EXITS	NOT INNER
66	80	JJ	46 55	16B	OPT	EXITS	
112	110	JJ	60 76	33B	OPT	EXITS	

COMMON BLOCKS

	LENGTH	MEMBERS - BIAS NAME(LENGTH)								
/ /	27297	0	NS	(1)	1	MMAX	(1)	2	NAM	(75)
		77	NAMA	(75)	152	X2	(3000)	3152	MM	(260)
		3412	M	(260)	3672	ITITLE	(2600)	6272	RMAT	(21025)
BETA	1545	0	IUNIQ	(520)	520	NUNIQ	(25)	545	MUNIQ	(1000)

STATISTICS

PROGRAM LENGTH	201B	129
CM LABELED COMMON LENGTH	3011B	1545
CM BLANK COMMON LENGTH	65241B	27297

52000B CM USED

```
      SUBROUTINE XUNIQ2(II,ICNT,IVEC,RMAT,RUNIQ)                        2014
C                                                                       2015
C ... SUBROUTINE TO PLACE UNIQUE EVENTS IN FINAL SEQUENCE               2016
C                                                                       2017
C     POSITIONS OF UNIQUE EVENTS ARE DETERMINED FROM FIRST              2018
C     AND SECOND APPROXIMATIONS BASED ON POSITIONS OF                   2019
C     NEIGHBOURING EVENTS.                                              2020
C                                                                       2021
      DIMENSION RX(3,2),ILEV(260),RUNIQ(260,2)                          2022
      DIMENSION IUNIQ(260,2),NUNIQ(25),MUNIQ(25,40)                     2023
      DIMENSION RMAT(260,3),IVEC(260)                                   2024
      COMMON/BETA/ IUNIQ,NUNIQ,MUNIQ                                    2025
C                                                                       2026
C                                                                       2027
      DO 10 I=1,260                                                     2028
      ILEV(I)=0                                                         2029
   10 CONTINUE                                                          2030
      KK=0                                                              2031
      DO 30 I=1,ICNT                                                    2032
      IF(IVEC(I).LT.0) GO TO 20                                         2033
      KK=KK+1                                                           2034
   20 ILEV(I)=KK                                                        2035
   30 CONTINUE                                                          2036
      MAXTEP=KK                                                         2037
      ITEM=1                                                            2038
   40 IEVENT=MUNIQ(II,ITEM)                                             2039
      IREFF=MUNIQ(II,ITEM+1)                                            2040
      IF(IEVENT.EQ.0) GO TO 900                                         2041
      DO 50 I=1,260                                                     2042
      IF(IABS(IVEC(I)).EQ.IABS(IREFF)) GO TO 60                         2043
   50 CONTINUE                                                          2044
   60 LEVEL=ILEV(I)                                                     2045
      IF(IREFF.GE.0) GO TO 70                                           2046
      LEVO=LEVEL                                                        2047
      LEVM=LEVO-1                                                       2048
      LEVP=LEVO+1                                                       2049
      GO TO 90                                                          2050
   70 IF(IEVENT.GE.0) GO TO 80                                          2051
      LEVM=LEVEL                                                        2052
      LEVP=LEVEL+1                                                      2053
      LEVO=0                                                            2054
      GO TO 90                                                          2055
   80 LEVO=0                                                            2056
      LEVP=LEVEL                                                        2057
      LEVM=LEVEL-1                                                      2058
C                                                                       2059
C ... CALCULATE THE FIRST APPROXIMATION...X1                            2060
C                                                                       2061
   90 DO 100 I=1,3                                                      2062
      RX(I,1)=0.0                                                       2063
      RX(I,2)=0.0                                                       2064
  100 CONTINUE                                                          2065
      DO 130 I=1,ICNT                                                   2066
      LEVI=ILEV(I)                                                      2067
      IF(LEVM.LE.0) GO TO 110                                           2068
      IF(LEVM.NE.LEVI) GO TO 110                                        2069
      RX(1,1)=RX(1,1)+RMAT(I,1)                                         2070
```

```
                      RX(1,2)=RX(1,2)+1.0                                    2071
                      GO TO 130                                              2072
   60           110 IF(LEVO.EQ.0) GO TO 120                                  2073
                    IF(LEVO.NE.LEVI) GO TO 120                               2074
                    RX(2,1)=RX(2,1)+RMAT(I,1)                                2075
                    RX(2,2)=RX(2,2)+1.0                                      2076
                    GO TO 130                                                2077
   65           120 IF(LEVP.GT.MAXTEP) GO TO 130                             2078
                    IF(LEVP.NE.LEVI) GO TO 130                               2079
                    RX(3,1)=RX(3,1)+RMAT(I,1)                                2080
                    RX(3,2)=RX(3,2)+1.0                                      2081
                130 CONTINUE                                                 2082
   70               RRR=0.0                                                 2083
                    ARX1=0.0                                                 2084
                    ARX2=0.0                                                 2085
                    ARX3=0.0                                                 2086
                    IF(RX(1,2).EQ.0.0) GO TO 140                             2087
   75               ARX1=RX(1,1)/RX(1,2)                                    2088
                    RRR=RRR+1.0                                              2089
                140 IF(RX(2,2).EQ.0.0) GO TO 150                             2090
                    ARX2=RX(2,1)/RX(2,2)                                     2091
                    RRR=RRR+1.0                                              2092
   80           150 IF(RX(3,2).EQ.0.0) GO TO 160                             2093
                    ARX3=RX(3,1)/RX(3,2)                                     2094
                    RRR=RRR+1.0                                              2095
                160 X1=(ARX1+ARX2+ARX3)/RRR                                  2096
                C                                                            2097
   85           C ... CALCULATE THE SECOND APPROXIMATION...X2                2098
                C                                                            2099
                    RANGE1=X1-1.386                                          2100
                    RANGE2=X1+1.386                                          2101
                    RSUM=0.0                                                 2102
   90               RRR=0.0                                                 2103
                    DO 190 I=1,ICNT                                          2104
                    DIST1=RMAT(I,1)                                          2105
                    IF(DIST1.LT.RANGE1.OR.DIST1.GT.RANGE2) GO TO 190         2106
                    IF(LEVO.EQ.0.OR.LEVEL.NE.ILEV(I)) GO TO 170              2107
   95               RSUM=RSUM+DIST1                                         2108
                    RRR=RRR+1                                                2109
                    GO TO 190                                                2110
                170 IF(ILEV(I).LE.LEVM.AND.LEVM.GT.0) GO TO 180              2111
                    IF(ILEV(I).LT.LEVP.OR.LEVP.GT.MAXTEP) GO TO 190          2112
  100               RSUM=RSUM+(DIST1+RANGE1)/2.0                            2113
                    RRR=RRR+1                                                2114
                    GO TO 190                                                2115
                180 RSUM=RSUM+(DIST1+RANGE2)/2.0                             2116
                    RRR=RRR+1                                                2117
  105           190 CONTINUE                                                 2118
                    X2=RSUM/RRR                                              2119
                    ID=IABS(IEVENT)                                          2120
                    RUNIQ(ID,1)=RUNIQ(ID,1)+X2                               2121
                    RUNIQ(ID,2)=RUNIQ(ID,2)+1.0                              2122
  110               ITEM=ITEM+2                                             2123
                    GO TO 40                                                 2124
                900 RETURN                                                   2125
                    END                                                      2126
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS DEF LINE REFERENCES
3 XUNIQ2 1 112

VARIABLES	SN	TYPE		RELOCATION								
271	ARX1	REAL			REFS	83	DEFINED	71	75			
272	ARX2	REAL			REFS	83	DEFINED	72	78			
273	ARX3	REAL			REFS	83	DEFINED	73	81			
300	DIST1	REAL			REFS	2*93	95	100	103	DEFINED	92	
255	I	INTEGER			REFS	16	20	22	30	32	50	51
					54	57	62	67	92	94	98	99
					DEFINED	15	19	29	49	53	91	
0	ICNT	INTEGER		F.P.	REFS	19	53	91	DEFINED	1		
302	ID	INTEGER			REFS	2*108	2*109	DEFINED	107			
261	IEVENT	INTEGER			REFS	28	38	107	DEFINED	26		
0	II	INTEGER		F.P.	REFS	26	27	DEFINED	1			
311	ILEV	INTEGER	ARRAY		REFS	9	32	54	94	98	99	
					DEFINED	16	22					
262	IREFF	INTEGER			REFS	30	33	DEFINED	27			
260	ITEM	INTEGER			REFS	26	27	110	DEFINED	25	110	
0	IUNIQ	INTEGER	ARRAY	BETA	REFS	10	12					
0	IVEC	INTEGER	ARRAY	F.P.	REFS	11	20	30	DEFINED	1		
256	KK	INTEGER			REFS	21	22	24	DEFINED	18	21	
263	LEVEL	INTEGER			REFS	34	39	40	44	45	94	
					DEFINED	32						
267	LEVI	INTEGER			REFS	56	61	66	DEFINED	54		
265	LEVM	INTEGER			REFS	55	56	2*98	DEFINED	35	39	45
266	LEVP	INTEGER			REFS	65	66	2*99	DEFINED	36	40	44
264	LEVO	INTEGER			REFS	35	36	60	61	94		
					DEFINED	34	41	43				
257	MAXTEP	INTEGER			REFS	65	99	DEFINED	24			
1041	MUNIQ	INTEGER	ARRAY	BETA	REFS	10	12	26	27			
1010	NUNIQ	INTEGER	ARRAY	BETA	REFS	10	12					
275	RANGE1	REAL			REFS	93	100	DEFINED	87			
276	RANGE2	REAL			REFS	93	103	DEFINED	88			
0	RMAT	REAL	ARRAY	F.P.	REFS	11	57	62	67	92		
					DEFINED	1						
270	RRR	REAL			REFS	76	79	82	83	96	101	104
					106	DEFINED	70	76	79	82	90	96
					101	104						
277	RSUM	REAL			REFS	95	100	103	106	DEFINED	89	95
					100	103						
0	RUNIQ	REAL	ARRAY	F.P.	REFS	9	108	109	DEFINED	1	108	109
303	RX	REAL	ARRAY		REFS	9	57	58	62	63	67	68
					74	2*75	77	2*78	80	2*81		
					DEFINED	50	51	57	58	62	63	67
					68							
274	X1	REAL			REFS	87	88	DEFINED	83			
301	X2	REAL			REFS	108	DEFINED	106				

INLINE FUNCTIONS	TYPE	ARGS		DEF LINE	REFERENCES	
IABS	INTEGER	1	INTRIN		2*30	107

STATEMENT LABELS		DEF LINE	REFERENCES				
0	10	17	15				
24	20	22	20				
0	30	23	19				
32	40	26	111				
0	50	31	29				
47	60	32	30				
56	70	38	33				
64	80	43	38				
70	90	49	37	42			
0	100	52	49				
116	110	60	55	56			
125	120	65	60	61			
133	130	69	53	59	64	65	66
143	140	77	74				
147	150	80	77				
153	160	83	80				
207	170	98	94				
223	180	103	98				
231	190	105	91	93	97	99	102
245	900	112	28				

LOOPS	LABEL	INDEX	FROM-TO	LENGTH	PROPERTIES	
11	10	I	15 17	28	INSTACK	
21	30	I	19 23	68	INSTACK	
41	50	I	29 31	68	INSTACK	EXITS
73	100	I	49 52	38	INSTACK	
106	130	I	53 69	268	OPT	
174	190	I	91 105	368	OPT	

COMMON BLOCKS LENGTH MEMBERS - BIAS NAME(LENGTH)
BETA 1545 0 IUNIQ (520) 520 NUNIQ (25) 545 MUNIQ (1000)

STATISTICS

PROGRAM LENGTH	717B	463
CM LABELED COMMON LENGTH	3011B	1545

52000B CM USED

```
      SUBROUTINE ZTOF(Z,PZ)                                              2127
C     COMPUTE FREQUENCY FROM Z                                           2128
C     M.ABRAMOWITZ AND I.A.STEGUN,1964,EQ.26.2.17                        2129
      PI=3.1415927                                                       2130
      X=Z                                                                2131
      IF(Z.LT.0.0) X=-Z                                                  2132
      T=1.0/(1.0+0.2316419*X)                                            2133
      PID=2.0*PI                                                         2134
      XX=-X*X/2.0                                                        2135
      XX=EXP(XX)/SQRT(PID)                                               2136
      B1=0.319381530                                                     2137
      B2=-0.356563782                                                    2138
      B3=1.781477937                                                     2139
      B4=-1.821255978                                                    2140
      B5=1.330274429                                                     2141
      PZ=1.0-(B1*T+B2*T*T+B3*T**3+B4*T**4+B5*T**5)*XX                    2142
      IF(Z.LT.0.0) PZ=1.0-PZ                                             2143
      RETURN                                                             2144
      END                                                                2145
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS		DEF LINE	REFERENCES
3	ZTOF	1	18

VARIABLES	SN	TYPE	RELOCATION							
70	B1	REAL		REFS	16	DEFINED	11			
71	B2	REAL		REFS	16	DEFINED	12			
72	B3	REAL		REFS	16	DEFINED	13			
73	B4	REAL		REFS	16	DEFINED	14			
74	B5	REAL		REFS	16	DEFINED	15			
63	PI	REAL		REFS	8	DEFINED	4			
66	PID	REAL		REFS	10	DEFINED	8			
0	PZ	REAL	F.P.	REFS	17	DEFINED	1	16	17	
65	T	REAL		REFS	6*16	DEFINED	7			
64	X	REAL		REFS	7	2*9	DEFINED	5	6	
67	XX	REAL		REFS	10	16	DEFINED	9	10	
0	Z	REAL	F.P.	REFS	5	2*6	17	DEFINED	1	

EXTERNALS	TYPE	ARGS	REFERENCES
EXP	REAL	1 LIBRARY	10
SQRT	REAL	1 LIBRARY	10

STATISTICS

PROGRAM LENGTH 75B 61

52000B CM USED

RESULTS OBTAINED BY MEANS OF PROGRAM RASC
PREPARED BY F.P. AGTERBERG AND L.D. NEL
GEOLOGICAL SURVEY OF CANADA
JANUARY 1981

VALUES OF INPUT PARAMETERS

RUN PARAMETERS:	NS	IOCR	INIQ	CRIT	TOL	AAA
	20	5	1	3.0	0.0	1.64500

LIMITS:	N	MAX	ITER
	184	60	10000

PROCESSING OP:	ITAPE	IOMAT	ISRT	IALPHA	ITAB1	ISCORE	ICOMP	ISKIP	IFIN	INOSC
	1	1	1	1	1	1	1	0	1	2

THE FOLLOWING UNIQUE EVENTS HAVE BEEN SELECTED:

184

THE FOLLOWING MARKER HORIZONS HAVE BEEN SELECTED:

ORIGINAL SEQUENCE DATA

BONAVISTA-CGG
4 -12 -13 -53 -11 -6 -16 54 -55 -17 -56 -23

CUMBERLAND B55
21 -16 -2 -13 -11 -6 -5 70 -24 -71 -20 -54 -72

ADOLPHUS O-50
1 -2 -3 -4 -5 -6 -7 -8 -9 -10 11 -12 -13 -14 -15 -16 -17 18 19 -20
-21 22 -23 -24 -25 -26 184 27 -28 -29 -30 -31 -32 33

BLUE H-28
4 -13 -12 -57 -3 -21 -7 -58 -6 -59 33 -30 -48 -50 -35

A GABRIEL C-60
4 -11 -12 -13 -57 -95 -3 16

HARE BAY E-21

6 -16 -53 -4 -3 -12 -13 -104 -7 -5 -105 -8 106 107

EGRET K-36
4 55 108 72 -30 112 -111 71 -15 -109 -128 -110 -113 -114 31 -129 -130 -115 -54

HIBERNIA O-35
13 -14 -20 -15 -72 -56 -108 113 -111 112 -109 30 -71 -141 131 -31

EGRET N-46
9 -8 -13 -4 -6 11 14 22 -15 108 -54 109 -110 -72 -111 112 -71 -113 -25 -114
-70 -31 -115 -116 30

PUFFIN B-90
3 -4 -105 -5 12 57 -11 13 14 20 -15 -26 23 54 -55 72 -113 109

KILTIWAKE P-11
4 -6 -13 -5 -1 -16 8 168 12 -14 11 -15 23 -24 54 -22 72 -30 131 -34
27 -28 169

HERMINE E-94
4 -6 -3 -168 -105 -5 -7 16 -8 13 -14 26 -15 12 20 70 54 71 170

PETREL A-62
4 14 15 13 72 27 33 -170 131 169

HERON H-73
8 14 -11 -107 17 -26 23 -20 24 70 55 72 184 27 -31 131 169

BITTERN M-62
16 105 -5 6 14 22 54 72

EIDER M-75
8 14 -107 -173 174 15 -175 56 -13 9 20 -26 -11 -70 54 112 -110 -30 -31

JAEGER A-49
4 -105 -16 -5 107 -173 -15 -11 -13 -178 -174 175 56 54

CORMORANT K-83
14 -13 -11 112 -30 -31 -110 -115 -24 -108 27 -28 -131

MURRE G-67
11 -13 -15 -14 108 -109 -110 115 -70 30 -31 112 -71 -24 131 27 -28

OSPREY H-84
173 -10 -9 -17 -11 -13 -4 -12 -5 26 -57 -53 -14 55 -56 -109 20 -15 72 -71
-54 -22 -70 -24 111 -30 131

PREPROCESSING INITIATED

TABULATION OF EVENT OCCURRENCES;
DICTIONARY CODE NUMBER VERSUS FREQUENCY OF OCCURRENCE

*	1	2	*	53	3	*	105	5	*	157	0	*	209	0
*	2	2	*	54	11	*	106	1	*	158	0	*	210	0
*	3	6	*	55	5	*	107	4	*	159	0	*	211	0
*	4	13	*	56	5	*	108	5	*	160	0	*	212	0
*	5	9	*	57	4	*	109	6	*	161	0	*	213	0
*	6	9	*	58	1	*	110	5	*	162	0	*	214	0
*	7	4	*	59	1	*	111	4	*	163	0	*	215	0
*	8	7	*	60	0	*	112	6	*	164	0	*	216	0
*	9	4	*	61	0	*	113	4	*	165	0	*	217	0
*	10	2	*	62	0	*	114	2	*	166	0	*	218	0
*	11	13	*	63	0	*	115	4	*	167	0	*	219	0
*	12	9	*	64	0	*	116	1	*	168	2	*	220	0
*	13	17	*	65	0	*	117	0	*	169	3	*	221	0
*	14	13	*	66	0	*	118	0	*	170	2	*	222	0
*	15	12	*	67	0	*	119	0	*	171	0	*	223	0
*	16	9	*	68	0	*	120	0	*	172	0	*	224	0
*	17	4	*	69	0	*	121	0	*	173	3	*	225	0
*	18	1	*	70	7	*	122	0	*	174	2	*	226	0
*	19	1	*	71	7	*	123	0	*	175	2	*	227	0
*	20	8	*	72	10	*	124	0	*	176	0	*	228	0
*	21	3	*	73	0	*	125	0	*	177	0	*	229	0
*	22	5	*	74	0	*	126	0	*	178	1	*	230	0
*	23	5	*	75	0	*	127	0	*	179	0	*	231	0
*	24	7	*	76	0	*	128	1	*	180	0	*	232	0
*	25	2	*	77	0	*	129	1	*	181	0	*	233	0
*	26	6	*	78	0	*	130	1	*	182	0	*	234	0
*	27	6	*	79	0	*	131	7	*	183	0	*	235	0
*	28	4	*	80	0	*	132	0	*	184	2	*	236	0
*	29	1	*	81	0	*	133	0	*	185	0	*	237	0
*	30	10	*	82	0	*	134	0	*	186	0	*	238	0
*	31	8	*	83	0	*	135	0	*	187	0	*	239	0
*	32	1	*	84	0	*	136	0	*	188	0	*	240	0
*	33	3	*	85	0	*	137	0	*	189	0	*	241	0
*	34	1	*	86	0	*	138	0	*	190	0	*	242	0
*	35	1	*	87	0	*	139	0	*	191	0	*	243	0
*	36	0	*	88	0	*	140	0	*	192	0	*	244	0
*	37	0	*	89	0	*	141	1	*	193	0	*	245	0
*	38	0	*	90	0	*	142	0	*	194	0	*	246	0
*	39	0	*	91	0	*	143	0	*	195	0	*	247	0
*	40	0	*	92	0	*	144	0	*	196	0	*	248	0
*	41	0	*	93	0	*	145	0	*	197	0	*	249	0
*	42	0	*	94	0	*	146	0	*	198	0	*	250	0
*	43	0	*	95	1	*	147	0	*	199	0	*	251	0
*	44	0	*	96	0	*	148	0	*	200	0	*	252	0
*	45	0	*	97	0	*	149	0	*	201	0	*	253	0
*	46	0	*	98	0	*	150	0	*	202	0	*	254	0
*	47	0	*	99	0	*	151	0	*	203	0	*	255	0
*	48	1	*	100	0	*	152	0	*	204	0	*	256	0
*	49	0	*	101	0	*	153	0	*	205	0	*	257	0
*	50	1	*	102	0	*	154	0	*	206	0	*	258	0
*	51	0	*	103	0	*	155	0	*	207	0	*	259	0
*	52	0	*	104	1	*	156	0	*	208	0	*	260	0

TABULATION OF EVENT OCCURRENCES:

NO. OF WELLS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
NO. OF EVENTS	19	10	5	9	7	5	5	2	4	2	1	1	3	0	0	0	1	0	0	0
CUM. OF EVENTS	74	55	45	40	31	24	19	14	12	8	6	5	4	1	1	1	1	0	0	0

SEQUENCE DATA MODIFIED TO INCLUDE ONLY
THOSE EVENTS WHICH OCCUR AT LEAST 5 TIMES

BONAVISTA-CGG
4 -12 -13 -11 -6 -16 54 -55 -56 -23

CUMBERLAND B55
16 -13 -11 -6 -5 70 -24 -71 -20 -54 -72

ADOLPHUS O-50
3 -4 -5 -6 -8 11 -12 -13 -14 -15 -16 20 22 -23 -24 -26 27 -30 -31

BLUE H-28
4 -13 -12 -3 -6 30

A GABRIEL C-60
4 -11 -12 -13 -3 16

HARE BAY E-21
6 -16 -4 -3 -12 -13 -5 -105 -8

EGRET K-36
4 55 108 72 -30 112 71 -15 -109 -110 31 -54

HIBERNIA O-35
13 -14 -20 -15 -72 -56 -108 112 -109 30 -71 131 -31

EGRET N-46
8 -13 -4 -6 11 14 22 -15 108 -54 109 -110 -72 112 -71 -70 -31 30

PUFFIN B-90
3 -4 -105 -5 12 11 13 14 20 -15 -26 23 54 -55 72 109

KILTIWAKE P-11

4 -6 -13 -5 -16 8 12 -14 11 -15 23 -24 54 -22 72 -30 131 27

HERMINE E-94
4 -6 -3 -105 -5 16 -8 13 -14 26 -15 12 20 70 54 71

PETREL A-62
4 14 15 13 72 27 131

HERON H-73
8 14 -11 26 23 -20 24 70 55 72 27 -31 131

BITTERN M-62
16 105 -5 6 14 22 54 72

EIDER M-75
8 14 15 56 -13 20 -26 -11 -70 54 112 -110 -30 -31

JAEGER A-49
4 -105 -16 -5 15 -11 -13 56 54

CORMORANT K-83
14 -13 -11 112 -30 -31 -110 -24 -108 27 -131

MURRE G-67
11 -13 -15 -14 108 -109 -110 70 30 -31 112 -71 -24 131 27

OSPREY H-84
11 -13 -4 -12 -5 26 -14 55 -56 -109 20 -15 72 -71 -54 -22 -70 -24 30 131

RECODE REFERENCE TABLE, OLD CODE VS. NEW CODE

3	1
4	2
5	3
6	4
8	5
11	6
12	7
13	8
14	9
15	10
16	11
20	12
22	13
23	14
24	15

26	16
27	17
30	18
31	19
54	20
55	21
56	22
70	23
71	24
72	25
105	26
108	27
109	28
110	29
112	30
131	31

RECODED SEQUENCE DATA

BONAVISTA-CGG
2 -7 -8 -6 -4 -11 20 -21 -22 -14

CUMBERLAND B55
11 -8 -6 -4 -3 23 -15 -24 -12 -20 -25

ADOLPHUS O-50
1 -2 -3 -4 -5 6 -7 -8 -9 -10 -11 12 13 -14 -15 -16 17 -18 -19

BLUE H-28
2 -8 -7 -1 -4 18

A GABRIEL C-60
2 -6 -7 -8 -1 11

HARE BAY E-21
4 -11 -2 -1 -7 -8 -3 -26 -5

EGRET K-36
2 21 27 25 -18 30 24 -10 -28 -29 19 -20

HIBERNIA O-35
8 -9 -12 -10 -25 -22 -27 30 -28 18 -24 31 -19

EGRET N-46
5 -8 -2 -4 6 9 13 -10 27 -20 28 -29 -25 30 -24 -23 -19 18

PUFFIN B-90
1 -2 -26 -3 7 6 8 9 12 -10 -16 14 20 -21 25 28

KILTIWAKE P-11
2 -4 -8 -3 -11 5 7 -9 6 -10 14 -15 20 -13 25 -18 31 17

HERMINE E-94
2 -4 -1 -26 -3 11 -5 8 -9 16 -10 7 12 23 20 24

PETREL A-62
2 9 10 8 25 17 31

HERON H-73
5 9 -6 16 14 -12 15 23 21 25 17 -19 31

BITTERN M-62
11 26 -3 4 9 13 20 25

EIDER M-75
5 9 10 22 -8 12 -16 -6 -23 20 30 -29 -18 -19

JAEGER A-49
2 -26 -11 -3 10 -6 -8 22 20

CORMORANT K-83
9 -8 -6 30 -18 -19 -29 -15 -27 17 -31

MURRE G-67
6 -8 -10 -9 27 -28 -29 23 18 -19 30 -24 -15 31 17

OSPREY H-84
6 -8 -2 -7 -3 16 -9 21 -22 -28 12 -10 25 -24 -20 -13 -23 -15 18 31

CROSS REFERENCE TABLE, NEW CODE VS. OLD CODE

1	3
2	4
3	5
4	6
5	8
6	11
7	12

8	13
9	14
10	15
11	16
12	20
13	22
14	23
15	24
16	26
17	27
18	30
19	31
20	54
21	55
22	56
23	70
24	71
25	72
26	105
27	108
28	109
29	110
30	112
31	131

NS= 20 MMAX= 31

PRESORT OPTION INITIATED

CUMULATIVE ORDER MATRIX

0.0	3.0	2.0	2.0	2.0	2.5	4.5	4.5	3.0	3.0	3.5	3.0	1.0	2.0	1.0	3.0	1.0	2.0	1.0	2.0
1.0	0.0	1.0	1.0	1.0	1.5	0.0	1.0	0.0	0.0	0.0									
3.0	0.0	3.5	3.5	3.5	6.5	6.5	8.5	7.0	9.0	5.0	4.0	4.0	4.0	3.0	4.0	3.0	6.0	3.0	8.0
4.0	3.0	3.0	4.0	6.0	2.0	2.0	4.0	2.0	2.0	3.0									
2.0	3.5	0.0	3.5	3.0	5.0	5.0	6.0	6.0	6.0	4.0	5.0	4.0	3.0	4.0	4.0	2.0	3.0	1.0	7.0
2.0	2.0	3.0	3.0	5.0	2.5	0.0	2.0	0.0	0.0	2.0									
2.0	3.5	2.5	0.0	3.5	4.0	4.5	5.0	5.0	4.0	4.0	3.0	4.0	3.0	3.0	2.0	2.0	4.0	2.0	6.0
1.0	1.0	3.0	3.0	4.0	1.0	1.0	1.0	1.0	1.0	1.0									
1.0	1.5	1.0	1.5	0.0	5.0	3.5	4.0	6.0	5.0	2.0	4.0	3.0	3.0	3.0	4.0	3.0	4.0	4.0	4.0
1.0	1.0	4.0	2.0	3.0	.5	1.0	1.0	2.0	2.0	2.0									
.5	1.5	1.0	1.0	0.0	0.0	2.0	5.0	5.0	5.0	2.5	5.5	4.0	5.0	7.0	4.5	5.0	7.0	6.0	8.0
4.0	3.0	5.5	4.0	6.0	0.0	3.0	4.0	4.0	4.0	5.0									
1.5	2.5	1.0	1.5	.5	4.0	0.0	4.0	3.0	3.5	2.5	4.0	3.0	4.0	3.0	3.0	2.0	4.0	1.0	5.0
3.0	2.0	2.0	2.0	3.0	.5	0.0	2.0	0.0	0.0	2.0									
1.5	3.5	2.0	3.0	2.0	7.0	5.0	0.0	6.5	7.0	3.5	6.5	4.0	4.0	6.0	5.0	5.0	9.0	6.0	9.0
3.0	4.0	6.0	6.0	6.5	.5	3.5	5.0	4.0	5.0	6.0									
0.0	0.0	0.0	0.0	0.0	4.0	2.0	4.5	0.0	8.5	.5	6.5	5.0	4.0	6.0	5.5	6.0	8.0	7.0	7.0
3.0	2.5	6.0	5.0	7.5	0.0	3.5	5.0	4.0	5.0	7.0									
0.0	0.0	0.0	0.0	0.0	3.0	1.5	4.0	1.5	0.0	.5	4.5	3.5	3.0	4.0	3.0	4.0	7.0	6.0	8.0
1.0	2.5	5.0	5.5	5.5	0.0	2.5	4.5	3.5	4.0	5.0									
.5	2.0	3.0	3.0	2.0	3.5	3.5	4.5	3.5	3.5	0.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	1.0	6.0
1.0	2.0	2.0	2.0	3.0	2.0	0.0	0.0	0.0	0.0	1.0									
0.0	0.0	0.0	0.0	0.0	.5	0.0	.5	.5	1.5	0.0	0.0	2.0	2.5	3.5	2.0	2.0	4.0	4.0	4.5
2.0	.5	4.0	3.5	4.0	0.0	.5	2.0	1.0	2.0	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	0.0	.5	1.0	.5	2.0	4.0	2.0	3.0
0.0	0.0	1.5	1.5	3.5	0.0	1.0	1.0	1.0	1.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	1.5	0.0	2.0	.5	3.0	2.0	2.0	2.5
2.5	.5	1.0	0.0	3.0	0.0	0.0	1.0	0.0	0.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	2.0	1.0	0.0	.5	5.0	3.5	2.5	2.0
1.0	0.0	2.0	1.5	3.0	0.0	.5	0.0	.5	1.0	5.0									
0.0	0.0	0.0	0.0	0.0	.5	1.0	0.0	.5	2.0	0.0	4.0	1.5	2.5	2.5	0.0	2.0	3.0	3.0	4.0
3.0	1.0	3.5	2.0	3.0	0.0	0.0	2.0	1.0	1.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	1.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.5	0.0	3.5	0.0	4.0	1.0
0.0	0.0	0.0	2.5	1.0	0.0	.5	1.0	2.0	3.0	5.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	3.0	3.0	0.0	.5
0.0	0.0	.5	1.5	0.0	0.0	.5	0.0	1.0	2.5	3.5									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	1.0	.5	1.0	0.0	1.0	4.0	2.5	0.0
1.0	.5	2.0	3.0	5.0	0.0	.5	2.0	2.0	2.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	1.0	1.0	.5	1.0	0.0	1.0	2.0	2.0	3.0
0.0	1.0	1.0	2.0	4.0	0.0	1.0	2.5	1.0	1.0	2.0									
0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	.5	1.5	0.0	2.5	1.0	.5	1.0	1.0	0.0	3.0	2.0	3.5
1.0	0.0	2.0	2.0	1.5	0.0	.5	1.5	1.0	2.0	2.0									
0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	0.0	0.0	0.0	1.0	.5	0.0	2.0	.5	2.0	4.0	3.5	3.0
1.0	0.0	0.0	3.5	2.0	0.0	0.0	0.0	1.0	2.5	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	.5	.5	0.0	1.5	0.0	1.0	2.5	2.5	2.0
0.0	0.0	1.5	0.0	1.0	0.0	0.0	.5	.5	1.0	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5	1.5	0.0	1.0	.5	0.0	1.0	0.0	3.0	4.0	4.0	2.0
0.0	.5	2.0	4.0	0.0	0.0	.5	3.5	1.5	3.0	5.0									
1.5	2.0	2.5	2.0	1.5	2.0	2.5	3.5	3.0	3.0	2.0	2.0	1.0	1.0	0.0	2.0	0.0	0.0	0.0	4.0
1.0	1.0	1.0	1.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5	1.5	0.0	.5	0.0	0.0	1.5	0.0	2.0	4.5	4.5	1.5
0.0	.5	2.0	4.0	2.5	0.0	0.0	3.5	3.0	4.5	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.0	1.0	0.0	2.0	0.0	1.0	4.0	4.0	2.0

.5	.5	3.0	4.5	1.5	0.0	.5	0.0	1.5	2.5	3.0										
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	0.0	0.0	1.5	0.0	2.0	3.0	4.0	1.0	
0.0	0.0	2.0	2.5	.5	0.0	1.0	1.5	0.0	3.0	2.0										
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0	3.0	3.5	1.0	
0.0	0.0	.5	3.0	0.0	0.0	.5	1.5	2.0	0.0	3.0										
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	.5	0.0	
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0										

CODE FOLLOWED BY SCORE

1.0	27.6
2.0	28.0
3.0	28.3
4.0	27.0
5.0	24.5
6.0	21.0
7.0	21.1
8.0	23.0
9.0	20.0
10.0	18.0
11.0	24.2
12.0	15.5
13.0	11.5
14.0	13.3
15.0	9.3
16.0	17.1
17.0	.5
18.0	4.1
19.0	2.1
20.0	8.5
21.0	14.5
22.0	16.1
23.0	8.5
24.0	4.1
25.0	8.5
26.0	27.3
27.0	17.0
28.0	9.8
29.0	10.6
30.0	6.3
31.0	.5

SCORES IN DESCENDING ORDER

3.0	28.3
2.0	28.0
1.0	27.6
26.0	27.3
4.0	27.0
5.0	24.5
11.0	24.2
8.0	23.0
7.0	21.1
6.0	21.0
9.0	20.0
10.0	18.0
16.0	17.1
27.0	17.0
22.0	16.1
12.0	15.5
21.0	14.5
14.0	13.3
13.0	11.5
29.0	10.6

28.0	9.8
15.0	9.3
23.0	8.5
25.0	8.5
20.0	8.5
30.0	6.3
18.0	4.1
24.0	4.1
19.0	2.1
17.0	.5
31.0	.5

NEW CROSS REFERENCE TABLE

1	3
2	2
3	1
4	26
5	4
6	5
7	11
8	8
9	7
10	6
11	9
12	10
13	16
14	27
15	22
16	12
17	21
18	14
19	13
20	29
21	28
22	15
23	23
24	25
25	20
26	30
27	18
28	24
29	19
30	17
31	31

RECODED AND PRESORTED DATA SET

BONAVISTA-CGG

2	-9	-8	-10	-5	-7	25	-17	-15	-18

CUMBERLAND B55

7	-8	-10	-5	-1	23	-22	-28	-16	-25	-24

ADOLPHUS 0-50

3	-2	-1	-5	-6	10	-9	-8	-11	-12	-7	16	19	-18	-22	-13	30	-27	-29

BLUE H-28
2 -8 -9 -3 -5 27

A GABRIEL C-60
2 -10 -9 -8 -3 7

HARE BAY E-21
5 -7 -2 -3 -9 -8 -1 -4 -6

EGRET K-36
2 17 14 24 -27 26 28 -12 -21 -20 29 -25

HIBERNIA O-35
8 -11 -16 -12 -24 -15 -14 26 -21 27 -28 31 -29

EGRET N-46
6 -8 -2 -5 10 11 19 -12 14 -25 21 -20 -24 26 -28 -23 -29 27

PUFFIN B-90
3 -2 -4 -1 9 10 8 11 16 -12 -13 18 25 -17 24 21

KILTIWAKE P-11
2 -5 -8 -1 -7 6 9 -11 10 -12 18 -22 25 -19 24 -27 31 30

HERMINE E-94
2 -5 -3 -4 -1 7 -6 8 -11 13 -12 9 16 23 25 28

PETREL A-62
2 11 12 8 24 30 31

HERON H-73
6 11 -10 13 18 -16 22 23 17 24 30 -29 31

BITTERN M-62
7 4 -1 5 11 19 25 24

EIDER M-75
6 11 12 15 -8 16 -13 -10 -23 25 26 -20 -27 -29

JAEGER A-49

2 -4 -7 -1 12 -10 -8 15 25

CORMORANT K-83

11 -8 -10 26 -27 -29 -20 -22 -14 30 -31

MURRE G-67

10 -8 -12 -11 14 -21 -20 23 27 -29 26 -28 -22 31 30

OSPREY H-84

10 -8 -2 -9 -1 13 -11 17 -15 -21 16 -12 24 -28 -25 -19 -23 -22 27 31

RANKING SOLUTION

RUN FOR 5 OR MORE OCCURRENCES AND 3 OR MORE PAIRS

CUMULATIVE ORDER MATRIX

0.0	3.5	2.0	2.5	3.5	3.0	4.0	6.0	5.0	5.0	6.0	6.0	4.0	0.0	2.0	5.0	2.0	3.0	4.0	0.0
2.0	4.0	3.0	5.0	7.0	0.0	3.0	3.0	1.0	2.0	2.0									
3.5	0.0	3.0	2.0	3.5	3.5	5.0	8.5	6.5	6.5	7.0	9.0	4.0	2.0	3.0	4.0	4.0	4.0	4.0	2.0
4.0	3.0	3.0	6.0	8.0	2.0	6.0	4.0	3.0	3.0	3.0									
2.0	3.0	0.0	1.5	2.0	2.0	3.5	4.5	4.5	2.5	3.0	3.0	3.0	0.0	0.0	3.0	1.0	2.0	1.0	0.0
1.0	1.0	1.0	1.0	2.0	0.0	2.0	1.0	1.0	1.0	0.0									
2.5	2.0	1.5	0.0	2.0	1.5	2.0	3.5	2.5	2.0	3.0	3.0	2.0	0.0	1.0	2.0	1.0	1.0	1.0	0.0
1.0	0.0	1.0	2.0	4.0	0.0	0.0	1.0	0.0	0.0	0.0									
2.5	3.5	2.0	1.0	0.0	3.5	4.0	5.0	4.5	4.0	5.0	4.0	2.0	1.0	1.0	3.0	1.0	3.0	4.0	1.0
1.0	3.0	3.0	4.0	6.0	1.0	4.0	3.0	2.0	2.0	1.0									
1.0	1.5	1.0	.5	1.5	0.0	2.0	4.0	3.5	5.0	6.0	5.0	4.0	1.0	1.0	4.0	1.0	3.0	3.0	2.0
1.0	3.0	4.0	3.0	4.0	2.0	4.0	2.0	4.0	3.0	2.0									
3.0	2.0	.5	2.0	3.0	2.0	0.0	4.5	3.5	3.5	3.5	3.5	2.0	0.0	2.0	3.0	1.0	3.0	3.0	0.0
0.0	3.0	2.0	3.0	6.0	0.0	2.0	2.0	1.0	2.0	1.0									
2.0	3.5	1.5	.5	3.0	2.0	3.5	0.0	5.0	7.0	6.5	7.0	5.0	3.5	4.0	6.5	3.0	4.0	4.0	4.0
5.0	6.0	6.0	6.5	9.0	5.0	9.0	6.0	6.0	5.0	6.0									
1.0	2.5	1.5	.5	1.5	.5	2.5	4.0	0.0	4.0	3.0	3.5	3.0	0.0	2.0	4.0	3.0	4.0	3.0	0.0
2.0	3.0	2.0	3.0	5.0	0.0	4.0	2.0	1.0	2.0	2.0									
1.0	1.5	.5	0.0	1.0	0.0	2.5	5.0	2.0	0.0	5.0	5.0	4.5	3.0	3.0	5.5	4.0	5.0	4.0	4.0

4.0	7.0	5.5	6.0	8.0	4.0	7.0	4.0	6.0	5.0	5.0									
0.0	0.0	0.0	0.0	0.0	0.0	.5	4.5	2.0	4.0	0.0	8.5	5.5	3.5	2.5	6.5	3.0	4.0	5.0	4.0
5.0	6.0	6.0	7.5	7.0	5.0	8.0	5.0	7.0	6.0	7.0									
0.0	0.0	0.0	0.0	0.0	0.0	.5	4.0	1.5	3.0	1.5	0.0	3.0	2.5	2.5	4.5	1.0	3.0	3.5	3.5
4.5	4.0	5.0	5.5	8.0	4.0	7.0	5.5	6.0	4.0	5.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	.5	.5	2.0	0.0	0.0	1.0	4.0	3.0	2.5	1.5	1.0
2.0	2.5	3.5	3.0	4.0	1.0	3.0	2.0	3.0	2.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	.5	1.5	0.0	0.0	.5	.5	0.0	0.0	0.0	3.0
3.5	1.5	2.0	2.5	1.5	4.5	4.5	4.0	4.5	2.0	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	.5	1.5	1.0	.5	0.0	2.5	1.0	.5	1.0	1.0
1.5	1.0	2.0	1.5	3.5	2.0	3.0	2.0	2.0	0.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	.5	.5	1.5	2.0	.5	.5	0.0	2.0	2.5	2.0	1.0
2.0	3.5	4.0	4.0	4.5	2.0	4.0	3.5	4.0	2.0	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	1.0	1.0	1.0	0.0	.5	1.0	1.0
2.5	1.0	1.0	4.0	3.0	1.0	2.0	2.0	2.0	1.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	.5	.5	2.5	0.0	1.5	0.0
1.0	2.0	1.0	3.0	2.5	0.0	2.0	0.0	2.0	3.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5	1.0	0.0	0.0	0.0	.5	0.0	1.0
1.0	1.0	1.5	3.5	3.0	1.0	4.0	1.5	2.0	2.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
1.5	1.5	2.0	.5	1.0	3.0	3.0	2.5	4.0	2.0	2.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	.5	.5	1.0	.5	0.0	1.0	1.5
0.0	2.0	3.0	1.5	2.0	2.5	4.0	4.5	4.0	1.0	3.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5	0.0	.5	1.0	1.0	2.0	.5
0.0	0.0	2.0	3.0	2.0	1.0	3.5	1.5	2.5	5.0	5.0									
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	.5	0.0	0.0	1.0	1.0	0.0	.5	1.0
0.0	2.0	0.0	2.0	3.0	2.5	4.0	3.5	3.5	2.0	3.0									

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.5 0.0 .5 .5 1.0 0.0 0.0 .5 1.5
3.5 1.0 2.0 0.0 2.0 3.0 4.0 4.0 4.0 3.0 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 .5 .5 1.0 .5 1.0 2.0
2.0 1.0 2.0 5.0 0.0 2.0 4.0 3.0 2.5 1.0 2.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 2.0
1.5 1.0 .5 0.0 1.0 0.0 3.0 3.0 3.5 2.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 2.0
1.0 1.5 0.0 1.0 1.0 3.0 0.0 2.5 4.0 3.5 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 .5 0.0 0.0 .5 .5
.5 1.5 1.5 1.0 2.0 1.0 2.5 0.0 2.5 1.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 1.0
0.0 1.5 .5 0.0 .5 2.5 3.0 1.5 0.0 3.0 3.5

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 1.0 0.0 2.5

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 2.5 0.0

MODIFICATION OF ORDER MATRIX;

BASED ON CRIT = 3.0, 165 PAIRS OUT OF 465 HAVE BEEN ZEROED

MODIFIED RELATION MATRIX

0.0 3.5 2.0 2.5 3.5 3.0 4.0 6.0 5.0 5.0 6.0 6.0 4.0 0.0 0.0 5.0 0.0 3.0 4.0 0.0
0.0 4.0 3.0 5.0 7.0 0.0 3.0 3.0 0.0 0.0 0.0

3.5 0.0 3.0 2.0 3.5 3.5 5.0 8.5 6.5 6.5 7.0 9.0 4.0 0.0 3.0 4.0 4.0 4.0 4.0 0.0
4.0 3.0 3.0 6.0 8.0 0.0 6.0 4.0 3.0 3.0 3.0

2.0	3.0	0.0	1.5	2.0	2.0	3.5	4.5	4.5	2.5	3.0	3.0	3.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0									
2.5	2.0	1.5	0.0	2.0	0.0	2.0	3.5	2.5	0.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0									
2.5	3.5	2.0	1.0	0.0	3.5	4.0	5.0	4.5	4.0	5.0	4.0	0.0	0.0	0.0	3.0	0.0	3.0	4.0	0.0
0.0	3.0	3.0	4.0	6.0	0.0	4.0	3.0	0.0	0.0	0.0									
1.0	1.5	1.0	0.0	1.5	0.0	2.0	4.0	3.5	5.0	6.0	5.0	4.0	0.0	0.0	4.0	0.0	3.0	3.0	0.0
0.0	3.0	4.0	3.0	4.0	0.0	4.0	0.0	4.0	3.0	0.0									
3.0	2.0	.5	2.0	3.0	2.0	0.0	4.5	3.5	3.5	3.5	3.5	0.0	0.0	0.0	3.0	0.0	3.0	3.0	0.0
0.0	3.0	0.0	3.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0									
2.0	3.5	1.5	.5	3.0	2.0	3.5	0.0	5.0	7.0	6.5	7.0	5.0	3.5	4.0	6.5	3.0	4.0	4.0	4.0
5.0	6.0	6.0	6.5	9.0	5.0	9.0	6.0	6.0	5.0	6.0									
1.0	2.5	1.5	.5	1.5	.5	2.5	4.0	0.0	4.0	3.0	3.5	3.0	0.0	0.0	4.0	3.0	4.0	3.0	0.0
0.0	3.0	0.0	3.0	5.0	0.0	4.0	0.0	0.0	0.0	0.0									
1.0	1.5	.5	0.0	1.0	0.0	2.5	5.0	2.0	0.0	5.0	5.0	4.5	3.0	3.0	5.5	4.0	5.0	4.0	4.0
4.0	7.0	5.5	6.0	8.0	4.0	7.0	4.0	6.0	5.0	5.0									
0.0	0.0	0.0	0.0	0.0	0.0	.5	4.5	2.0	4.0	0.0	8.5	5.5	3.5	2.5	6.5	3.0	4.0	5.0	4.0
5.0	6.0	6.0	7.5	7.0	5.0	8.0	5.0	7.0	6.0	7.0									

0.0 0.0 0.0 0.0 0.0 0.0 .5 4.0 1.5 3.0 1.5 0.0 3.0 2.5 2.5 4.5 1.0 3.0 3.5 3.5

4.5 4.0 5.0 5.5 8.0 4.0 7.0 5.5 6.0 4.0 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 .5 .5 2.0 0.0 0.0 0.0 4.0 3.0 2.5 0.0 0.0

0.0 2.5 3.5 3.0 4.0 0.0 3.0 0.0 3.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 3.0

3.5 0.0 0.0 2.5 0.0 4.5 4.5 4.0 4.5 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 1.0 .5 1.5 0.0 0.0 0.0 2.5 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 3.5 0.0 3.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 .5 .5 1.5 2.0 0.0 .5 0.0 2.0 2.5 0.0 0.0

2.0 3.5 4.0 4.0 4.5 0.0 4.0 3.5 4.0 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0

2.5 0.0 0.0 4.0 3.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 2.5 0.0 0.0 0.0

0.0 2.0 0.0 3.0 2.5 0.0 0.0 0.0 0.0 3.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 1.0 0.0 3.5 3.0 0.0 4.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 1.0 0.0 0.0 0.0 0.0 0.0 0.0

1.5 0.0 2.0 0.0 1.0 3.0 3.0 2.5 4.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.5 0.0 .5 0.0 1.0 .5 0.0 0.0 1.5

0.0 0.0 3.0 1.5 2.0 2.5 4.0 4.5 4.0 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 0.0 1.0 2.0 0.0
0.0 0.0 2.0 3.0 2.0 0.0 3.5 1.5 2.5 5.0 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 0.0 0.0 1.0 0.0 0.0 0.0 1.0
0.0 2.0 0.0 2.0 3.0 2.5 4.0 3.5 3.5 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.5 0.0 .5 0.0 1.0 0.0 0.0 .5 0.0
3.5 1.0 2.0 0.0 2.0 3.0 4.0 4.0 4.0 3.0 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 .5 1.0 .5 1.0 2.0
2.0 1.0 2.0 5.0 0.0 2.0 4.0 3.0 2.5 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 2.0
1.5 0.0 .5 0.0 1.0 0.0 3.0 3.0 3.5 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 2.0
1.0 1.5 0.0 1.0 1.0 3.0 0.0 2.5 4.0 3.5 5.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 .5 0.0 0.0 0.0 .5
.5 1.5 1.5 1.0 2.0 1.0 2.5 0.0 2.5 0.0 3.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 1.0
0.0 1.5 .5 0.0 .5 2.5 3.0 1.5 0.0 3.0 3.5

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 1.0 0.0 2.5

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 2.5 0.0

CYCLING EVENTS: 17. 16. 12.

EVENT POSITIONS: 12 15 13

MATRIX ELEMENTS:
0.0 1.0 2.0
2.0 0.0 1.5
1.0 4.5 0.0

C(12, 15) AND C(15, 12) ZEROED - BASED ON LEAST DIFFERENCE BETWEEN PAIRS IN THE CYCLING MATRIX

CYCLING EVENTS: 12. 17. 13.

EVENT POSITIONS: 12 13 17

MATRIX ELEMENTS:
0.0 1.0 3.0
2.0 0.0 0.0
2.0 3.0 0.0

C(12, 13) AND C(13, 12) ZEROED - BASED ON LEAST DIFFERENCE BETWEEN PAIRS IN THE CYCLING MATRIX

CYCLING EVENTS: 21. 24. 25. 23.

EVENT POSITIONS: 22 21 23 24

MATRIX ELEMENTS:
0.0 1.5 2.0 3.0
3.5 0.0 2.0 2.0
2.0 5.0 0.0 2.0
0.0 2.0 3.0 0.0

C(23, 24) AND C(24, 23) ZEROED - BASED ON LEAST DIFFERENCE BETWEEN PAIRS IN THE CYCLING MATRIX

FINAL ORDER RELATION MATRIX

1

0.0 3.5 2.0 2.5 3.5 3.0 4.0 6.0 5.0 5.0 6.0 6.0 4.0 0.0 0.0 5.0 3.0 0.0 4.0 4.0

7.0 5.0 0.0 0.0 3.0 0.0 3.0 3.0 0.0 0.0 0.0

2

3.5 0.0 3.0 2.0 3.5 3.5 5.0 8.5 6.5 6.5 7.0 9.0 4.0 0.0 3.0 4.0 4.0 4.0 3.0 4.0

8.0 6.0 4.0 0.0 3.0 0.0 6.0 4.0 3.0 3.0 3.0

3

2.0 3.0 0.0 1.5 2.0 2.0 3.5 4.5 4.5 2.5 3.0 3.0 3.0 0.0 0.0 3.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

4

2.5 2.0 1.5 0.0 2.0 0.0 2.0 3.5 2.5 0.0 3.0 3.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
4.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

5

2.5 3.5 2.0 1.0 0.0 3.5 4.0 5.0 4.5 4.0 5.0 4.0 0.0 0.0 0.0 3.0 3.0 0.0 3.0 4.0
6.0 4.0 0.0 0.0 3.0 0.0 4.0 3.0 0.0 0.0 0.0

6

1.0 1.5 1.0 0.0 1.5 0.0 2.0 4.0 3.5 5.0 6.0 5.0 4.0 0.0 0.0 4.0 3.0 0.0 3.0 3.0
4.0 3.0 0.0 0.0 4.0 0.0 4.0 0.0 4.0 3.0 0.0

7

3.0 2.0 .5 2.0 3.0 2.0 0.0 4.5 3.5 3.5 3.5 3.5 0.0 0.0 0.0 3.0 3.0 0.0 3.0 3.0
6.0 3.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

8

2.0 3.5 1.5 .5 3.0 2.0 3.5 0.0 5.0 7.0 6.5 7.0 5.0 3.5 4.0 6.5 4.0 3.0 6.0 4.0
9.0 6.5 5.0 4.0 6.0 5.0 9.0 6.0 6.0 5.0 6.0

9

1.0 2.5 1.5 .5 1.5 .5 2.5 4.0 0.0 4.0 3.0 3.5 3.0 0.0 0.0 4.0 4.0 3.0 3.0 3.0
5.0 3.0 0.0 0.0 0.0 0.0 4.0 0.0 0.0 0.0 0.0

10

1.0 1.5 .5 0.0 1.0 0.0 2.5 5.0 2.0 0.0 5.0 5.0 4.5 3.0 3.0 5.5 5.0 4.0 7.0 4.0
8.0 6.0 4.0 4.0 5.5 4.0 7.0 4.0 6.0 5.0 5.0

11

0.0 0.0 0.0 0.0 0.0 0.0 .5 4.5 2.0 4.0 0.0 8.5 5.5 3.5 2.5 6.5 4.0 3.0 6.0 5.0
7.0 7.5 5.0 4.0 6.0 5.0 8.0 5.0 7.0 6.0 7.0

12

0.0 0.0 0.0 0.0 0.0 0.0 .5 4.0 1.5 3.0 1.5 0.0 3.0 2.5 2.5 4.5 3.0 1.0 4.0 3.5
8.0 5.5 4.5 3.5 5.0 4.0 7.0 5.5 6.0 4.0 5.0

13

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 .5 .5 2.0 0.0 0.0 0.0 4.0 2.5 3.0 2.5 0.0

4.0 3.0 0.0 0.0 3.5 0.0 3.0 0.0 3.0 0.0 0.0

14

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 2.5 3.5 3.0 0.0 4.5 4.5 4.0 4.5 0.0 3.0

15

0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 1.0 .5 1.5 0.0 0.0 0.0 2.5 0.0 0.0 0.0 0.0

3.5 0.0 0.0 0.0 0.0 0.0 3.0 0.0 0.0 0.0 0.0

16

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 .5 .5 1.5 2.0 0.0 .5 0.0 2.5 2.0 3.5 0.0

4.5 4.0 2.0 0.0 4.0 0.0 4.0 3.5 4.0 0.0 3.0

17

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 0.0 2.5 2.0 0.0

2.5 3.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 3.0 0.0

18

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 1.0 .5 0.0 0.0 0.0

3.0 4.0 2.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

19

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.0 0.0 0.0 2.0

2.0 3.0 0.0 0.0 2.0 0.0 3.5 1.5 2.5 5.0 5.0

20

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0

3.0 3.5 0.0 0.0 0.0 0.0 4.0 0.0 0.0 0.0 0.0

21

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 .5 .5 1.0 1.0 1.0

0.0 5.0 2.0 2.0 2.0 2.0 4.0 3.0 2.5 0.0 0.0

22

0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 1.5 0.0 .5 0.0 1.0 0.0 0.0 1.0 .5

2.0 0.0 3.5 0.0 2.0 3.0 4.0 4.0 4.0 3.0 5.0

23

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.5 0.0 .5 0.0 1.0 0.0 .5 0.0 0.0

2.0 1.5 0.0 1.5 3.0 2.5 4.0 4.5 4.0 0.0 3.0

24

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 1.0 0.0 0.0 0.0 0.0 0.0 0.0

1.0 0.0 1.5 0.0 2.0 3.0 3.0 2.5 4.0 0.0 0.0

25

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 .5 0.0 0.0 1.0 0.0 0.0 2.0 0.0

3.0 2.0 0.0 1.0 0.0 2.5 4.0 3.5 3.5 0.0 3.0

26

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 0.0 0.0

1.0 0.0 1.5 2.0 .5 0.0 3.0 3.0 3.5 0.0 3.0

27

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 .5 0.0 0.0 0.0 0.0 1.5 0.0

1.0 1.0 1.0 2.0 0.0 3.0 0.0 2.5 4.0 3.5 5.0

28

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 .5 0.0 0.0 1.5 0.0

2.0 1.0 .5 .5 1.5 1.0 2.5 0.0 2.5 0.0 3.0

29

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 0.0 0.0 0.0 1.5 0.0

.5 0.0 0.0 1.0 .5 2.5 3.0 1.5 0.0 3.0 3.5

30

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 .5 0.0 1.0 0.0 2.5

31

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 .5 2.5 0.0

OPTIMUM SEQUENCE OBTAINED VIA RANKING

1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	18.0	17.0	22.0	19.0
25.0	24.0	21.0	20.0	23.0	26.0	27.0	28.0	29.0	30.0	31.0									

OPTIMUM SEQUENCE USING ORIGINAL CODE NUMBERS

5	4	3	105	6	8	16	13	12	11	14	15	26	108	56	20	23	55	24	22
54	72	109	110	70	112	30	71	31	27	131									

RANKING SOLUTION OBTAINED WITH:

312 ITERATIONS OUT OF MAX 10000

CRITICAL TRANSPOSE ELEMENT SUM OF 3.0

TOLERANCE OF 0.0

NUMERICAL LISTING

1GLOBOTRUNCANA CONTUSA
2FRUCTICOSE PSEUDOTEXTULARIA
3GLOBOTRUNCANA STUARTI
4GLOBOTRUNCANA ARCA
5STENSIOINA POMMERANA
6GLOBOTRUNCANELLA HAVANENSIS
7PSEUDOTEXTULARIA ELEGANS
8GLOBIGERINELLOIDES MESSINAE
9GLOBOROTALITES MICHELINIANUS
10ARENOBULIMINA AMERICANA
11GLOBOTRUNCANA FORNICATA
12GLOBOTRUNCANA STUARTIFORMIS
13GLOBOTRUNCANA LINNEIANA
14GLOBOTRUNCANA CRETACEA
15GLOBOTRUNCANA MARGINATA
16RUGOGLOBIGERINA RUGOSA
17GLOBOROTALITES AFF. MULTISEPTUS
18PRAEBULIMINA SP
19ARAGONIA MATERNA KUGLERI
20GLOBOTRUNCANA CORONATA
21REUSSELLA SZAJNOCHAE
22SIGALIA DEFLAENSIS
23STENSIOINA EXCULPTA
24HEDBERGELLA AMABILIS
25HEDBERGELLA SPP
26GLOBOTRUNCANA ANGUSTICARINATA
27ROTALIPORA CUSHMANI
28ROTALIPORA GREENHORNENSIS

29ROTALIPORA DECKERI
30PRAEGLOBOTRUNCANA STEPHANI
31PRAEGLOBOTRUNCANA TURBINATA
32GRANDES HEDBERGELLES
33ROTALIPORA APPENNINICA
34PRAEGLOBOTRUNCANA DELRIOENSIS
35DOROTHIA AFF. FILIFORMIS
36TEXTULARIA LOSANGICA
37PRAEBULIMINA SP 13
38GLOBIGERINELLOIDES EAGLEFORDENSIS
39MILIAMMINA SP
40PLANOMALINA BUXTORFI
41OSANGULARIA UTATURENSIS
42DOROTHIA OXYCONA
43ROTALIPORA TICINENSIS
44OSANGULARIA INSIGNA
45GYROIDINOIDES PRIMITIVA
46FALSOGAUDRYINELLA TEALBYENSIS
47HEDBERGELLA INFRACRETACEA
48HEDBERGELLA PLANISPIRA
49GAVELINELLA INTERMEDIA
50AGGLUTINATED SPP ABUNDANT
51GAUDRYINA DIVIDENS
52ROTALIPORA SUBTICINENSIS
53GLOBOTRUNCANA CONICA
54GLOBOTRUNCANA CONCAVATA
55GLOBOTRUNCANA CARINATA
56GAUDRYINA AUSTINANA
57GLOBOTRUNCANA VENTRICOSA
58GLOBIGERINELLOIDES ASPERA
59RUGOGLOBIGERINA ROTUNDIDORSATA
60DUMMY
61EPISTOMINA SPINULIFERA SPINULIFERA
62LENTICULINA GAULTINA
63SPIROPLECTAMMINA LATA
64LENTICULINA MERIDIANA
65ORBITOLINA SP.
66GAVELINELLA BARREMIANA
67LENTICULINA OUACHENSIS
68TROCHOLINA SP
69EPISTOMINA CARACOLLA
70HEDBERGELLA BOSQUENSIS
71GLOBOTRUNCANA SCHNEEGANSI
72GLOBOTRUNCANA RENZI
73GLOBIGERINELLOIDES GYROIDINAEFORMIS
74GAVELINELLA SP A
75GAVELINELLA AMMONOIDEA
76VALVULINERIA GRACILLIMA
77GLOBOROTALITES APTIENSIS
78LENTICULINA CREPIDULARIS
79TEXTULARIA FOEDA
80VERNEUILLINOIDES SUBFILIFORMIS
81CAUCASELLA HOTERIVICA
82LENTICULINA EICHENBERGII
83EPISTOMINA ORNATA
84GAVELINELLA SIGMOICOSTA
85LENTICULINA SCHREITERI
86EPISTOMINA CRETOSA
87LENTICULINA SAXONICA 'SAXONICA'
88EPISTOMINA HECHTI
89EVERTICYCLAMMINA VIRGULIANA
90CONORBOIDES HOFKERI
91EPISTOMINA SP 26
92LENTICULINA BUSNARDOI
93DUMMY
94LENTICULINA NODOSA

95GLOBOTRUNCANA STUARTI FALSO
96UVIGERINAMMINA SP
97CONOROTALITES APTIENSIS
98MARGINULOPSIS SIGALI
99PSEUDONODOSARIA HUMILIS
100VAGINULINA PROCERA
101CHOFFATELLA DECIPIENS
102EPISTOMINA TENUICOSTATA
103PENTACRINUS SP
104GLOBOTRUNCANA ROSETTA
105LOXOSTOMA GEMMUM
106ARENOBULIMINA DORBIGNYI
107KYPHOPYXA CHRISTNERI
108GAVELINELLA MINIMA
109COARSE AGGLUTINATED SPP
110GLOBOTRUNCANA IMBRICATA
111GLOBOTRUNCANA PRIMITIVA
112GLOBOTRUNCANA HELVETICA
113GLOBOTRUNCANA SIGALI
114GLOBOTRUNCANA MARIANOSI
115LINGULOGAVELINELLA TURONICA
116HEDBERGELLA PARADUBIA
117BICULCOCYPRIS
118CHARA SPORANGIA
119EOGUTTULINA SP
120OSTRACOD SP 48
121OSTRACOD SP 50
122METACYPRIS FORBESII
123PARACYPRIS SP
124CYTHEROPTERON BISPINOSUM
125ALVEOSEPTA JACCARDI (PEAK)
126GAUDRYINA HEERSUMENSIS
127EPISTOMINA UHLIGI
128GAVELINELLA TOURAINENSIS
129PRAEGLOBOTRUNCANA HAGNI
130PRAEGLOBOTRUNCANA DIFFORMIS
131GAVELINOPSIS CENOMANICA
132ASCIOCYTHERE BREVIS
133NEOCYTHERE VANVEENI
134DICTYOCYTHERE
135ANCHISPIROCYCLINA LUSITANICA
136DUMMY
137SCHULERIDEA SP 1
138AMMOBACULITES COPROLITHIFORMIS
139GAUDRYINA PYRAMIDATA
140MARSONELLA OXYCONA
141HEDBERGELLA SIMPLEX
142DUMMY
143PLANULARIA KOCHII
144TICINELLA BREGGIENSIS
145DUMMY
146DUMMY
147LAMARCKINA LAMPLUGHI
148EPISTOMINA SPINULIFERA POLYPIODES
149EPISTOMINA RETICULATA
150DUMMY
151EPISTOMINA STELLICOSTATA
152CONORBOIDES SCUTULIFORMIS
153EPISTOMINA MOSQUENSIS
154LENTICULINA TRIQUETRA
155MILIAMMINA JURASSICA
156FRONDICULARIA NIKITINI
157EPISTOMINA OMNIRETICULATA
158TROCHOLINA CONICA
159LENTICULINA QUENSTEDTI
160CONICOSPIRILLINA BASILIENSIS

161 TROCHOLINA TRANSVERSARII
162 CONORBOIDES PARASPIS
163 EPISTOMINA PRAERETICULATA
164 CONORBOIDES VALENDISENSIS
165 PSEUDOCYCLAMMINA LITUUS
166 NEOBULIMINA VARSOVIENSIS
167 VERNEUILINOIDES NEOCOMIENSIS
168 GLOBOTRUNCANA GANSSERI
169 FAVUSELLA WASHITENSIS
170 PRAEGLOBOTRUNCANA SP
171 EPISTOMINA REGULARIS
172 VALVULINA MEENTZENI
173 PLANULINA TAYLORENSIS
174 EPISTOMINA STELLIGIRA ALVEOLATA
175 VAGINULINA TEXANA
176 LENTICULINA TRICARINELLA
177 EPISTOMINA SOLDANII
178 NEOFLABELLINA RUGOSA
179 REINHOLDELLA CREBRA VAR
180 FRONDICULARIA FRANCONICA
181 ALVEOSEPTA JACCARDI (TOP)
182 LENTICULINA NODOSA (TOP)
183 TROCHOLINA SP (TOP)
184 PETREL LIMESTONE

ALPHABETIC LISTING

50	AGGLUTINATED SPP ABUNDANT
125	ALVEOSEPTA JACCARDI (PEAK)
181	ALVEOSEPTA JACCARDI (TOP)
138	AMMOBACULITES COPROLITHIFORMIS
135	ANCHISPIROCYCLINA LUSITANICA
19	ARAGONIA MATERNA KUGLERI
106	ARENOBULIMINA DORBIGNYI
10	ARENOBULIMINA AMERICANA
132	ASCIOCYTHERE BREVIS
117	BICULCOCYPRIS
81	CAUCASELLA HOTERIVICA
118	CHARA SPORANGIA
101	CHOFFATELLA DECIPIENS
109	COARSE AGGLUTINATED SPP
160	CONICOSPIRILLINA BASILIENSIS
152	CONORBOIDES SCUTULIFORMIS
164	CONORBOIDES VALENDISENSIS
97	CONOROTALITES APTIENSIS
162	CONORBOIDES PARASPIS
90	CONORBOIDES HOFKERI
124	CYTHEROPTERON BISPINOSUM
134	DICTYOCYTHERE
42	DOROTHIA OXYCONA
35	DOROTHIA AFF. FILIFORMIS
142	DUMMY
146	DUMMY
150	DUMMY
60	DUMMY
136	DUMMY
93	DUMMY
145	DUMMY
119	EOGUTTULINA SP
148	EPISTOMINA SPINULIFERA POLYPIODES
91	EPISTOMINA SP 26
174	EPISTOMINA STELLIGIRA ALVEOLATA

61	EPISTOMINA SPINULIFERA SPINULIFERA
171	EPISTOMINA REGULARIS
177	EPISTOMINA SOLDANII
69	EPISTOMINA CARACOLLA
86	EPISTOMINA CRETOSA
157	EPISTOMINA OMNIRETICULATA
163	EPISTOMINA PRAERETICULATA
149	EPISTOMINA RETICULATA
83	EPISTOMINA ORNATA
88	EPISTOMINA HECHTI
102	EPISTOMINA TENUICOSTATA
127	EPISTOMINA UHLIGI
153	EPISTOMINA MOSQUENSIS
151	EPISTOMINA STELLICOSTATA
89	EVERTICYCLAMMINA VIRGULIANA
46	FALSOGAUDRYINELLA TEALBYENSIS
169	FAVUSELLA WASHITENSIS
180	FRONDICULARIA FRANCONICA
156	FRONDICULARIA NIKITINI
2	FRUCTICOSE PSEUDOTEXTULARIA
126	GAUDRYINA HEERSUMENSIS
139	GAUDRYINA PYRAMIDATA
56	GAUDRYINA AUSTINANA
51	GAUDRYINA DIVIDENS
66	GAVELINELLA BARREMIANA
84	GAVELINELLA SIGMOICOSTA
75	GAVELINELLA AMMONOIDEA
128	GAVELINELLA TOURAINENSIS
108	GAVELINELLA MINIMA
74	GAVELINELLA SP A
131	GAVELINOPSIS CENOMANICA
49	GAVELINELLA INTERMEDIA
114	GLOBOTRUNCANA MARIANOSI
111	GLOBOTRUNCANA PRIMITIVA
104	GLOBOTRUNCANA ROSETTA
6	GLOBOTRUNCANELLA HAVANENSIS
11	GLOBOTRUNCANA FORNICATA
13	GLOBOTRUNCANA LINNEIANA
15	GLOBOTRUNCANA MARGINATA
72	GLOBOTRUNCANA RENZI
20	GLOBOTRUNCANA CORONATA
71	GLOBOTRUNCANA SCHNEEGANSI
12	GLOBOTRUNCANA STUARTIFORMIS
53	GLOBOTRUNCANA CONICA
54	GLOBOTRUNCANA CONCAVATA
26	GLOBOTRUNCANA ANGUSTICARINATA
1	GLOBOTRUNCANA CONTUSA
168	GLOBOTRUNCANA GANSSERI
57	GLOBOTRUNCANA VENTRICOSA
55	GLOBOTRUNCANA CARINATA
95	GLOBOTRUNCANA STUARTI FALSO
3	GLOBOTRUNCANA STUARTI
4	GLOBOTRUNCANA ARCA
14	GLOBOTRUNCANA CRETACEA
58	GLOBIGERINELLOIDES ASPERA
8	GLOBIGERINELLOIDES MESSINAE
17	GLOBOROTALITES AFF. MULTISEPTUS
9	GLOBOROTALITES MICHELINIANUS
77	GLOBOROTALITES APTIENSIS
38	GLOBIGERINELLOIDES EAGLEFORDENSIS
73	GLOBIGERINELLOIDES GYROIDINAEFORMIS
112	GLOBOTRUNCANA HELVETICA
113	GLOBOTRUNCANA SIGALI
110	GLOBOTRUNCANA IMBRICATA
32	GRANDES HEDBERGELLES
45	GYROIDINOIDES PRIMITIVA

70	HEDBERGELLA BOSQUENSIS
116	HEDBERGELLA PARADUBIA
24	HEDBERGELLA AMABILIS
25	HEDBERGELLA SPP
47	HEDBERGELLA INFRACRETACEA
141	HEDBERGELLA SIMPLEX
48	HEDBERGELLA PLANISPIRA
107	KYPHOPYXA CHRISTNERI
147	LAMARCKINA LAMPLUGHI
94	LENTICULINA NODOSA
85	LENTICULINA SCHREITERI
82	LENTICULINA EICHENBERGII
92	LENTICULINA BUSNARDOI
62	LENTICULINA GAULTINA
64	LENTICULINA MERIDIANA
159	LENTICULINA QUENSTEDTI
182	LENTICULINA NODOSA (TOP)
67	LENTICULINA OUACHENSIS
176	LENTICULINA TRICARINELLA
154	LENTICULINA TRIQUETRA
78	LENTICULINA CREPIDULARIS
87	LENTICULINA SAXONICA 'SAXONICA'
115	LINGULOGAVELINELLA TURONICA
105	LOXOSTOMA GEMMUM
98	MARGINULOPSIS SIGALI
140	MARSONELLA OXYCONA
122	METACYPRIS FORBESII
155	MILIAMMINA JURASSICA
39	MILIAMMINA SP
166	NEOBULIMINA VARSOVIENSIS
133	NEOCYTHERE VANVEENI
178	NEOFLABELLINA RUGOSA
65	ORBITOLINA SP.
41	OSANGULARIA UTATURENSIS
44	OSANGULARIA INSIGNA
121	OSTRACOD SP 50
120	OSTRACOD SP 48
123	PARACYPRIS SP
103	PENTACRINUS SP
184	PETREL LIMESTONE
173	PLANULINA TAYLORENSIS
143	PLANULARIA KOCHII
40	PLANOMALINA BUXTORFI
37	PRAEBULIMINA SP 13
18	PRAEBULIMINA SP
129	PRAEGLOBOTRUNCANA HAGNI
170	PRAEGLOBOTRUNCANA SP
130	PRAEGLOBOTRUNCANA DIFFORMIS
30	PRAEGLOBOTRUNCANA STEPHANI
31	PRAEGLOBOTRUNCANA TURBINATA
34	PRAEGLOBOTRUNCANA DELRIOENSIS
99	PSEUDONODOSARIA HUMILIS
7	PSEUDOTEXTULARIA ELEGANS
165	PSEUDOCYCLAMMINA LITUUS
179	REINHOLDELLA CREBRA VAR
21	REUSSELLA SZAJNOCHAE
52	ROTALIPORA SUBTICINENSIS
27	ROTALIPORA CUSHMANI
43	ROTALIPORA TICINENSIS
33	ROTALIPORA APPENNINICA
29	ROTALIPORA DECKERI
28	ROTALIPORA GREENHORNENSIS
59	RUGOGLOBIGERINA ROTUNDIDORSATA
16	RUGOGLOBIGERINA RUGOSA
137	SCHULERIDEA SP 1
22	SIGALIA DEFLAENSIS

63	SPIROPLECTAMMINA LATA
5	STENSIOINA POMMERANA
23	STENSIOINA EXCULPTA
79	TEXTULARIA FOEDA
36	TEXTULARIA LOSANGICA
144	TICINELLA BREGGIENSIS
68	TROCHOLINA SP
158	TROCHOLINA CONICA
183	TROCHOLINA SP (TOP)
161	TROCHOLINA TRANSVERSARII
96	UVIGERINAMMINA SP
175	VAGINULINA TEXANA
100	VAGINULINA PROCERA
76	VALVULINERIA GRACILLIMA
172	VALVULINA MEENTZENI
80	VERNEUILLINOIDES SUBFILIFORMIS
167	VERNEUILINOIDES NEOCOMIENSIS

OPTIMUM SEQUENCE TABULATED WITH EVENT RANGES AND LABELS;

SEQUENCE POSITION	FOSSIL NUMBER	RANGE	FOSSIL NAME
1	5	0- 5	STENSIOINA POMMERANA
2	4	0- 6	GLOBOTRUNCANA ARCA
3	3	0- 6	GLOBOTRUNCANA STUARTI
4	105	0- 5	LOXOSTOMA GEMMUM
5	6	4- 6	GLOBOTRUNCANELLA HAVANENSIS
6	8	5- 8	GLOBIGERINELLOIDES MESSINAE
7	16	5- 8	RUGOGLOBIGERINA RUGOSA
8	13	7- 9	GLOBOTRUNCANA LINNEIANA
9	12	8- 10	GLOBOTRUNCANA STUARTIFORMIS
10	11	9- 11	GLOBOTRUNCANA FORNICATA
11	14	10- 12	GLOBOTRUNCANA CRETACEA
12	15	11- 13	GLOBOTRUNCANA MARGINATA
13	26	12- 16	GLOBOTRUNCANA ANGUSTICARINATA
14	108	12- 22	GAVELINELLA MINIMA
15	56	12- 16	GAUDRYINA AUSTINANA
16	20	15- 17	GLOBOTRUNCANA CORONATA
17	23	16- 18	STENSIOINA EXCULPTA
18	55	17- 21	GLOBOTRUNCANA CARINATA
19	24	17- 20	HEDBERGELLA AMABILIS
20	22	19- 21	SIGALIA DEFLAENSIS
21	54	20- 22	GLOBOTRUNCANA CONCAVATA
22	72	21- 23	GLOBOTRUNCANA RENZI
23	109	22- 25	COARSE AGGLUTINATED SPP
24	110	21- 25	GLOBOTRUNCANA IMBRICATA
25	70	24- 26	HEDBERGELLA BOSQUENSIS
26	112	25- 28	GLOBOTRUNCANA HELVETICA
27	30	25- 29	PRAEGLOBOTRUNCANA STEPHANI
28	71	26- 29	GLOBOTRUNCANA SCHNEEGANSI
29	31	28- 30	PRAEGLOBOTRUNCANA TURBINATA
30	27	29- 32	ROTALIPORA CUSHMANI
31	131	29- 32	GAVELINOPSIS CENOMANICA

- RANGES DEFINE OUTER LIMITS IN THE POSITION SEQUENCE. EVENTS CAN OCCUR ANYWHERE WITHIN THESE LIMITS. (NOTE: THIS RANGE IS NOT STRATIGRAPHIC)

SCALING ANALYSIS

EVALUATION BASED ON UNWEIGHTED AND WEIGHTED DISTANCE ANALYSIS;

UPPER TRIANGLE OF NORMAL Z VALUES

0.000	.000	.000	.000	.210	.674	.180	.674	.967	.967	1.645	1.645	1.645	9.000	9.000
1.645	1.645	9.000	1.645	1.645	1.645	1.645	9.000	9.000	1.645	9.000	1.645	1.645	9.000	9.000
9.000														
3.500	0.000	.000	.000	.000	.524	.566	.548	.589	.887	1.645	1.645	1.645	9.000	1.645
1.645	1.645	1.645	1.645	1.645	1.645	1.645	1.645	9.000	1.645	9.000	1.645	1.645	1.645	1.645
1.645														
2.000	3.000	0.000	.000	.000	.430	1.150	.674	.674	.967	1.645	1.645	1.645	9.000	9.000
1.645	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
2.500	2.000	1.500	0.000	.430	9.000	.000	1.150	.967	9.000	1.645	1.645	9.000	9.000	9.000
9.000	9.000	9.000	9.000	9.000	1.645	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
2.500	3.500	2.000	1.000	0.000	.524	.180	.318	.674	.841	1.645	1.645	9.000	9.000	9.000
1.645	1.645	9.000	1.645	1.645	1.645	1.645	9.000	9.000	1.645	9.000	1.645	1.645	9.000	9.000
9.000														
1.000	1.500	1.000	0.000	1.500	0.000	.000	.430	1.150	1.645	1.645	1.645	1.645	9.000	9.000
1.645	1.645	9.000	1.645	1.645	1.645	1.645	9.000	9.000	1.645	9.000	1.645	9.000	1.645	1.645
9.000														
3.000	2.000	.500	2.000	3.000	2.000	0.000	.157	.210	.210	1.150	1.150	9.000	9.000	9.000
1.645	1.645	9.000	1.645	1.645	1.645	1.645	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
2.000	3.500	1.500	.500	3.000	2.000	3.500	0.000	.139	.210	.229	.348	1.645	1.150	.841

1.466 1.645 1.645 1.645 1.645 1.645 1.466 1.645 1.645 1.645 1.645 1.645 1.645 1.645 1.645
1.645

1.000 2.500 1.500 .500 1.500 .500 2.500 4.000 0.000 .430 .253 .524 .674 9.000 9.000
1.645 1.645 1.645 1.645 1.645 1.645 1.645 9.000 9.000 9.000 9.000 1.645 9.000 9.000 9.000
9.000

1.000 1.500 .500 0.000 1.000 .250 2.500 5.000 2.000 0.000 .139 .318 1.282 1.645 .674
1.383 1.645 1.645 1.645 1.645 1.645 1.645 1.645 1.645 1.383 1.645 1.645 1.645 1.645 1.645
1.645

.300 .350 .150 .150 .250 .300 .500 4.500 2.000 4.000 0.000 1.036 1.383 1.150 .967
1.466 1.645 1.645 1.645 1.645 1.645 1.534 1.645 1.645 1.645 1.645 1.645 1.645 1.645 1.645
1.645

.300 .450 .150 .150 .200 .250 .500 4.000 1.500 3.000 1.500 0.000 .253 .318 .318
.674 1.645 -.430 1.645 1.150 1.645 .791 .674 1.150 1.645 .841 1.150 1.383 1.645 1.645
1.645

.200 .200 .150 0.000 0.000 .200 0.000 .250 1.000 .500 .500 2.000 0.000 9.000 9.000
.430 .967 1.645 .967 9.000 1.645 1.645 9.000 9.000 1.150 9.000 1.645 9.000 1.645 9.000
9.000

0.000 0.000 0.000 0.000 0.000 0.000 0.000 .500 0.000 .150 .500 1.500 0.000 0.000 9.000
9.000 9.000 9.000 9.000 9.000 9.000 .967 1.150 .674 9.000 1.282 1.282 1.645 1.282 9.000
1.645

0.000 .150 0.000 0.000 0.000 0.000 0.000 1.000 0.000 1.000 .500 1.500 0.000 0.000 0.000
.967 9.000 9.000 9.000 9.000 1.150 9.000 9.000 9.000 9.000 9.000 1.645 9.000 9.000 9.000
9.000

.250 .200 .150 0.000 .150 .200 .150 .500 .200 .500 .500 1.500 2.000 0.000 .500
0.000 .967 .430 1.150 9.000 1.282 .841 .430 9.000 .841 9.000 1.645 1.150 1.645 9.000
1.645

.150 .200 0.000 0.000 .150 .150 .150 .200 .200 .250 .200 .150 .500 0.000 0.000
.500 0.000 .967 .430 9.000 .967 1.645 9.000 9.000 9.000 9.000 9.000 9.000 9.000 1.645
9.000

0.000	.200	0.000	0.000	0.000	0.000	0.000	.150	.150	.200	.150	2.000	.150	0.000	0.000
1.000	.500	0.000	9.000	9.000	.674	1.645	.967	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
.200	.150	0.000	0.000	.150	.150	.150	.300	.150	.350	.300	.200	.500	0.000	0.000
.500	1.000	0.000	0.000	.430	.430	.674	9.000	9.000	.000	9.000	.524	.000	.318	1.645
1.645														
.200	.200	0.000	0.000	.200	.150	.150	.200	.150	.200	.250	.500	0.000	0.000	0.000
0.000	0.000	0.000	1.000	0.000	.674	1.150	9.000	9.000	9.000	9.000	1.645	9.000	9.000	9.000
9.000														
.350	.400	0.000	.200	.300	.200	.300	.450	.250	.400	.350	.400	.200	0.000	.500
.500	.500	1.000	1.000	1.000	0.000	.566	.000	.430	-.253	.430	.841	.253	.967	9.000
9.000														
.250	.300	0.000	0.000	.200	.150	.150	.500	.150	.300	.500	1.500	.150	.500	0.000
1.000	.150	.200	1.000	.500	2.000	0.000	.524	9.000	.000	1.645	.841	.841	1.645	1.645
1.645														
0.000	.200	0.000	0.000	0.000	0.000	0.000	.250	0.000	.200	.250	1.500	0.000	.500	0.000
1.000	0.000	.500	0.000	0.000	2.000	1.500	0.000	.000	1.645	.318	.841	1.282	1.645	9.000
1.645														
0.000	0.000	0.000	0.000	0.000	0.000	0.000	.200	0.000	.200	.200	.500	0.000	1.000	0.000
0.000	0.000	0.000	0.000	0.000	1.000	0.000	1.500	0.000	.430	.253	.253	.967	.841	9.000
9.000														
.150	.150	0.000	0.000	.150	.200	0.000	.300	0.000	.500	.300	.250	.500	0.000	0.000
1.000	0.000	0.000	2.000	0.000	3.000	2.000	.150	1.000	0.000	.967	1.645	.524	1.150	9.000
1.645														
0.000	0.000	0.000	0.000	0.000	0.000	0.000	.250	0.000	.200	.250	1.000	0.000	.500	0.000
0.000	0.000	0.000	0.000	0.000	1.000	.150	1.500	2.000	.500	0.000	.000	.674	.210	9.000
1.645														

.150 .300 0.000 0.000 .200 .200 0.000 .450 .200 .350 .400 1.000 .150 .500 .150
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1.645

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.500 0.000 0.000 1.500 0.000 2.000 1.000 .500 .500 1.500 1.000 2.500 0.000 .318 9.000
1.645

0.000 .150 0.000 0.000 0.000 .200 0.000 .300 0.000 .300 .350 .300 .150 .500 0.000
.200 0.000 0.000 1.500 0.000 .500 .200 .200 1.000 .500 2.500 3.000 1.500 0.000 .674
1.150

0.000 .150 0.000 0.000 0.000 .150 0.000 .250 0.000 .250 .300 .200 0.000 0.000 0.000
0.000 .150 0.000 .250 0.000 0.000 .150 0.000 0.000 0.000 0.000 .500 0.000 1.000 0.000
.000

0.000 .150 0.000 0.000 0.000 0.000 0.000 .300 0.000 .250 .350 .250 0.000 .150 0.000
.150 0.000 0.000 .250 0.000 0.000 .250 .150 0.000 .150 .150 .250 .150 .500 2.500
0.000

UNWEIGHTED DISTANCE ANALYSIS

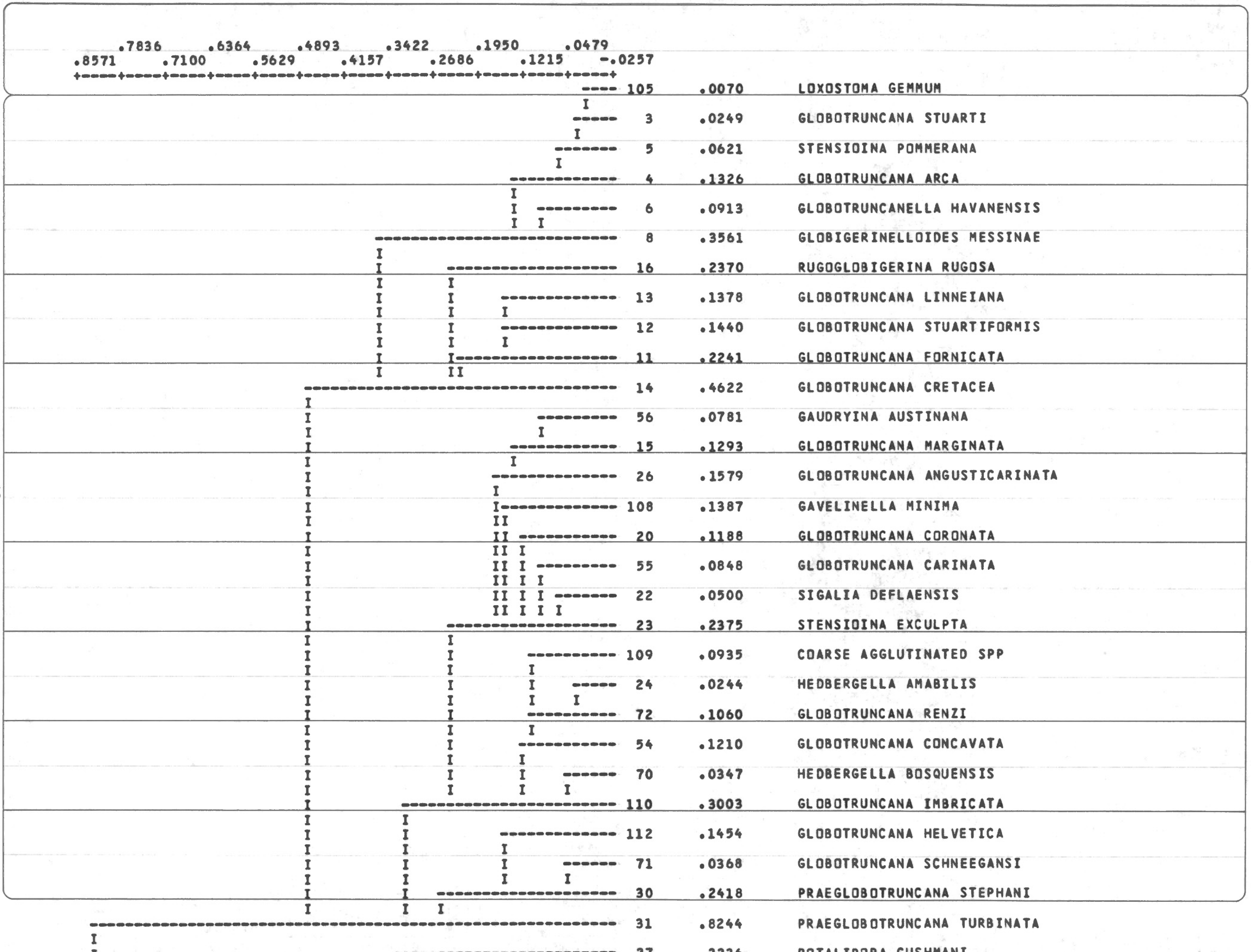
POSITION	FOSSIL PAIRS	FOSSIL DISTANCE	CUMULATIVE DISTANCE	SUM DIFF Z VALUES	NO. PAIRS
1	5- 4	.0621	.0621	.56	9.
2	4- 3	-.0870	-.0249	-.78	9.
3	3-105	-.0070	-.0319	-.05	7.
4	105- 6	.2266	.1947	1.59	7.
5	6- 8	.0913	.2860	.73	8.
6	8- 16	.3561	.6420	3.56	10.
7	16- 13	.2370	.8791	4.03	17.
8	13- 12	.1378	1.0169	1.79	13.
9	12- 11	.1440	1.1608	1.73	12.
10	11- 14	.2241	1.3850	3.14	14.
11	14- 15	.5403	1.9253	11.35	21.
12	15- 26	.1293	2.0546	1.68	13.
13	26-108	.1579	2.2125	1.11	7.
14	108- 56	-.3652	1.8472	-1.83	5.
15	56- 20	.5039	2.3511	3.02	6.
16	20- 23	.2536	2.6047	2.79	11.
17	23- 55	-.1348	2.4699	-.67	5.
18	55- 24	.4659	2.9358	2.80	6.
19	24- 22	-.3811	2.5547	-1.91	5.
20	22- 54	.5114	3.0662	2.56	5.
21	54- 72	-.1060	2.9602	-1.91	18.
22	72-109	-.1179	2.8423	-1.53	13.
23	109-110	.3796	3.2219	3.42	9.
24	110- 70	-.0347	3.1872	-.35	10.
25	70-112	.3350	3.5222	3.68	11.
26	112- 30	.1822	3.7044	1.82	10.
27	30- 71	-.0368	3.6676	-.44	12.
28	71- 31	.2786	3.9461	3.62	13.

29	31- 27	.8244	4.7706	4.12	5.
30	27-131	.3236	5.0942	.97	3.

EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES

NEW SEQUENCE	DISTANCE FROM 1ST POSITION	FOSSIL PAIRS	INTER FOSSIL DISTANCE
105	-.0319	105- 3	.0070
3	-.0249	3- 5	.0249
5	0.0000	5- 4	.0621
4	.0621	4- 6	.1326
6	.1947	6- 8	.0913
8	.2860	8- 16	.3561
16	.6420	16- 13	.2370
13	.8791	13- 12	.1378
12	1.0169	12- 11	.1440
11	1.1608	11- 14	.2241
14	1.3850	14- 56	.4622
56	1.8472	56- 15	.0781
15	1.9253	15- 26	.1293
26	2.0546	26-108	.1579
108	2.2125	108- 20	.1387
20	2.3511	20- 55	.1188
55	2.4699	55- 22	.0848
22	2.5547	22- 23	.0500
23	2.6047	23-109	.2375
109	2.8423	109- 24	.0935
24	2.9358	24- 72	.0244
72	2.9602	72- 54	.1060
54	3.0662	54- 70	.1210
70	3.1872	70-110	.0347
110	3.2219	110-112	.3003
112	3.5222	112- 71	.1454
71	3.6676	71- 30	.0368
30	3.7044	30- 31	.2418
31	3.9461	31- 27	.8244
27	4.7706	27-131	.3236
131	5.0942		

DENDROGRAM OF UNWEIGHTED INTERFOSSIL DISTANCES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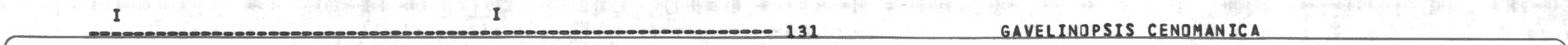
.8571 .7100 .5629 .4157 .2686 .1215 -.0257
105 .0070 LOXOSTOMA GEMMUM
3 .0249 GLOBOTRUNCANA STUARTI
5 .0621 STENSIOINA POMMERANA
4 .1326 GLOBOTRUNCANA ARCA
6 .0913 GLOBOTRUNCANELLA HAVANENSIS
8 .3561 GLOBIGERINELLOIDES MESSINAE
16 .2370 RUGOGLOBIGERINA RUGOSA
13 .1378 GLOBOTRUNCANA LINNEIANA
12 .1440 GLOBOTRUNCANA STUARTIFORMIS
11 .2241 GLOBOTRUNCANA FORNICATA
14 .4622 GLOBOTRUNCANA CRETACEA
56 .0781 GAUDRYINA AUSTINANA
15 .1293 GLOBOTRUNCANA MARGINATA
26 .1579 GLOBOTRUNCANA ANGUSTICARINATA
108 .1387 GAVELINELLA MINIMA
20 .1188 GLOBOTRUNCANA CORONATA
55 .0848 GLOBOTRUNCANA CARINATA
22 .0500 SIGALIA DEFLAENSIS
23 .2375 STENSIOINA EXCULPTA
109 .0935 COARSE AGGLUTINATED SPP
24 .0244 HEDBERGELLA AMABILIS
72 .1060 GLOBOTRUNCANA RENZI
54 .1210 GLOBOTRUNCANA CONCAVATA
70 .0347 HEDBERGELLA BOSQUENSIS
110 .3003 GLOBOTRUNCANA IMBRICATA
112 .1454 GLOBOTRUNCANA HELVETICA
71 .0368 GLOBOTRUNCANA SCHNEEGANSI
30 .2418 PRAEGLOBOTRUNCANA STEPHANI
31 .8244 PRAEGLOBOTRUNCANA TURBINATA
27 .3236 ROTALIPORA CUSHMANI



DENDROGRAM - VALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES
VALUES ALONG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR

DISTANCE ANALYSIS REPEATED WITH WEIGHTED DIFFERENCES

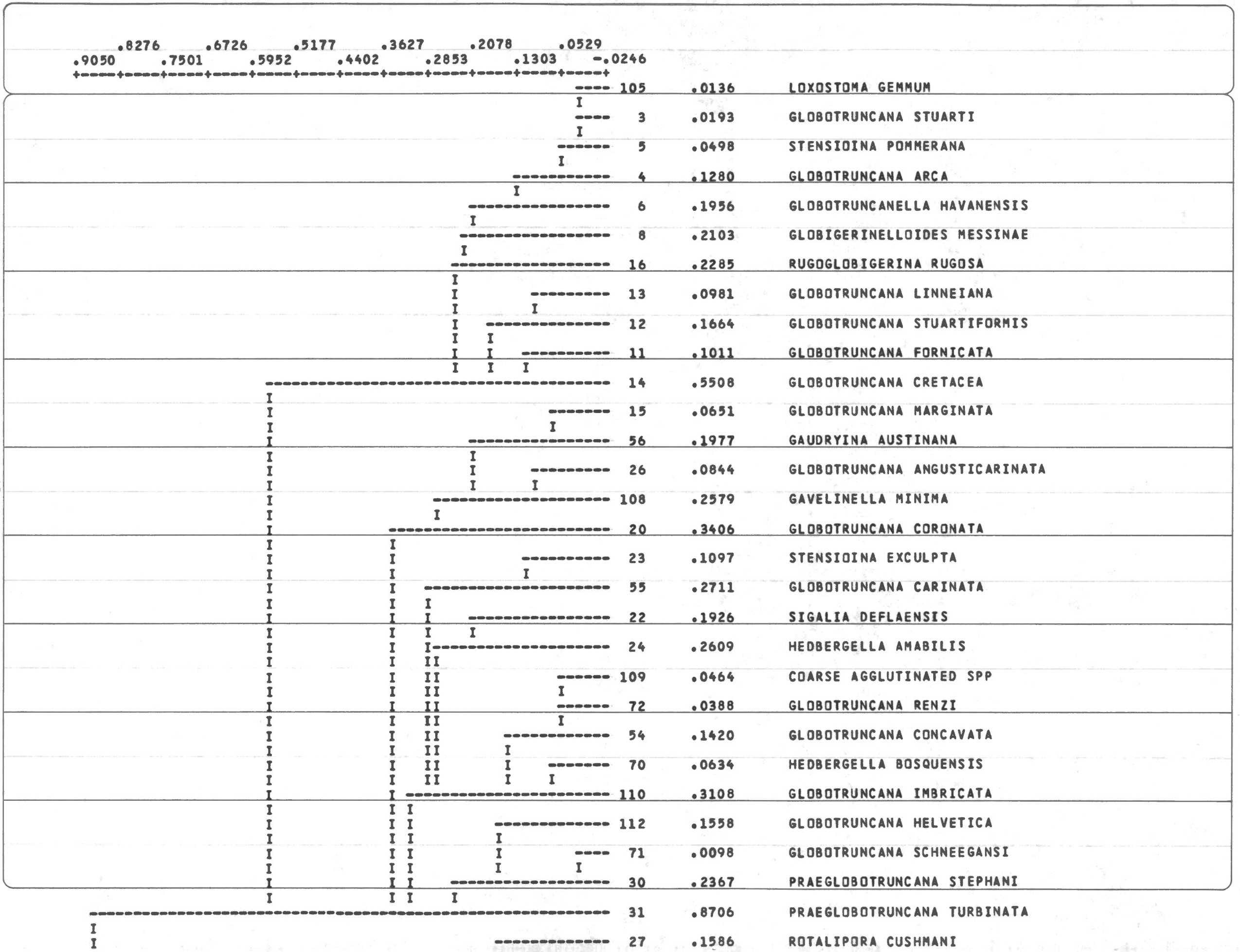
POSITION	FOSSIL PAIRS	FOSSIL DISTANCE	CUMULATIVE DISTANCE	SUM DIFF Z VALUES	WEIGHT	S.D.
1	5- 4	.0498	.0498	.9330	18.7	.0676
2	4- 3	-.0691	-.0193	-1.0725	15.5	.0547
3	3-105	-.0136	-.0329	-.1207	8.9	.1833
4	105- 6	.2107	.1778	2.0989	10.0	.1236
5	6- 8	.1956	.3734	2.4529	12.5	.1544
6	8- 16	.2103	.5837	2.8706	13.6	.1718
7	16- 13	.2285	.8122	5.9092	25.9	.0861
8	13- 12	.0981	.9103	2.5201	25.7	.0752
9	12- 11	.1664	1.0767	3.4235	20.6	.0689
10	11- 14	.1011	1.1778	2.1522	21.3	.1209
11	14- 15	.5508	1.7286	14.0818	25.6	.0995
12	15- 26	.2629	1.9914	3.5202	13.4	.1868
13	26-108	.0844	2.0758	.4015	4.8	.1417
14	108- 56	-.2821	1.7937	-1.0977	3.9	.1503
15	56- 20	.5400	2.3337	3.4770	6.4	.1472
16	20- 23	.3406	2.6743	2.7714	8.1	.1673
17	23- 55	.1097	2.7839	.4257	3.9	.4957
18	55- 24	.4637	3.2476	1.9711	4.3	.3860
19	24- 22	-.1926	3.0550	-.9461	4.9	.2677
20	22- 54	.5386	3.5937	3.0416	5.6	.1242
21	54- 72	-.0388	3.5549	-.7354	18.9	.1284
22	72-109	-.0464	3.5085	-.6339	13.7	.1622
23	109-110	.2905	3.7990	2.7737	9.5	.1415
24	110- 70	-.0634	3.7357	-.5519	8.7	.2388
25	70-112	.3741	4.1098	3.6336	9.7	.2554
26	112- 30	.1656	4.2754	2.3571	14.2	.1054
27	30- 71	-.0098	4.2656	-.1456	14.8	.1413
28	71- 31	.2465	4.5121	3.2554	13.2	.1031
29	31- 27	.8706	5.3827	4.7841	5.5	.1689
30	27-131	.1586	5.5413	.7507	4.7	.1607

EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES
NOTE: AFTER SORTING, IN ORDER TO RECALCULATE STANDARD DEVIATIONS, DISTANCE VALUES MUST BE RECALCULATED

NEW SEQUENCE	DISTANCE FROM 1ST POSITION	FOSSIL PAIRS	INTER FOSSIL DISTANCE
105	-.0329	105- 3	.0136
3	-.0193	3- 5	.0193
5	0.0000	5- 4	.0498
4	.0498	4- 6	.1280
6	.1778	6- 8	.1956
8	.3734	8- 16	.2103
16	.5837	16- 13	.2285
13	.8122	13- 12	.0981
12	.9103	12- 11	.1664
11	1.0767	11- 14	.1011
14	1.1778	14- 15	.5508
15	1.7286	15- 56	.0651
56	1.7937	56- 26	.1977
26	1.9914	26-108	.0844
108	2.0758	108- 20	.2579
20	2.3337	20- 23	.3406
23	2.6743	23- 55	.1097

55	2.7839	55- 22	.2711
22	3.0550	22- 24	.1926
24	3.2476	24-109	.2609
109	3.5085	109- 72	.0464
72	3.5549	72- 54	.0388
54	3.5937	54- 70	.1420
70	3.7357	70-110	.0634
110	3.7990	110-112	.3108
112	4.1098	112- 71	.1558
71	4.2656	71- 30	.0098
30	4.2754	30- 31	.2367
31	4.5121	31- 27	.8706
27	5.3827	27-131	.1586
131	5.5413		

DENDROGRAM OF WEIGHTED INTERFOSSIL DISTANCES


.8276 .6726 .5177 .3627 .2078 .0529
.9050 .7501 .5952 .4402 .2853 .1303 -.0246
105 .0136 LOXOSTOMA GEMMUM
3 .0193 GLOBOTRUNCANA STUARTI
5 .0498 STENSIOINA POMMERANA
4 .1280 GLOBOTRUNCANA ARCA
6 .1956 GLOBOTRUNCANELLA HAVANENSIS
8 .2103 GLOBIGERINELLOIDES MESSINAE
16 .2285 RUGOGLOBIGERINA RUGOSA
13 .0981 GLOBOTRUNCANA LINNEIANA
12 .1664 GLOBOTRUNCANA STUARTIFORMIS
11 .1011 GLOBOTRUNCANA FORNICATA
14 .5508 GLOBOTRUNCANA CRETACEA
15 .0651 GLOBOTRUNCANA MARGINATA
56 .1977 GAUDRYINA AUSTINANA
26 .0844 GLOBOTRUNCANA ANGUSTICARINATA
108 .2579 GAVELINELLA MINIMA
20 .3406 GLOBOTRUNCANA CORONATA
23 .1097 STENSIOINA EXCULPTA
55 .2711 GLOBOTRUNCANA CARINATA
22 .1926 SIGALIA DEFLAENSIS
24 .2609 HEDBERGELLA AMABILIS
109 .0464 COARSE AGGLUTINATED SPP
72 .0388 GLOBOTRUNCANA RENZI
54 .1420 GLOBOTRUNCANA CONCAVATA
70 .0634 HEDBERGELLA BOSQUENSIS
110 .3108 GLOBOTRUNCANA IMBRICATA
112 .1558 GLOBOTRUNCANA HELVETICA
71 .0098 GLOBOTRUNCANA SCHNEEGANSI
30 .2367 PRAEGLOBOTRUNCANA STEPHANI
31 .8706 PRAEGLOBOTRUNCANA TURBINATA
27 .1586 ROTALIPORA CUSHMANI

.9050 .7501 .5952 .4402 .2853 .1303 -.0246
.8276 .6726 .5177 .3627 .2078 .0529

DENDROGRAM - VALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES
VALUES ALONG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR

APPLICATION OF FINAL REORDERING;

DISTANCES ESTIMATED FROM SUCCESSIVE EVENTS

TO RECALCULATE STANDARD DEVIATIONS , DISTANCE VALUES AVE TO BE RECALCULATED STARTING WITH THE NEW SEQUENCE

UPPER TRIANGLE OF NORMAL Z VALUES

0.000	.000	.000	.000	.429	9.000	-.000	1.151	.967	9.000	1.645	1.645	9.000	9.000	9.000
9.000	9.000	9.000	9.000	9.000	9.000	9.000	1.645	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
1.500	0.000	.000	.000	-.000	.429	1.151	.673	.673	.967	1.645	1.645	9.000	1.645	9.000
1.645	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000	9.000
9.000														
2.500	2.000	0.000	-.000	.209	.673	.178	.673	.967	.967	1.645	1.645	9.000	1.645	9.000
1.645	1.645	9.000	1.645	9.000	1.645	1.645	1.645	9.000	1.645	9.000	1.645	1.645	9.000	9.000
9.000														
2.000	3.000	3.500	0.000	-.000	.522	.564	.547	.588	.887	1.645	1.645	1.645	1.645	9.000
1.645	1.645	1.645	1.645	1.645	1.645	1.645	1.645	9.000	1.645	9.000	1.645	1.645	1.645	1.645
1.645														
1.000	2.000	2.500	3.500	0.000	.522	.178	.316	.673	.841	1.645	1.645	9.000	9.000	9.000
1.645	1.645	9.000	1.645	9.000	1.645	1.645	1.645	9.000	1.645	9.000	1.645	1.645	9.000	9.000
9.000														
0.000	1.000	1.000	1.500	1.500	0.000	-.000	.429	1.151	1.645	1.645	1.645	9.000	1.645	9.000
1.645	1.645	9.000	1.645	9.000	1.645	1.645	1.645	9.000	1.645	9.000	9.000	1.645	1.645	1.645
9.000														

2.000 .500 3.000 2.000 3.000 2.000 0.000 .156 .209 .209 1.151 1.151 9.000 9.000 9.000
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.150 .150 .300 .350 .250 .300 .500 4.500 2.000 4.000 0.000 1.036 .967 1.384 1.151
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.673 1.645 -.429 1.151 .673 1.645 .791 1.645 1.151 1.645 .841 1.384 1.151 1.645 1.645
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9.000 9.000 9.000 9.000 1.151 9.000 .967 9.000 .673 9.000 1.282 1.645 1.282 1.282 9.000
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0.000 .150 .250 .200 .150 .200 .150 .500 .200 .500 .500 1.500 .500 2.000 0.000
0.000 .967 .429 9.000 .429 .841 .841 1.282 9.000 1.151 9.000 1.151 1.645 1.645 9.000

1.645

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.500 0.000 .967 9.000 9.000 9.000 1.645 .967 9.000 .429 9.000 9.000 9.000 9.000 1.645
9.000

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1.645

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0.000 0.000 .150 .150 .150 .200 0.000 .300 0.000 .500 .300 .250 0.000 .500 0.000
1.000 0.000 0.000 0.000 .150 0.000 .000 .251 -.429 .000 .967 .522 1.645 1.151 9.000
1.645

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1.000 .150 .200 .500 3.498 2.000 0.000 -.564 9.000 -.673 1.645 .841 .841 1.645 1.645
1.645

.200 0.000 .350 .400 .300 .200 .300 .450 .250 .400 .350 .400 .500 .200 0.000
.500 .500 1.000 1.001 2.000 2.003 4.997 0.000 .429 -.429 .429 .251 .841 .967 9.000
9.000

0.000 0.000 0.000 0.000 0.000 0.000 0.000 .200 0.000 .200 .200 .500 0.000 0.000 1.000
0.000 0.000 0.000 0.000 1.500 1.999 0.000 1.001 0.000 9.000 .251 .967 .251 .841 9.000
9.000

0.000 0.000 .200 .150 .150 .150 .150 .300 .150 .350 .300 .200 0.000 .500 0.000
.500 1.000 0.000 1.999 0.000 2.000 2.995 1.996 0.000 0.000 9.000 -.000 .522 .316 1.645
1.645

0.000 0.000 0.000 0.000 0.000 0.000 0.000 .250 0.000 .200 .250 1.000 0.000 0.000 .500
0.000 0.000 0.000 0.000 1.500 .500 .150 1.000 2.000 0.000 0.000 .673 -.000 .209 9.000
1.645

0.000 0.000 .150 .200 .150 0.000 0.000 .300 0.000 .200 .250 .500 0.000 0.000 .200
.500 0.000 0.000 0.000 .500 1.500 1.000 2.000 .500 1.500 1.000 0.000 .000 .316 9.000
1.645

0.000 0.000 .150 .300 .200 .200 0.000 .450 .200 .350 .400 1.000 .150 .150 .500
.200 0.000 0.000 .200 1.000 .200 1.000 1.000 2.000 1.500 3.000 2.500 0.000 .178 1.151
1.645

0.000 0.000 0.000 .150 0.000 .200 0.000 .300 0.000 .300 .350 .300 0.000 .150 .500
.200 0.000 0.000 0.000 .200 .500 .200 .500 1.000 1.500 2.500 1.500 3.000 0.000 .673
1.151

0.000 0.000 0.000 .150 0.000 .150 0.000 .250 0.000 .250 .300 .200 0.000 0.000 0.000
0.000 .150 0.000 0.000 0.000 0.000 .150 0.000 0.000 .250 0.000 0.000 .500 1.000 0.000
-.000

0.000 0.000 0.000 .150 0.000 0.000 0.000 .300 0.000 .250 .350 .250 0.000 0.000 .150
.150 0.000 0.000 0.000 .150 .150 .250 0.000 0.000 .250 .150 .150 .250 .500 2.500
0.000

UNWEIGHTED DISTANCE ANALYSIS

POSITION	FOSSIL PAIRS	FOSSIL DISTANCE	CUMULATIVE DISTANCE	SUM DIFF Z VALUES	NO. PAIRS
1	105- 3	.0071	.0071	.05	7.
2	3- 5	.0250	.0321	.23	9.
3	5- 4	.0622	.0943	.56	9.
4	4- 6	.1348	.2292	1.21	9.
5	6- 8	.0902	.3194	.72	8.
6	8- 16	.3565	.6759	3.57	10.
7	16- 13	.2685	.9444	4.03	15.
8	13- 12	.0951	1.0395	1.62	17.
9	12- 11	.1437	1.1832	1.72	12.
10	11- 14	.1493	1.3325	2.99	20.
11	14- 15	.5407	1.8732	11.35	21.
12	15- 56	.1148	1.9880	.80	7.
13	56- 26	.3017	2.2896	1.81	6.
14	26-108	.1576	2.4472	1.10	7.
15	108- 20	.1495	2.5967	1.35	9.
16	20- 23	.2536	2.8503	2.79	11.
17	23- 55	-.1122	2.7382	-.67	6.
18	55- 22	.6912	3.4293	2.07	3.
19	22-109	.6681	4.0975	2.67	4.

20	109- 70	.1852	4.2827	2.22	12.
21	70- 72	-.1252	4.1575	-1.75	14.
22	72- 54	.1058	4.2634	1.91	18.
23	54-110	-.0710	4.1923	-.57	8.
24	110- 24	.2143	4.4067	1.29	6.
25	24-112	.4708	4.8774	3.30	7.
26	112- 71	.1727	5.0501	1.73	10.
27	71- 30	.0367	5.0868	.44	12.
28	30- 31	.2529	5.3397	3.79	15.
29	31- 27	1.0312	6.3709	4.12	4.
30	27-131	.3240	6.6949	.97	3.

EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES

NEW SEQUENCE	DISTANCE FROM 1ST POSITION	FOSSIL PAIRS	INTER FOSSIL DISTANCE
105	0.0000	105- 3	.0071
3	.0071	3- 5	.0250
5	.0321	5- 4	.0622
4	.0943	4- 6	.1348
6	.2292	6- 8	.0902
8	.3194	8- 16	.3565
16	.6759	16- 13	.2685
13	.9444	13- 12	.0951
12	1.0395	12- 11	.1437
11	1.1832	11- 14	.1493
14	1.3325	14- 15	.5407
15	1.8732	15- 56	.1148
56	1.9880	56- 26	.3017
26	2.2896	26-108	.1576
108	2.4472	108- 20	.1495
20	2.5967	20- 55	.1415
55	2.7382	55- 23	.1122
23	2.8503	23- 22	.5790
22	3.4293	22-109	.6681
109	4.0975	109- 72	.0601
72	4.1575	72-110	.0348
110	4.1923	110- 54	.0710
54	4.2634	54- 70	.0193
70	4.2827	70- 24	.1240
24	4.4067	24-112	.4708
112	4.8774	112- 71	.1727
71	5.0501	71- 30	.0367
30	5.0868	30- 31	.2529
31	5.3397	31- 27	1.0312
27	6.3709	27-131	.3240
131	6.6949		

DENDROGRAM OF UNWEIGHTED INTERFOSSIL DISTANCES

.9800 .7957 .6113 .4270 .2426 .0583
1.0722 .8878 .7035 .5192 .3348 .1505 -.0339
105 .0071 LOXOSTOMA GEMMUM
3 .0250 GLOBOTRUNCANA STUARTI
5 .0622 STENSIOINA POMMERANA
4 .1348 GLOBOTRUNCANA ARCA
6 .0902 GLOBOTRUNCANELLA HAVANENSIS
8 .3565 GLOBIGERINELLOIDES MESSINAE
16 .2685 RUGOGLOBIGERINA RUGOSA
13 .0951 GLOBOTRUNCANA LINNEIANA
12 .1437 GLOBOTRUNCANA STUARTIFORMIS
11 .1493 GLOBOTRUNCANA FORNICATA
14 .5407 GLOBOTRUNCANA CRETACEA
15 .1148 GLOBOTRUNCANA MARGINATA
56 .3017 GAUDRYINA AUSTINANA
26 .1576 GLOBOTRUNCANA ANGUSTICARINATA
108 .1495 GAVELINELLA MINIMA
20 .1415 GLOBOTRUNCANA CORONATA
55 .1122 GLOBOTRUNCANA CARINATA
23 .5790 STENSIDINA EXCULPTA
22 .6681 SIGALIA DEFLAENSIS
109 .0601 COARSE AGGLUTINATED SPP
72 .0348 GLOBOTRUNCANA RENZI
110 .0710 GLOBOTRUNCANA IMBRICATA
54 .0193 GLOBOTRUNCANA CONCAVATA
70 .1240 HEDBERGELLA BOSQUENSIS
24 .4708 HEDBERGELLA AMABILIS
112 .1727 GLOBOTRUNCANA HELVETICA
71 .0367 GLOBOTRUNCANA SCHNEEGANSI
30 .2529 PRAEGLOBOTRUNCANA STEPHANI
31 1.0312 PRAEGLOBOTRUNCANA TURBINATA
27 .3240 ROTALIPORA CUSHMANI

1.0722 .8878 .7035 .5192 .3348 .1505 -.0339
.9800 .7957 .6113 .4270 .2426 .0583

DENDROGRAM - VALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES
VALUES ALONG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR

DISTANCE ANALYSIS REPEATED WITH WEIGHTED DIFFERENCES

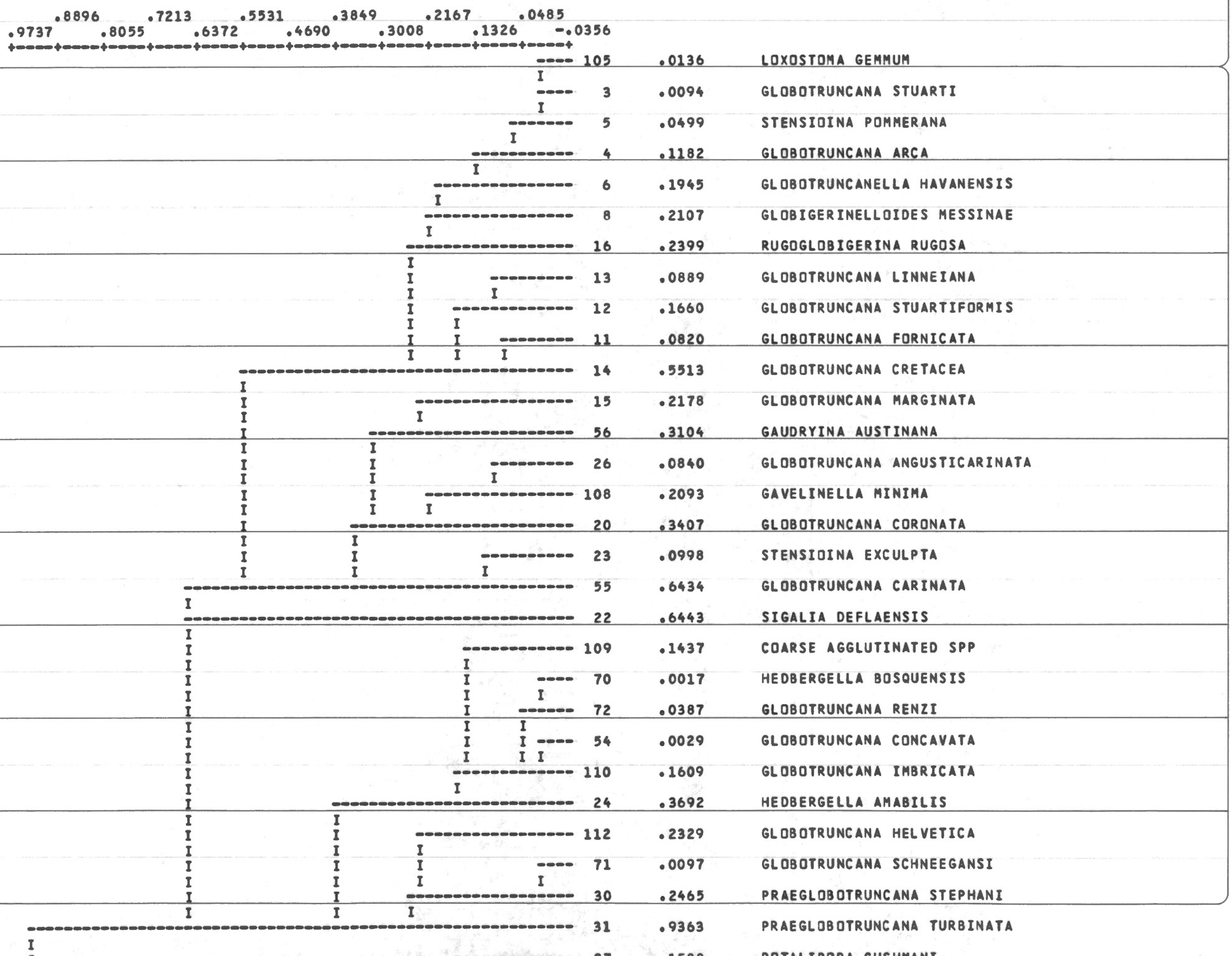
POSITION	FOSSIL PAIRS	FOSSIL DISTANCE	CUMULATIVE DISTANCE	SUM DIFF Z VALUES	WEIGHT	S.D.
1	105- 3	.0136	.0136	.1204	8.9	.1834
2	3- 5	.0094	.0230	.1280	13.6	.1105
3	5- 4	.0499	.0728	.9338	18.7	.0676
4	4- 6	.1182	.1911	2.2346	18.9	.0572
5	6- 8	.1945	.3856	2.4365	12.5	.1543
6	8- 16	.2107	.5963	2.8744	13.6	.1720
7	16- 13	.2399	.8362	5.8990	24.6	.0935
8	13- 12	.0889	.9250	2.4289	27.3	.0640
9	12- 11	.1660	1.0911	3.4131	20.6	.0690
10	11- 14	.0820	1.1731	2.0297	24.7	.0942
11	14- 15	.5513	1.7243	14.0893	25.6	.0996
12	15- 56	.2178	1.9422	1.9811	9.1	.1260
13	56- 26	.3104	2.2525	1.6810	5.4	.1816
14	26-108	.0840	2.3366	.3999	4.8	.1417
15	108- 20	.2093	2.5459	1.4781	7.1	.1200
16	20- 23	.3407	2.8866	2.7717	8.1	.1675
17	23- 55	.0998	2.9864	.4255	4.3	.4232
18	55- 22	.6434	3.6298	1.5920	2.5	.4895
19	22-109	.6443	4.2741	2.4985	3.9	.4545
20	109- 70	.1437	4.4178	1.5216	10.6	.2025
21	70- 72	.0017	4.4196	.0242	13.9	.1816
22	72- 54	.0387	4.4582	.7331	18.9	.1284
23	54-110	.0029	4.4611	.0265	9.2	.1794
24	110- 24	.1609	4.6220	.9679	6.0	.2589
25	24-112	.3692	4.9912	2.6121	7.1	.3297
26	112- 71	.2329	5.2241	2.6872	11.5	.1623
27	71- 30	.0097	5.2338	.1434	14.8	.1414
28	30- 31	.2465	5.4803	4.2505	17.2	.0772
29	31- 27	.9363	6.4166	4.7836	5.1	.1438
30	27-131	.1588	6.5754	.7519	4.7	.1609

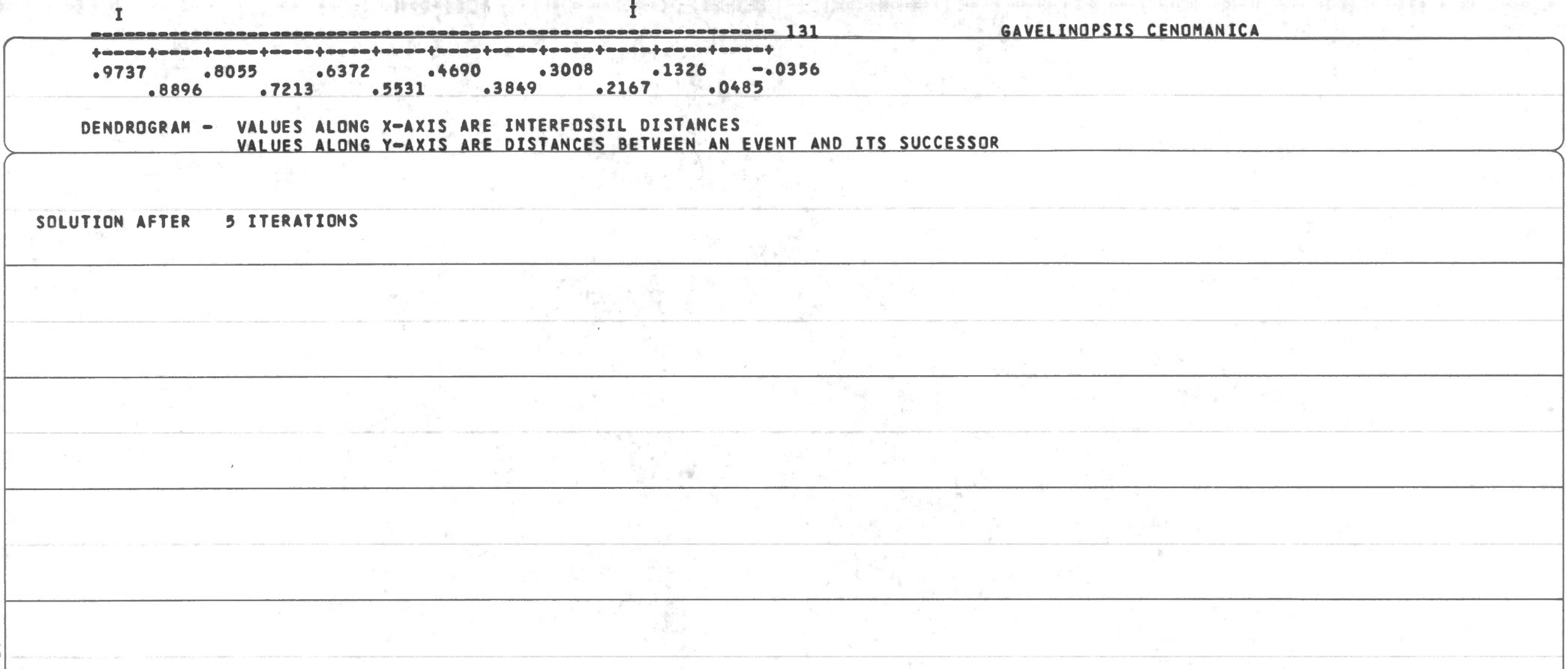
EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES
NOTE: AFTER SORTING, IN ORDER TO RECALCULATE STANDARD DEVIATIONS, DISTANCE VALUES MUST BE RECALCULATED

NEW SEQUENCE	DISTANCE FROM 1ST POSITION	FOSSIL PAIRS	INTER FOSSIL DISTANCE
105	0.0000	105- 3	.0136
3	.0136	3- 5	.0094
5	.0230	5- 4	.0499
4	.0728	4- 6	.1182
6	.1911	6- 8	.1945
8	.3856	8- 16	.2107
16	.5963	16- 13	.2399
13	.8362	13- 12	.0889
12	.9250	12- 11	.1660
11	1.0911	11- 14	.0820
14	1.1731	14- 15	.5513
15	1.7243	15- 56	.2178
56	1.9422	56- 26	.3104
26	2.2525	26-108	.0840
108	2.3366	108- 20	.2093
20	2.5459	20- 23	.3407
23	2.8866	23- 55	.0998

55	2.9864	55- 22	.6434
22	3.6298	22-109	.6443
109	4.2741	109- 70	.1437
70	4.4178	70- 72	.0017
72	4.4196	72- 54	.0387
54	4.4582	54-110	.0029
110	4.4611	110- 24	.1609
24	4.6220	24-112	.3692
112	4.9912	112- 71	.2329
71	5.2241	71- 30	.0097
30	5.2338	30- 31	.2465
31	5.4803	31- 27	.9363
27	6.4166	27-131	.1588
131	6.5754		

DENDROGRAM OF WEIGHTED INTERFOSSIL DISTANCES


.8896 .7213 .5531 .3849 .2167 .0485
.9737 .8055 .6372 .4690 .3008 .1326 -.0356
105 .0136 LOXOSTOMA GEMMUM
3 .0094 GLOBOTRUNCANA STUARTI
5 .0499 STENSIOINA POMMERANA
4 .1182 GLOBOTRUNCANA ARCA
6 .1945 GLOBOTRUNCANELLA HAVANENSIS
8 .2107 GLOBIGERINELLOIDES MESSINAE
16 .2399 RUGOGLOBIGERINA RUGOSA
13 .0889 GLOBOTRUNCANA LINNEIANA
12 .1660 GLOBOTRUNCANA STUARTIFORMIS
11 .0820 GLOBOTRUNCANA FORNICATA
14 .5513 GLOBOTRUNCANA CRETACEA
15 .2178 GLOBOTRUNCANA MARGINATA
56 .3104 GAUDRYINA AUSTINANA
26 .0840 GLOBOTRUNCANA ANGUSTICARINATA
108 .2093 GAVELINELLA MINIMA
20 .3407 GLOBOTRUNCANA CORONATA
23 .0998 STENSIOINA EXCULPTA
55 .6434 GLOBOTRUNCANA CARINATA
22 .6443 SIGALIA DEFLAENSIS
109 .1437 COARSE AGGLUTINATED SPP
70 .0017 HEDBERGELLA BOSQUENSIS
72 .0387 GLOBOTRUNCANA RENZI
54 .0029 GLOBOTRUNCANA CONCAVATA
110 .1609 GLOBOTRUNCANA IMBRICATA
24 .3692 HEDBERGELLA AMABILIS
112 .2329 GLOBOTRUNCANA HELVETICA
71 .0097 GLOBOTRUNCANA SCHNEEGANSI
30 .2465 PRAEGLOBOTRUNCANA STEPHANI
31 .9363 PRAEGLOBOTRUNCANA TURBINATA
27 .1588 ROTALIPORA CUSHMANI


131
GAVELINOPSIS CENOMANICA
.9737
.8055
.6372
.4690
.3008
.1326
-.0356
.8896
.7213
.5531
.3849
.2167
.0485
DENDROGRAM - VALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES
VALUES ALONG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR
SOLUTION AFTER 5 ITERATIONS

OCCURRENCE TABLE

NAME	NO.	WELL NO. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
LOXOSTOMA GEMMUM	105						X				X		X			X		X			
GLOBOTRUNCANA STUARTI	3			X	X	X	X				X		X								
STENSIOINA POMMERANA	5		X	X			X				X	X	X			X		X			X
GLOBOTRUNCANA ARCA	4	X		X	X	X	X	X		X	X	X	X	X				X			X
GLOBOTRUNCANELLA HAVANENSIS	6	X	X	X	X		X			X		X	X			X					
GLOBIGERINELLOIDES MESSINAE	8			X			X			X		X	X		X		X				
RUGOGLOBIGERINA RUGOSA	16	X	X	X		X	X					X	X			X		X			
GLOBOTRUNCANA LINNEIANA	13	X	X	X	X	X	X		X	X	X	X	X	X			X	X	X	X	X
GLOBOTRUNCANA STUARTIFORMIS	12	X		X	X	X	X				X	X	X								X
GLOBOTRUNCANA FORNICATA	11	X	X	X		X				X	X	X			X		X	X	X	X	X
GLOBOTRUNCANA CRETACEA	14			X					X	X	X	X	X	X	X	X	X		X	X	X
GLOBOTRUNCANA MARGINATA	15			X				X	X	X	X	X	X	X			X	X		X	X
GAUDRYINA AUSTINANA	56	X							X								X	X			X
GLOBOTRUNCANA ANGUSTICARINATA	26			X							X		X		X		X				X
GAVELINELLA MINIMA	108							X	X	X									X	X	
GLOBOTRUNCANA CORONATA	20		X	X					X		X		X		X		X				X
STENSIOINA EXCULPTA	23	X		X							X	X			X						
GLOBOTRUNCANA CARINATA	55	X						X			X				X						X
SIGALIA DEFLAENSIS	22			X						X		X				X					X
COARSE AGGLUTINATED SPP	109							X	X	X	X									X	X
HEDBERGELLA BOSQUENSIS	70		X							X			X		X		X			X	X
GLOBOTRUNCANA RENZI	72		X					X	X	X	X	X		X	X	X					X
GLOBOTRUNCANA CONCAVATA	54	X	X					X		X	X	X	X			X	X	X			X
GLOBOTRUNCANA IMBRICATA	110							X		X							X		X	X	
HEDBERGELLA AMABILIS	24		X	X								X			X				X	X	X
GLOBOTRUNCANA HELVETICA	112							X	X	X							X		X	X	
GLOBOTRUNCANA SCHNEEGANSI	71		X					X	X	X			X							X	X
PRAEGLOBOTRUNCANA STEPHANI	30			X	X			X	X	X		X					X		X	X	X
PRAEGLOBOTRUNCANA TURBINATA	31			X				X	X	X					X		X		X	X	
ROTALIPORA CUSHMANI	27			X								X		X	X				X	X	
GAVELINOPSIS CENOMANICA	131								X			X		X	X				X	X	X

STEP MODEL

NAME	NO.	WELL NO. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		18	19	20														
LOXOSTOMA GEMMUM	105	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	1.5	0.0	2.0	0.0	0.0	1.5	0.0	1.5
		0.0	0.0	0.0														
GLOBOTRUNCANA STUARTI	3	0.0	0.0	2.0	2.0	2.0	4.0	0.0	0.0	0.0	1.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0														
STENSIOINA POMMERANA	5	0.0	2.0	2.0	0.0	0.0	4.0	0.0	0.0	0.0	1.5	2.0	2.0	0.0	0.0	1.5	0.0	1.5
		0.0	0.0	2.0														
GLOBOTRUNCANA ARCA	4	2.5	0.0	2.0	2.0	2.0	4.0	0.0	0.0	1.5	1.5	2.0	2.0	0.0	0.0	0.0	0.0	1.5
		0.0	0.0	2.0														
GLOBOTRUNCANELLA HAVANENSIS	6	2.5	2.0	2.0	2.0	0.0	4.0	0.0	0.0	1.5	0.0	2.0	2.0	0.0	0.0	1.0	0.0	0.0
		0.0	0.0	0.0														
GLOBIGERINELLOIDES MESSINAE	8	0.0	0.0	2.0	0.0	0.0	4.0	0.0	0.0	1.5	0.0	2.0	.5	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0														
RUGOGLOBIGERINA RUGOSA	16	2.5	2.0	2.5	0.0	3.0	4.0	0.0	0.0	0.0	0.0	3.0	.5	0.0	0.0	3.0	0.0	1.5
		0.0	0.0	0.0														
GLOBOTRUNCANA LINNEIANA	13	2.5	2.0	2.5	2.0	3.0	4.0	0.0	3.0	1.5	2.0	3.0	.5	2.0	0.0	0.0	2.5	1.0
		1.0	1.5	2.0														
GLOBOTRUNCANA STUARTIFORMIS	12	2.5	0.0	2.5	2.0	3.0	4.0	0.0	0.0	0.0	1.0	.5	3.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	2.0														
GLOBOTRUNCANA FORNICATA	11	2.5	2.0	2.5	0.0	3.0	0.0	0.0	0.0	0.0	1.0	1.5	0.0	0.0	.5	0.0	4.5	1.0
		1.0	1.5	2.0														
GLOBOTRUNCANA CRETACEA	14	0.0	0.0	2.5	0.0	0.0	0.0	0.0	3.0	0.0	0.0	1.5	1.5	1.0	.5	0.0	2.0	0.0
		1.0	1.5	.5														
GLOBOTRUNCANA MARGINATA	15	0.0	0.0	2.5	0.0	0.0	0.0	6.5	3.0	.5	1.0	.5	1.5	1.0	0.0	0.0	2.0	1.0
		0.0	1.5	4.5														
GAUDRYINA AUSTINANA	56	1.5	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
		0.0	0.0	3.0														
GLOBOTRUNCANA ANGUSTICARINATA	26	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.5	0.0	0.0	0.0	1.5	0.0
		0.0	0.0	2.5														
GAVELINELLA MINIMA	108	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		2.5	1.0	0.0														
GLOBOTRUNCANA CORONATA	20	0.0	2.5	1.0	0.0	0.0	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	.5	0.0	1.5	0.0
		0.0	0.0	2.5														
STENSIOINA EXCULPTA	23	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	.5	0.0	0.0	0.0
		0.0	0.0	0.0														
GLOBOTRUNCANA CARINATA	55	1.5	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0
		0.0	0.0	3.0														
SIGALIA DEFLAENSIS	22	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	3.5														
COARSE AGGLUTINATED SPP	109	0.0	0.0	0.0	0.0	0.0	0.0	4.5	1.5	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0	1.0	4.0														
HEDBERGELLA BOSQUENSIS	70	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	2.0	0.0	1.5	0.0
		0.0	1.0	2.5														
GLOBOTRUNCANA RENZI	72	0.0	2.5	0.0	0.0	0.0	0.0	2.5	4.0	3.0	2.0	2.5	0.0	0.0	1.0	1.0	0.0	0.0
		0.0	0.0	2.5														
GLOBOTRUNCANA CONCAVATA	54	1.5	2.5	0.0	0.0	0.0	0.0	4.5	0.0	3.5	2.5	2.5	0.0	0.0	0.0	1.0	0.0	0.0
		0.0	0.0	2.5														
GLOBOTRUNCANA IMBRICATA	110	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
		2.5	2.0	0.0														
HEDBERGELLA AMABILIS	24	0.0	2.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	3.0	0.0	0.0	0.0
		2.5	3.0	2.5														
GLOBOTRUNCANA HELVETICA	112	0.0	0.0	0.0	0.0	0.0	0.0	5.0	.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
		2.5	3.0	0.0														

GLOBOTRUNCANA SCHNEEGANSI	71	0.0 0.0	2.5 3.0	0.0 2.5	0.0	0.0	0.0	3.5	.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRAEGLOBOTRUNCANA STEPHANI	30	0.0 2.5	0.0 3.5	1.0 0.0	0.0	0.0	0.0	6.5	.5	1.0	0.0	.5	0.0	0.0	0.0	0.0	1.5	0.0
PRAEGLOBOTRUNCANA TURBINATA	31	0.0 2.5	0.0 3.5	1.0 0.0	0.0	0.0	0.0	.5	.5	2.5	0.0	0.0	0.0	0.0	.5	0.0	1.5	0.0
ROTALIPORA CUSHMANI	27	0.0 .5	0.0 1.0	1.0 0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	.5	0.0	0.0	0.0
GAVELINOPSIS CENOMANICA	131	0.0 .5	0.0 1.0	0.0 0.0	0.0	0.0	0.0	0.0	.5	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0

NORMALITY TEST

BONAVISTA-CGG

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	-.9410
GLOBOTRUNCANA LINNEIANA	-13	.8362	.3437
GLOBOTRUNCANA FORNICATA	-11	1.0911	-1.1549
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	1.3052
RUGOGLOBIGERINA RUGOSA	-16	.5963	.6430
GLOBOTRUNCANA CONCAVATA	54	4.4582	-2.5201 *
GLOBOTRUNCANA CARINATA	-55	2.9864	.4277
GAUDRYINA AUSTINANA	-56	1.9422	1.9886
STENSIOINA EXCULPTA	-23	2.8866	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

CUMBERLAND B55

		CUM. DIST.	2ND ORDER DIFF.	
RUGOGLOBIGERINA RUGOSA	16	.5963		
GLOBOTRUNCANA LINNEIANA	-13	.8362	.0150	
GLOBOTRUNCANA FORNICATA	-11	1.0911	-1.1549	
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	.7319	
STENSIOINA POMMERANA	-5	.0230	.7397	
HEDBERGELLA BOSQUENSIS	70	4.4178	-.3674	
HEDBERGELLA AMABILIS	-24	4.6220	.3980	
GLOBOTRUNCANA SCHNEEGANSI	-71	5.2241	-3.2804	*
GLOBOTRUNCANA CORONATA	-20	2.5459	4.5906	**
GLOBOTRUNCANA CONCAVATA	-54	4.4582	-1.9510	
GLOBOTRUNCANA RENZI	-72	4.4196		

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

ADOLPHUS 0-50

		CUM. DIST.	2ND ORDER DIFF.	
GLOBOTRUNCANA STUARTI	3	.0136		
GLOBOTRUNCANA ARCA	-4	.0728	-.1091	
STENSIOINA POMMERANA	-5	.0230	.2180	
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	.0264	
GLOBIGERINELLOIDES MESSINAE	-8	.3856	-.8557	
GLOBOTRUNCANA FORNICATA	11	1.0911	.4952	
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	.0772	
GLOBOTRUNCANA LINNEIANA	-13	.8362	.4258	
GLOBOTRUNCANA CRETACEA	-14	1.1731	.2144	
GLOBOTRUNCANA MARGINATA	-15	1.7243	-1.6793	
RUGOGLOBIGERINA RUGOSA	-16	.5963	1.7110	
GLOBOTRUNCANA CORONATA	20	2.5459	-.8658	
SIGALIA DEFLAENSIS	22	3.6298	-.4604	
STENSIOINA EXCULPTA	-23	2.8866	2.4786	*
HEDBERGELLA AMABILIS	-24	4.6220	-4.1049	**
GLOBOTRUNCANA ANGUSTICARINATA	-26	2.2525	5.1669	**
ROTALIPORA CUSHMANI	27	6.4166	-3.9802	**
PRAEGLOBOTRUNCANA STEPHANI	-30	5.2338	1.4293	
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803		

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

BLUE H=28

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANA LINNEIANA	-13	.8362	-.6745
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	-1.0003
GLOBOTRUNCANA STUARTI	-3	.0136	1.0889
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	-.2957
PRAEGLOBOTRUNCANA STEPHANI	30	5.2338	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

A GABRIEL C-60

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANA FORNICATA	-11	1.0911	-1.1842
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	.0772
GLOBOTRUNCANA LINNEIANA	-13	.8362	-.7337
GLOBOTRUNCANA STUARTI	-3	.0136	.8818
RUGOGLOBIGERINA RUGOSA	16	.5963	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

HARE BAY E-21

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANELLA HAVANENSIS	6	.1911	
RUGOGLOBIGERINA RUGOSA	-16	.5963	-.9287
GLOBOTRUNCANA ARCA	-4	.0728	.4642
GLOBOTRUNCANA STUARTI	-3	.0136	.9707
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	-1.0003
GLOBOTRUNCANA LINNEIANA	-13	.8362	-.7244
STENSIOINA POMMERANA	-5	.0230	.7902
LOXOSTOMA GEMMUM	-105	0.0000	.4085
GLOBIGERINELLOIDES MESSINAE	-8	.3856	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

EGRET K=36

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANA CARINATA	55	2.9864	-3.5633 **
GAVELINELLA MINIMA	108	2.3366	2.7328 *
GLOBOTRUNCANA RENZI	72	4.4196	-.5378
PRAEGLOBOTRUNCANA STEPHANI	-30	5.2338	-1.7878
GLOBOTRUNCANA HELVETICA	112	4.9912	.4756
GLOBOTRUNCANA SCHNEEGANSI	71	5.2241	-3.0018 *
GLOBOTRUNCANA MARGINATA	-15	1.7243	6.0496 **
COARSE AGGLUTINATED SPP	-109	4.2741	-2.3628 *
GLOBOTRUNCANA IMBRICATA	-110	4.4611	.1013
PRAEGLOBOTRUNCANA TURBINATA	31	5.4803	-1.3103
GLOBOTRUNCANA CONCAVATA	-54	4.4582	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

HIBERNIA 0-35

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA LINNEIANA	13	.8362	
GLOBOTRUNCANA CRETACEA	-14	1.1731	1.0359
GLOBOTRUNCANA CORONATA	-20	2.5459	-2.1944
GLOBOTRUNCANA MARGINATA	-15	1.7243	3.5168 **
GLOBOTRUNCANA RENZI	-72	4.4196	-5.1726 **
GAUDRYINA AUSTINANA	-56	1.9422	2.8718 *
GAVELINELLA MINIMA	-108	2.3366	.7122
GLOBOTRUNCANA HELVETICA	112	4.9912	-1.8237
COARSE AGGLUTINATED SPP	-109	4.2741	.1287
PRAEGLOBOTRUNCANA STEPHANI	30	5.2338	.5787
GLOBOTRUNCANA SCHNEEGANSI	-71	5.2241	-.1871
GAVELINOPSIS CENOMANICA	131	6.5754	-.8983
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

EGRET N=46

		CUM. DIST.	2ND ORDER DIFF.
GLOBIGERINELLOIDES MESSINAE	8	.3856	
GLOBOTRUNCANA LINNEIANA	-13	.8362	-1.2140
GLOBOTRUNCANA ARCA	-4	.0728	.8816
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	.0891
GLOBOTRUNCANA FORNICATA	11	1.0911	-.8180
GLOBOTRUNCANA CRETACEA	14	1.1731	2.3747 *
SIGALIA DEFLAENSIS	22	3.6298	-3.6695 **
GLOBOTRUNCANA MARGINATA	-15	1.7243	1.8251
GAVELINELLA MINIMA	108	2.3366	2.2021
GLOBOTRUNCANA CONCAVATA	-54	4.4582	-2.9984 *
COARSE AGGLUTINATED SPP	109	4.2741	1.0637
GLOBOTRUNCANA IMBRICATA	-110	4.4611	-.2286
GLOBOTRUNCANA RENZI	-72	4.4196	-.0794
GLOBOTRUNCANA HELVETICA	112	4.9912	.3539
GLOBOTRUNCANA SCHNEEGANSI	-71	5.2241	-1.0393
HEDBERGELLA BOSQUENSIS	-70	4.4178	1.8688
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	-2.0016
PRAEGLOBOTRUNCANA STEPHANI	30	5.2338	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

PUFFIN B-90

		CUM. DIST.	2ND ORDER DIFF.	
GLOBOTRUNCANA STUARTI	3	.0136		
GLOBOTRUNCANA ARCA	-4	.0728	-.1321	
LOXOSTOMA GEMMUM	-105	0.0000	.0958	
STENSIOINA POMMERANA	-5	.0230	.4057	
GLOBOTRUNCANA STUARTIFORMIS	12	.9250	-.7360	
GLOBOTRUNCANA FORNICATA	11	1.0911	-.4209	
GLOBOTRUNCANA LINNEIANA	13	.8362	.5918	
GLOBOTRUNCANA CRETACEA	14	1.1731	1.0359	
GLOBOTRUNCANA CORONATA	20	2.5459	-1.7210	
GLOBOTRUNCANA MARGINATA	-15	1.7243	1.3497	
GLOBOTRUNCANA ANGUSTICARINATA	-26	2.2525	-.3675	
STENSIOINA EXCULPTA	23	2.8866	.9376	
GLOBOTRUNCANA CONCAVATA	54	4.4582	-2.5701	*
GLOBOTRUNCANA CARINATA	-55	2.9864	2.4317	*
GLOBOTRUNCANA RENZI	72	4.4196	-1.5786	
COARSE AGGLUTINATED SPP	109	4.2741		

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

KILTIWAKE P-11

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	.5269
GLOBOTRUNCANA LINNEIANA	-13	.8362	-1.4583
STENSIOINA POMMERANA	-5	.0230	1.3865
RUGOGLOBIGERINA RUGOSA	-16	.5963	-1.5770
GLOBIGERINELLOIDES MESSINAE	8	.3856	.7502
GLOBOTRUNCANA STUARTIFORMIS	12	.9250	.5015
GLOBOTRUNCANA CRETACEA	-14	1.1731	-1.1230
GLOBOTRUNCANA FORNICATA	11	1.0911	1.5083
GLOBOTRUNCANA MARGINATA	-15	1.7243	-.2640
STENSIOINA EXCULPTA	23	2.8866	1.3661
HEDBERGELLA AMABILIS	-24	4.6220	-2.6922 *
GLOBOTRUNCANA CONCAVATA	54	4.4582	.1283
SIGALIA DEFLAENSIS	-22	3.6298	.8253
GLOBOTRUNCANA RENZI	72	4.4196	.8175
PRAEGLOBOTRUNCANA STEPHANI	-30	5.2338	-.2656
GAVELINOPSIS CENOMANICA	131	6.5754	-1.5004
ROTALIPORA CUSHMANI	27	6.4166	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

HERMINE E-94

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANELLA HAVANENSIS	-6	.1911	-.2957
GLOBOTRUNCANA STUARTI	-3	.0136	.1639
LOXOSTOMA GEMMUM	-105	0.0000	.0366
STENSIOINA POMMERANA	-5	.0230	-.0936
RUGOGLOBIGERINA RUGOSA	16	.5963	-.1401
GLOBIGERINELLOIDES MESSINAE	-8	.3856	.0174
GLOBOTRUNCANA LINNEIANA	13	.8362	.5302
GLOBOTRUNCANA CRETACEA	-14	1.1731	.0986
GLOBOTRUNCANA ANGUSTICARINATA	26	2.2525	-.9637
GLOBOTRUNCANA MARGINATA	-15	1.7243	-.9150
GLOBOTRUNCANA STUARTIFORMIS	12	.9250	2.4202 *
GLOBOTRUNCANA CORONATA	20	2.5459	.2510
HEDBERGELLA BOSQUENSIS	70	4.4178	-1.8315
GLOBOTRUNCANA CONCAVATA	54	4.4582	.7255
GLOBOTRUNCANA SCHNEEGANSI	71	5.2241	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

PETREL A-62

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
GLOBOTRUNCANA CRETACEA	14	1.1731	-.5490
GLOBOTRUNCANA MARGINATA	15	1.7243	-1.4394
GLOBOTRUNCANA LINNEIANA	13	.8362	4.4715 **
GLOBOTRUNCANA RENZI	72	4.4196	-1.5863
ROTALIPORA CUSHMANI	27	6.4166	-1.8382
GAVELINOPSIS CENOMANICA	131	6.5754	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

HERON H-73

		CUM. DIST.	2ND ORDER DIFF.
GLOBIGERINELLOIDES MESSINAE	8	.3856	
GLOBOTRUNCANA CRETACEA	14	1.1731	-.1818
GLOBOTRUNCANA FORNICATA	-11	1.0911	.5557
GLOBOTRUNCANA ANGUSTICARINATA	26	2.2525	-.5274
STENSIOINA EXCULPTA	23	2.8866	-.2870
GLOBOTRUNCANA CORONATA	-20	2.5459	1.7290
HEDBERGELLA AMABILIS	24	4.6220	-2.2803
HEDBERGELLA BOSQUENSIS	70	4.4178	-1.2273
GLOBOTRUNCANA CARINATA	55	2.9864	2.8647 *
GLOBOTRUNCANA RENZI	72	4.4196	.5639
ROTALIPORA CUSHMANI	27	6.4166	-2.2456
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	1.3436
GAVELINOPSIS CENOMANICA	131	6.5754	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

BITTERN M-62

		CUM. DIST.	2ND ORDER DIFF.
RUGOGLOBIGERINA RUGOSA	16	.5963	
LOXOSTOMA GEMMUM	105	0.0000	1.2565
STENSIOINA POMMERANA	-5	.0230	-.4921
GLOBOTRUNCANELLA HAVANENSIS	6	.1911	.8139
GLOBOTRUNCANA CRETACEA	14	1.1731	1.4747
SIGALIA DEFLAENSIS	22	3.6298	-1.6282
GLOBOTRUNCANA CONCAVATA	54	4.4582	-.8672
GLOBOTRUNCANA RENZI	72	4.4196	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

EIDER M=75

		CUM. DIST.	2ND ORDER DIFF.
GLOBIGERINELLOIDES MESSINAE	8	.3856	
GLOBOTRUNCANA CRETACEA	14	1.1731	-.2363
GLOBOTRUNCANA MARGINATA	15	1.7243	-.3334
GAUDRYINA AUSTINANA	56	1.9422	-.4747
GLOBOTRUNCANA LINNEIANA	-13	.8362	1.9666
GLOBOTRUNCANA CORONATA	20	2.5459	-1.1540
GLOBOTRUNCANA ANGUSTICARINATA	-26	2.2525	-.8681
GLOBOTRUNCANA FORNICATA	-11	1.0911	4.4882 **
HEDBERGELLA BOSQUENSIS	-70	4.4178	-4.1355 **
GLOBOTRUNCANA CONCAVATA	54	4.4582	.4925
GLOBOTRUNCANA HELVETICA	112	4.9912	-.2139
GLOBOTRUNCANA IMBRICATA	-110	4.4611	1.3028
PRAEGLOBOTRUNCANA STEPHANI	-30	5.2338	-.5262
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

JAEGER A-49

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA ARCA	4	.0728	
LOXOSTOMA GEMMUM	-105	0.0000	.6691
RUGOGLOBIGERINA RUGOSA	-16	.5963	-1.1696
STENSIOINA POMMERANA	-5	.0230	.8129
GLOBOTRUNCANA MARGINATA	15	1.7243	-.8729
GLOBOTRUNCANA FORNICATA	-11	1.0911	.3784
GLOBOTRUNCANA LINNEIANA	-13	.8362	-.1009
GAUDRYINA AUSTINANA	56	1.9422	1.4101
GLOBOTRUNCANA CONCAVATA	54	4.4582	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

CORMORANT K-83

		CUM. DIST.	2ND ORDER DIFF.	
GLOBOTRUNCANA CRETACEA	14	1.1731		
GLOBOTRUNCANA LINNEIANA	-13	.8362	.5918	
GLOBOTRUNCANA FORNICATA	-11	1.0911	.9441	
GLOBOTRUNCANA HELVETICA	112	4.9912	-.9564	
PRAEGLOBOTRUNCANA STEPHANI	-30	5.2338	.0039	
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	-1.2657	
GLOBOTRUNCANA IMBRICATA	-110	4.4611	1.1800	
HEDBERGELLA AMABILIS	-24	4.6220	-2.4463	*
GAVELINELLA MINIMA	-108	2.3366	3.6643	**
ROTALIPORA CUSHMANI	27	6.4166	-1.2201	
GAVELINOPSIS CENOMANICA	-131	6.5754		

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

MURRE G=67

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA FORNICATA	11	1.0911	
GLOBOTRUNCANA LINNEIANA	-13	.8362	1.1430
GLOBOTRUNCANA MARGINATA	-15	1.7243	-1.4394
GLOBOTRUNCANA CRETACEA	-14	1.1731	.8272
GAVELINELLA MINIMA	108	2.3366	1.6617
COARSE AGGLUTINATED SPP	-109	4.2741	-1.7505
GLOBOTRUNCANA IMBRICATA	-110	4.4611	-1.1179
HEDBERGELLA BOSQUENSIS	70	4.4178	.8593
PRAEGLOBOTRUNCANA STEPHANI	30	5.2338	.3181
PRAEGLOBOTRUNCANA TURBINATA	-31	5.4803	-1.6232
GLOBOTRUNCANA HELVETICA	112	4.9912	1.6096
GLOBOTRUNCANA SCHNEEGANSI	-71	5.2241	-.8351
HEDBERGELLA AMABILIS	-24	4.6220	1.6680
GAVELINOPSIS CENOMANICA	131	6.5754	-2.1122
ROTALIPORA CUSHMANI	27	6.4166	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

OSPREY H-84

		CUM. DIST.	2ND ORDER DIFF.
GLOBOTRUNCANA FORNICATA	11	1.0911	
GLOBOTRUNCANA LINNEIANA	-13	.8362	-.5085
GLOBOTRUNCANA ARCA	-4	.0728	1.6155
GLOBOTRUNCANA STUARTIFORMIS	-12	.9250	-1.7543
STENSIOINA POMMERANA	-5	.0230	2.2176
GLOBOTRUNCANA ANGUSTICARINATA	26	2.2525	-2.3949 *
GLOBOTRUNCANA CRETACEA	-14	1.1731	1.9787
GLOBOTRUNCANA CARINATA	55	2.9864	-1.9434
GAUDRYINA AUSTINANA	-56	1.9422	3.3762 **
COARSE AGGLUTINATED SPP	-109	4.2741	-4.9742 **
GLOBOTRUNCANA CORONATA	20	2.5459	1.8207
GLOBOTRUNCANA MARGINATA	-15	1.7243	2.6027 *
GLOBOTRUNCANA RENZI	72	4.4196	-.9766
GLOBOTRUNCANA SCHNEEGANSI	-71	5.2241	-1.5705
GLOBOTRUNCANA CONCAVATA	-54	4.4582	-.0626
SIGALIA DEFLAENSIS	-22	3.6298	1.6165
HEDBERGELLA BOSQUENSIS	-70	4.4178	-.5838
HEDBERGELLA AMABILIS	-24	4.6220	-.5064
PRAEGLOBOTRUNCANA STEPHANI	30	5.2338	.7298
GAVELINOPSIS CENOMANICA	131	6.5754	

* -GREATER THAN 95% PROB. EVENT OUT OF POSITION
** -GREATER THAN 99% PROB. EVENT OUT OF POSITION

NORMALITY TEST

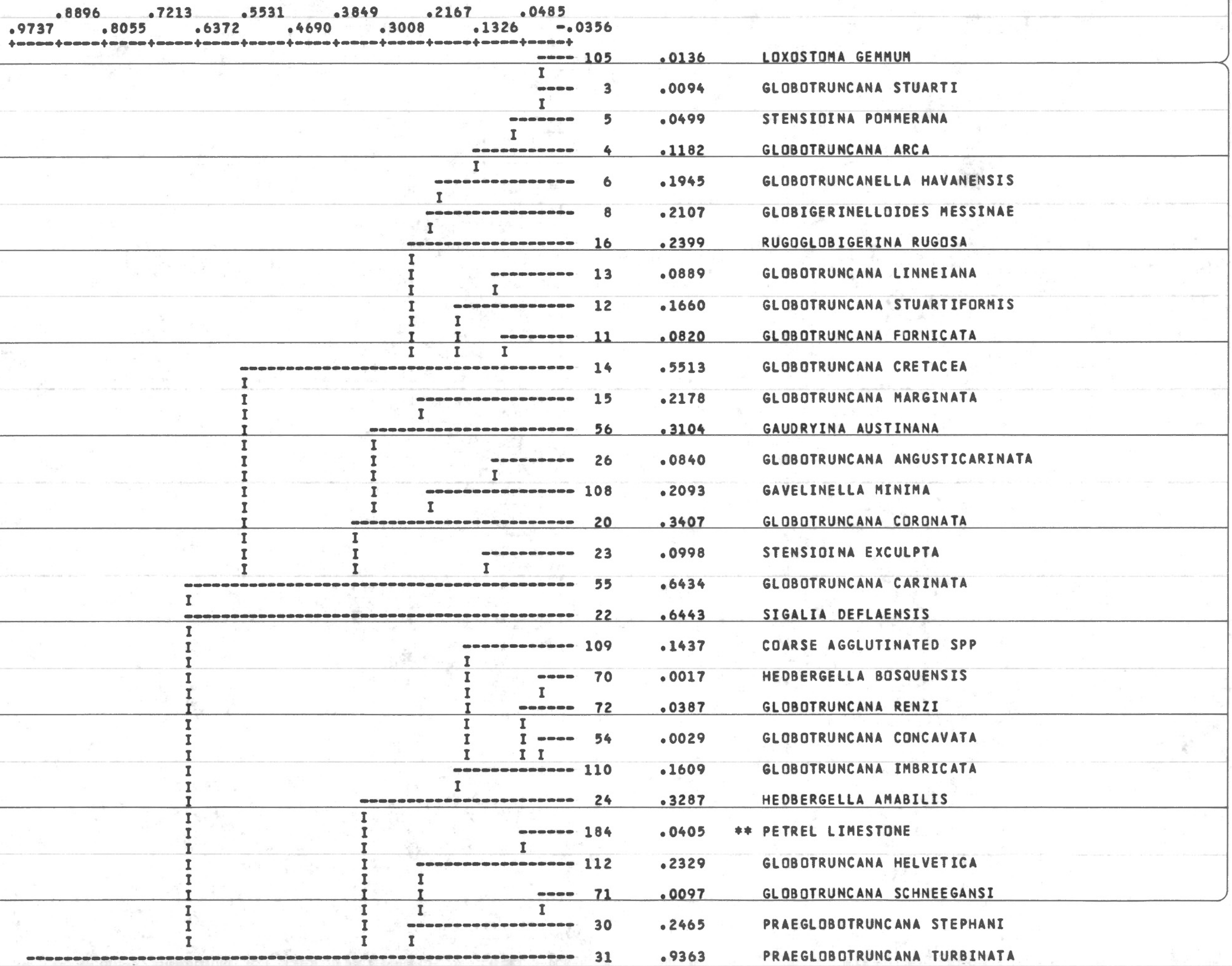
COMPARISON OF OBSERVED AND EXPECTED OCCURRENCES OF SECOND ORDER DIFFERENCE VALUES

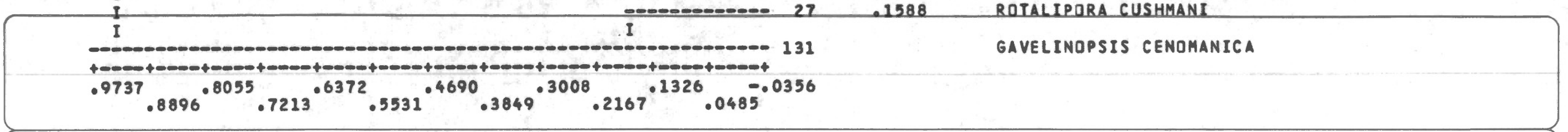
CLASS NO.	OBSERVED	EXPECTED	DIFFERENCE
1	26	21.100	4.900
2	20	21.100	-1.100
3	24	21.100	2.900
4	17	21.100	-4.100
5	18	21.100	-3.100
6	20	21.100	-1.100
7	25	21.100	3.900
8	19	21.100	-2.100
9	18	21.100	-3.100
10	24	21.100	2.900

POSITIONING OF UNIQUE EVENTS IN FINAL SEQUENCE;

EVENTS ARE SORTED ON THE BASIS OF CUMULATIVE DISTANCE TO OBTAIN ONLY POSITIVE INTERFOSSIL DISTANCES

NEW SEQUENCE	DISTANCE FROM 1ST POSITION	FOSSIL PAIRS	INTER FOSSIL DISTANCE
105	0.0000	105- 3	.0136
3	.0136	3- 5	.0094
5	.0230	5- 4	.0499
4	.0728	4- 6	.1182
6	.1911	6- 8	.1945
8	.3856	8- 16	.2107
16	.5963	16- 13	.2399
13	.8362	13- 12	.0889
12	.9250	12- 11	.1660
11	1.0911	11- 14	.0820
14	1.1731	14- 15	.5513
15	1.7243	15- 56	.2178
56	1.9422	56- 26	.3104
26	2.2525	26-108	.0840
108	2.3366	108- 20	.2093
20	2.5459	20- 23	.3407
23	2.8866	23- 55	.0998
55	2.9864	55- 22	.6434
22	3.6298	22-109	.6443
109	4.2741	109- 70	.1437
70	4.4178	70- 72	.0017
72	4.4196	72- 54	.0387
54	4.4582	54-110	.0029
110	4.4611	110- 24	.1609
24	4.6220	24-184	.3287
184	4.9507	184-112	.0405
112	4.9912	112- 71	.2329
71	5.2241	71- 30	.0097
30	5.2338	30- 31	.2465
31	5.4803	31- 27	.9363
27	6.4166	27-131	.1588
131	6.5754		


.8896 .7213 .5531 .3849 .2167 .0485
.9737 .8055 .6372 .4690 .3008 .1326 -.0356
105 .0136 LOXOSTOMA GEMMUM
3 .0094 GLOBOTRUNCANA STUARTI
5 .0499 STENSIOINA POMMERANA
4 .1182 GLOBOTRUNCANA ARCA
6 .1945 GLOBOTRUNCANELLA HAVANENSIS
8 .2107 GLOBIGERINELLOIDES MESSINAE
16 .2399 RUGOGLOBIGERINA RUGOSA
13 .0889 GLOBOTRUNCANA LINNEIANA
12 .1660 GLOBOTRUNCANA STUARTIFORMIS
11 .0820 GLOBOTRUNCANA FORNICATA
14 .5513 GLOBOTRUNCANA CRETACEA
15 .2178 GLOBOTRUNCANA MARGINATA
56 .3104 GAUDRYINA AUSTINANA
26 .0840 GLOBOTRUNCANA ANGUSTICARINATA
108 .2093 GAVELINELLA MINIMA
20 .3407 GLOBOTRUNCANA CORONATA
23 .0998 STENSIOINA EXCULPTA
55 .6434 GLOBOTRUNCANA CARINATA
22 .6443 SIGALIA DEFLAENSIS
109 .1437 COARSE AGGLUTINATED SPP
70 .0017 HEDBERGELLA BOSQUENSIS
72 .0387 GLOBOTRUNCANA RENZI
54 .0029 GLOBOTRUNCANA CONCAVATA
110 .1609 GLOBOTRUNCANA IMBRICATA
24 .3287 HEDBERGELLA AMABILIS
184 .0405 ** PETREL LIMESTONE
112 .2329 GLOBOTRUNCANA HELVETICA
71 .0097 GLOBOTRUNCANA SCHNEEGANSI
30 .2465 PRAEGLOBOTRUNCANA STEPHANI
31 .9363 PRAEGLOBOTRUNCANA TURBINATA



DENDROGRAM - VALUES ALONG X-AXIS ARE INTERFOSSIL DISTANCES
VALUES ALONG Y-AXIS ARE DISTANCES BETWEEN AN EVENT AND ITS SUCCESSOR

** INDICATES A UNIQUE EVENT