817

STRAP: A User-Oriented Computer Analysis System for Groundfish Research Trawl Survey Data

S.J. Smith, and G.D. Somerton

Research and Resource Services
Department of Fisheries and Oceans
P.O. Box 5667
St. John's, Newfoundland A1C 5X1

September 1981

Canadian Technical Report of Fisheries and Aquatic Sciences No. 1030

Government of Canada
Fisheries and Oceans

Gouvernement du Canada
Pêches et Océans

Canadian Technical Report of Fisheries and Aquatic Sciences

These reports contain scientific and technical information that represents an important contribution to existing knowledge but which for some reason may not be appropriate for primary scientific (i.e. *Journal*) publication. Technical Reports are directed primarily towards a worldwide audience and have an international distribution. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries management, technology and development, ocean sciences, and aquatic environments relevant to Canada.

Technical Reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report will be abstracted in *Aquatic Sciences and Fisheries Abstracts* and will be indexed annually in the Department's index to scientific and technical publications.

Numbers 1-456 in this series were issued as Technical Reports of the Fisheries Research Board of Canada. Numbers 457-714 were issued as Department of the Environment, Fisheries and Marine Service, Research and Development Directorate Technical Reports. Numbers 715-924 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Technical Reports. The current series name was changed with report number 925.

Details on the availability of Technical Reports in hard copy may be obtained from the issuing establishment indicated on the front cover.

Rapport technique canadien des sciences halieutiques et aquatiques

Ces rapports contiennent des renseignements scientifiques et techniques qui constituent une contribution importante aux connaissances actuelles mais qui, pour une raison ou pour une autre, ne semblent pas appropriés pour la publication dans un journal scientifique. Il n'y a aucune restriction quant au sujet, de fait, la série reflète la vaste gamme des intérêts et des politiques du Ministère des Pêches et des Océans, notamment gestion des pêches, techniques et développement, sciences océaniques et environnements aquatiques, au Canada.

Les Rapports techniques peuvent être considérés comme des publications complètes. Le titre exact paraîtra au haut du résumé de chaque rapport, qui sera publié dans la revue *Aquatic Sciences and Fisheries Abstracts* et qui figurera dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1-456 de cette série ont été publiés à titre de Rapports techniques de l'Office des recherches sur les pêcheries du Canada. Les numéros 457-714, à titre de Rapports techniques de la Direction générale de la recherche et du développement, Service des pêches et de la mer, ministère de l'Environnement. Les numéros 715-924 ont été publiés à titre de Rapports techniques du Service des pêches et de la mer, Ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 925.

La page couverture porte le nom de l'établissement auteur où l'on peut se procurer les rapports sous couverture cartonnée.

Canadian Technical Report of

Fisheries and Aquatic Sciences 1030

September 1981

STRAP: A USER-ORIENTED COMPUTER ANALYSIS SYSTEM FOR GROUNDFISH RESEARCH TRAWL SURVEY DATA

by

S. J. Smith[1], and G. D. Somerton[2]

Research and Resource Services

Department of Fisheries and Oceans

P.O. Box 5667

St. John's, Newfoundland A1C 5X1

This is the sixty-sixth Technical Report from

Research and Resource Services, St. John's, Newfoundland.

[1] Present address: Marine Fish Division, Department of Fisheries and Oceans, Bedford Institute of Oceanography, Dartmouth, Nova Scotia B2Y 4A2

[2] Send enquiries and reprint requests to G. Somerton.

Cat. No. Fs 97-6/1030 ISSN 0706-6457

Correct citation for this publication:

Smith, S. J., and G. D. Somerton. 1981. STRAP: A user-oriented computer analysis system for groundfish research trawl survey data. Can. Tech. Rep. Fish. Aquat. Sci. 1030: iv + 66 p.

CONTENTS

Abstract/Résumé..... iv

Introduction..... 1

Standard notation for use in groundfish research trawl surveys..... 2

Program design..... 3

The control statements..... 5

Some examples..... 12

References..... 29

Appendix 1: File specifications and sample job streams..... 30

Appendix 2: Data formats - St. John's coding specs

2A: Groundfish research set details (coding specifications)..... 32

2B: Groundfish research age and growth (coding specifications).... 46

2C: Groundfish research length frequencies (coding specifications) 64

ABSTRACT

Smith, S. J., and G. D. Somerton. 1981. STRAP: A user-oriented computer analysis system for groundfish research trawl survey data. Can. Tech. Rep. Fish. Aquat. Sci. 1030: iv + 66 p.

A computer analysis system STRAP, was devloped at the Northwest Atlantic Fisheries Centre for use in analyzing observations obtained from groundfish research trawl surveys.

The system was designed to allow the user greater freedom in data manipulation and estimation by means of 'plain' english control statements. This will enable and encourage closer examination of the data. The modular nature of the programs will permit easy inclusion of new analysis techniques.

Examples given demonstrate the flexibility of STRAP.

Key words: Groundfish trawl surveys, stratified-random surveys, fisheries management

RÉSUMÉ

Smith, S. J., and G. D. Somerton. 1981. STRAP: A user-oriented computer analysis system for groundfish research trawl survey data. Can. Tech. Rep. Fish. Aquat. Sci. 1030: iv + 66 p.

Le Centre des pêches de l'Atlantique nord-ouest a mis au point un système STRAP d'analyse par ordinateur qui sert à analyser les observations provenant des levés par chalutage de poisson de fond réalisés à des fins de recherche.

Le système a été conçu pour permettre à l'utilisateur de manipuler et d'évaluer les données avec une plus grande latitude grâce à des instructions en langage courant. Cela permettra et favorisera un examen plus minutieux des données. Comme les programmes sont modulaires, on pourra facilement y inclure les nouvelles techniques d'analyse.

Les exemples cités démontrent la souplesse du système STRAP.

INTRODUCTION

Management decisions on Canada's east coast groundfish stocks are mainly realized from the analysis of information provided by two basic sources of data; commercial statistics and groundfish research trawl surveys. Although groundfish surveys on the east coast date back to the 1940's, stratified-random groundfish surveys were introduced to the east coast in 1970 in order to provide an alternative to the commercial sources for the determination of stock abundance as well as information on age and length structure, parasites, and other biological information. The sampling scheme that is used is a stratified random sampling design with depth as the major stratifying variable. The depth ranges used were based in part on the experiences of the Northeast Atlantic Fisheries Centre (Wood's Hole, Mass.) which had been conducting like surveys since 1963 and when such information was available, on knowledge of the distribution characteristics of the major commercial species in a specific area. (Documentation with regards to the development of these surveys are contained in the following reports: Grosslein and Pinhorn 1971; Halliday and Kohler 1971; Pinhorn 1971; and Grosslein 1971). The advantages of using trawl surveys so designed was seen as: 1) use of a standard gear type over all years would provide data which would not be affected by an ambiguity in the use of a 'standard' effort when many gear types are used such as in the commercial fishery, and 2) the stratified-random design would provide estimates of the precision of the estimates of abundance which were not available for the commercially based estimates.

The original computer programs which were used in St. John's to analyze the survey data were modified versions of programs written by D. N. Fitzgerald (St. Andrews Biological Station, St. Andrews, New Brunswick). These programs written in the early 1970's provided estimates of the stratified means as well as an estimate of the total abundance with their respective measures of precision and confidence limits. Analysis was carried out in two formats; 1) the so-called 'Strat-1' program which provided estimates of numbers caught per age-group and 2) the 'Strat-2' program which calculated estimates of the mean numbers and weights caught per tow (as well as estimates of totals per survey area).

These programs were adequate enough at the time but since then changes in data storage (tape files replacing card decks) and a need to explore and study this data source in order to refine the survey and estimation techniques required a more flexible computer analysis system. This then was the motivation for writing the programs which are being presented here. This new analysis system known simply as STRAP (Stratified Analysis Programs) is not a modified version of the Fitzgerald programs but instead is a freshly designed system such that the following requirements be met:

1) that the programs are easy to use in order to promote increased study of the data base,

2) that the programs are designed such that new developments or requirements can be built into the programs in a systematic fashion.

The above requirements were met by making the programs parameter driven in a way that 'plain english' commands supplied by the user would run the programs and the programs were written in self contained modules so that changes could be made easily. The actual details will be explained more fully in the body of this report.

The programs as presented are the version in use at the Northwest Atlantic Fisheries Centre in St. John's, Newfoundland. Therefore the data formats (included here as Appendix 2 for illustration only) and any special programming required to deal with unusual structures in the data are specific to the Newfoundland region. The system is also designed to run on an IBM 370/158 MVS type-computer but a modified version of it is being proposed for a CDC/CYBER 171 machine used by the Marine Fish Division at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia.

It should be stressed that the STRAP system presented here is not the final form to be taken by this analysis system. The STRAP system will evolve as more developments occur from research into the groundfish surveys.

STANDARD NOTATION FOR USE IN GROUNDFISH RESEARCH TRAWL SURVEYS

L = number of strata samples ($h = 1, 2, \ldots, L$)

N_h = total number of sample units in the hth stratum

n_h = total number of units sampled in the hth stratum ($i = 1, 2, \ldots, n_h$)

$N = \sum_{h=1}^{L} N_h$ = total number of sample units in survey

$n = \sum_{h=1}^{L} n_h$ = total number of observations in survey

$W_h = \frac{N_h}{N}$ = stratum weight

$f_h = \frac{n_h}{N_h}$ = sampling fraction in the hth stratum

y_{hi} = ith observation in the hth stratum

$\bar{Y}_h = \sum_{i=1}^{n_h} Y_{hi} \, / n_h$ = sample mean in the hth stratum

$S^2_h = \sum_{i=1}^{n_h} (Y_{h_i} - \bar{Y}_h)^2/(n_h - 1)$ = sample variance in the hth stratum

$\bar{Y}_{st} = \sum_{h=1}^{L} W_h \bar{Y}_h$ = estimate of the population mean per unit (i.e. stratified mean catch per tow)

$\widehat{Var(\bar{Y}_{st})}$ or $s^2(\bar{Y}_{st}) = \frac{1}{N^2} \sum_{h=1}^{L} N_h (N_h - n_h) \frac{S^2_h}{n_h}$ = estimate of the variance of the stratified mean

$\hat{Y}_{st} = N\bar{Y}_{st}$ = estimate of the population total over the survey area

PROGRAM DESIGN

The main factor in developing the design of the STRAP program was to make it as user-oriented as possible so that requests could be developed and coded easily, possibly by non-EDP users of the program. In order to do this, it was decided that the STRAP program should be parameter driven by English-language type control cards similar to those used in BMDP (Dixon 1977) and POPAN (Arnason and Baniuk 1980). The control cards were structured into sets according to their usage and each card took the following format ....

KEYWORD = 'LIST OF VALUES'

An attempt was made to make both the keywords and the list of values as explanatory as possible. To make the program "user-friendly" the control cards were designed to be free-format. This allows the user freedom in preparing the parameter card request deck. Also, the STRAP program attempts to error check the control parameters to avoid wasted or meaningless jobs. When an error is detected, an appropriate message is printed beneath the control statement in error. Error checking continues to the end of the control statements but no processing is attempted if an error has been detected.

During the design of the STRAP program it became evident that the program could be separated into two components - one to read and decode the parameter control cards and extract from the existing master files of data the subfiles required for a particular request, and the other to do the necessary analysis of the extracted data. The second analysis component could further be split into two distinct sections roughly equivalent to the old 'STRAT1' and 'STRAT2' programs. This modularization of the program and the flow of program control are illustrated in Fig. 1. Also, it was decided that since IBM's FORTRAN IV was inefficient for handling character strings and input/output operations, the first component of the program would be written in IBM's PL/I programming language, while the second component would be programmed in FORTRAN. Communication between the two components of the STRAP program is accomplished by temporary data sets created in the PL/I component and read in the FORTRAN section. The major options and flow of logic in the analysis routines are controlled by a vector called IND in the program code. The vector is set in the PL/I component of the program depending on the options requested and is passed by means of a temporary data set to the FORTRAN analysis routines. The FORTRAN routines use the settings of the IND vector to control the type of analysis being done. For example, the first position of IND is set to 1 if an AGE LENGTH analysis is required and 0 otherwise.

As far as possible, the STRAP program has been modularized, so that each distinct function of the program is contained in a separate subroutine.

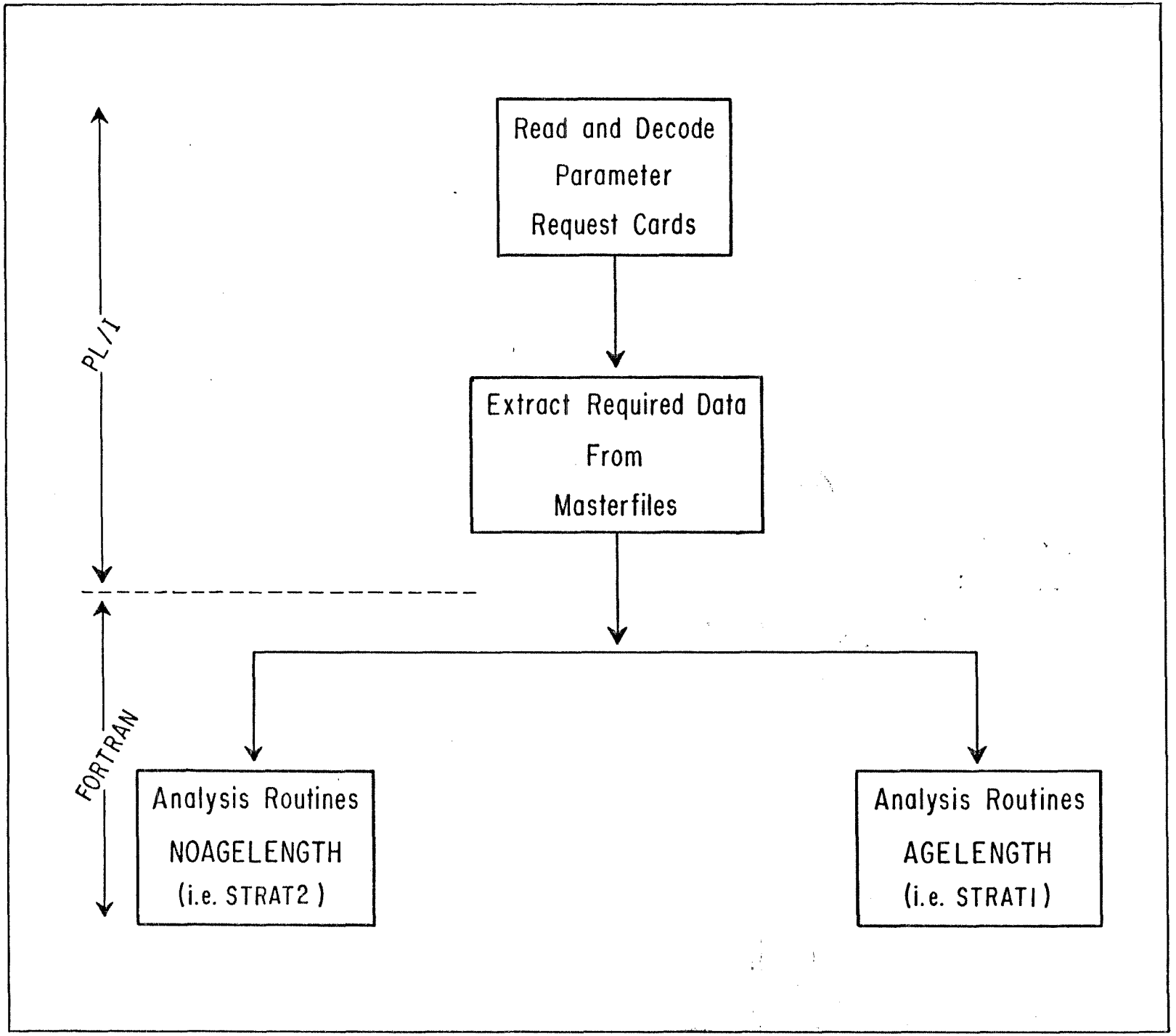
Read and Decode Parameter Request Cards
PL/I
Extract Required Data From Masterfiles
FORTRAN
Analysis Routines NOAGELENGTH (i.e. STRAT2)
Analysis Routines AGELENGTH (i.e. STRAT1)

Figure 1

When extracting the requested data from the master files the STRAP program attempts to validate the records as much as possible. Unsuccessful sets are identified, listed on the output and excluded from the analysis. If the standard stratum areas (Anon. 1979) are being used then the stratum number coded is checked for validity. Sets having zero or blanks coded for the "distance towed" are identified and listed on the output as are sets which have zeros or blanks coded for the number or weight of a species caught. Both these cases cause an error parameter to be switched on; this parameter is tested before the analysis of the extracted data is begun, and if found to be on, execution is terminated.

Since the STRAP program uses a variety of temporary data sets, the job control language for running the program at the Northwest Atlantic Fisheries Centre has been catalogued on the IBM machine at Newfoundland and Labrador Computer Services. To execute STRAP at the Northwest Atlantic Fisheries Centre, the user simply invokes the catalogued procedure with an EXECute statement and supplies the necessary master files which the program expects to use. See Appendix 1 for a description of the files required by the program and several sample job streams.

THE CONTROL STATEMENTS

The general format of all control statements is:

KEYWORD = 'LIST OF VALUES'

All control statements can be entered in free format. The control statements are organized into 'sets' according to their respective data specification or estimation-type functions. The sets are denoted by a ? with the set name following (e.g. ?START). A set is terminated by the next set statement. The order of the control statement sets is optional with the exception of the sets denoted by ?END and ?FINISH. Only sets ?SELECT1 ?END. ?FINISH and ?ESTIMATE are required, all others are optional and used as needed.

Following is a description of each set with its member control statements. (Note: If the default value is desired the statement does not have to appear.)

I. ?START (optional)

a) TITLE = any alphanumeric title, maximum of 72 characters and blanks are allowed.

= blank (default)

b) PROGRAM = AGELENGTH; analysis is done on the basis of age or length groupings. Output will be in estimated numbers per age or length grouping.

= NOAGELENGTH (default); analysis is done on the total numbers and total weight caught per species per tow

II ?SELECT1 (Required)

a) VESSEL = give a list of vessel number(s) (at present as per St. John's coding specification; Appendix 2) used in the survey(s) of interest, separated by a blank or comma.

b) TRIP = give a list of trip number(s) to be selected. Each trip number must be in the following format YYNNN, where YY is the year (e.g. 81) and NNN refers to the cruise number (as per coding specification; Appendix 2). The cruise number must be in a three digit field (e.g. cruise number 2 must be written as 002).
Note: The correspondence between vessel and trip numbers is as follows;

i) if only one vessel is specified then all trips are for that vessel.

ii) if more than one vessel is specified then there is a one to one relationship between vessel numbers and the trip numbers.

c) ICNAF = give the ICNAF/NAFO Divisions to be selected. Single areas are specified by giving the two digit code, e.g. 2J,3L, etc. If a combination of areas is desired for one analysis e.g. areas 3L, 3N, 30 (Grand Bank) are to be combined then specify 3LNO.
Note: Each vessel/trip combination will be analyzed for each ICNAF/NAFO Div. specified.

d) SPECIES = give a list of species to be analyzed. Currently 11 species are recognized by the species name.

They are: COD (Atlantic cod)
AMPLAICE (American plaice)
YELLOWTAIL (Yellowtail flounder)
TURBOT (Greenland halibut)
WITCH (Witch flounder or Grey sole)
MENTELLA (Redfish: Sebastes mentella)
MARINUS (Redfish: Sebastes marinus)
HADDOCK
TSKATE (Thorny skate)
SHRIMP (Pandalus borealis)
GRENADIER (Roundnose grenadier)

In addition to these species, the user can specify OTHER, if the species required is not in the above list. This will require supplementary information to be provided in the control statement set ?SELECT2.
Note: When PROGRAM=NOAGELENGTH is specified a maximum of six species can be analysed concurrently. If PROGRAM= AGELENGTH is specified the maximum number is two. When listing the species names, the names can be separated by commas or blanks.

e) TOW = give length of tow in nautical miles. Decimal point must be entered (i.e. a tow of 1.8 N. miles is entered as TOW = 1.8).

f) WING = give the wing spread in feet. Decimal point must be entered as above.

NOTE: All control commands in this set must be entered. None are optional.

III ?SELECT2 (Optional)

a) OTHER = give species code as per coding specification in Appendix 2 if SPECIES=OTHER is specified in ?SELECT1. The rules for the SPECIES = control statement apply here.

b) RUN = SEPARATE; a separate analysis will be done for each vessel and trip combination.

= COMBINED (default); combine vessels and trips into one analysis.

c) SELSTR = give a list of specific strata numbers to be analyzed if it is desired not to analyze the complete set of strata covered in the survey.

d) COMSTR = (G) H_1, H_2, ..., H_k where G denotes the group number and the H_i are the strata numbers to be combined in this group. This option is used to combine a number of strata into one super strata or group. More than one group may be specified but the strata must be mutually exclusive with respect to group membership.

e) DELSTR = give a list of strata which are not to be analyzed.

f) STRAT=DEPTH; form superstrata based on common depth ranges. At present the strata for the Atlantic coast are defined on specific depth ranges i.e. 30-50 fath, 50-100 fath, 100-150 fath etc. (with the exception of ICNAF/NAFO Div. 2J and 3K in which the depth ranges are in increments of 100 m). Since the area covered by any one depth range is extremely large, the depth ranges were originally subdivided into the present strata system (Anon. 1979). This option ignores those subdivisions.

= STRATUM (default); Use strata boundaries as defined in (Anon. 1979).

g) DELSET=(T)S_1, S_2 ....., S_k; delete from the analysis the sets denoted by their set numbers (S_i) for trip 'T'. The value in the parenthesis (T) refers to a specific trip by its position in the TRIP = list in the ?SELECT1 control statement set.

h) AREAS=OTHER;indicates that stratum areas other than those listed in (Anon. 1979) be used. A file containing the other areas will be supplied by the user (see Appendix C).

= STANDARD (default); Use areas as per (Anon. 1979).

i) PRINT=NO; this option suppresses printing of the set details (see example section).

= YES (default); No printing is suppressed.

j) SPECIAL; this option is required for some species (such as SHRIMP) where only weights were recorded. The analysis for numbers will be presented but all number entries will be set to 1.0 (one). This option is for PROGRAM=NOAGELENGTH only.

IV ?SELECT3 (Optional; this control statement set is used only when PROGRAM=AGELENGTH is specified in the ?START set).

a) SPECIES = Sp_1, Sp_2, ..., Sp_n; this option is used when SPECIES=OTHER is specified in the ?SELECT1 set. The Sp_i specify species codes for the selection of age and growth records required for the construction of an age-length key. In St. John's the species codes on the age/growth records are different than those used for other files required by the program (see Appendix 2).

b) VESSEL = give a list of vessel number(s) as per the VESSEL = statement in the ?SELECT1 set. This option is used when the age and growth records to be used in constructing an age-length key are to be obtained from a cruise other than that specified in the ?SELECT1 set.

c) TRIP = again when the age and growth records are to be obtained from another cruise these statements are used to specify the selection.

d) ICNAF = criteria. They are coded exactly the same as their counterparts in the ?SELECT1 set.

e) TIMES = YYMM; this option is specific to the age and growth records collected previous to 1978 at the St. John's facility. Before 1978 cruise numbers were not included on the records. Selection criteria is specified by YY→year (e.g. 76) and MM→month (e.g. January=01).

f) SEX= MALE - this option specifies what sex will be used as a selection.
= FEMALE - criteria for the age and growth records. (Note: SEX=UNSEXED)
=UNSEXED - refers to those species in which the animals were not sexed. (This is not a combined option.)
= ALL - refers to all of the above combined.

=BOTH (default); both male and female age and growth records will be selected.

V. ?AGELENGTH (Optional: This control statement set is used only when PROGRAM=AGELENGTH is specified in the ?START set).

a) GROUP=LENGTH; if the user does not want an age length key and only requries the data analyzed by length groupings this option is activated.

=AGE (default); an age-lenth key is constructed and applied to the observed lengths. Analysis is done by ages.

b) UNSEXED=SEPARATE; if the species being analyzed has not been sexed (or a component of the species being analyzed such as juveniles has not been sexed) then a separate analysis will be carried out using a combined age-length key.
If GROUP=LENGTH is specified then the unsexed will be analyzed by lengths only.

= NONE (default); No unsexed animals are present.

c) SEXES=BOTH; male and female records are combined and analyzed.

=All; male, female and unsexed records are combined and analyzed.

=ONE(default); one or more sexes are to be analyzed separately.

d) COMSEX=SEP; more than one sex is being analyzed and the analysis is to be carried out on each sex separately.

=SEPALL;more than one sex is being analyzed and the analysis is to be carried out on each sex separately and then a separate analysis is carried out on all the sexes requested as a combined set.

=ONE(default); only one sex is being analyzed.

e) SUMMARY = SP, SEX (L_1, U_1) (L_2, U_2); this option provides an output (and analysis) in which ages are grouped into age groupings where; sp=the position of the species of interest in either the SPECIES=statement of the ?SELECT1 or the OTHER=statement of the ?SELECT2 set.
Sex = 1 Male
2 Female
3 Unsexed
4 Combined.

At present only two age groupings are allowed. These groupings are defined by their respective upper (U) and lower (L) limits. Note: the age groups must be contiguous.

f) OUTPUT=WEIGHT; data received for analysis in PROGRAM=AGELENGTH option is in terms of numbers of animals observed at length. This option allows the numbers to be converted to weights by use of the following relationship:

$$WEIGHT=\alpha(LENGTH)^{\beta},$$

where α and β are set in the following control statement.

= NUMBERS (default)

g) PARMS = Sp, SEX, α, β; The entries for Sp and SEX are as for the SUMMARY= statement. α and β are the parameter values required for the length/weight relationship above.

(h) LENGTH = give a list of length groupings to be used when groupings other than the standard are desired. One grouping is given for each species being analysed. Normally, this option is used only when SPECIES = OTHER is specified in the SELECT1 set.

VI ?ESTIMATE (Required)

a) METHOD=STANDARD; stratum means and variances are calculated as per (Cochran 1977). Also see the notation list which follows the introduction to this report.

= GEOMEAN; stratum means are calculated by means of the geometric mean, i.e.

$$\bar{Y}'_h = \left(\prod_{i=1}^{n_h} Y_{hi}\right)^{1/n_h}.$$

If zeros are present in the data in any one strata then the calculation is not done for that strata and an error message is printed. No variance estimates are available at present.

= W3MIX; This option carries out calculations based on developments presented in SMITH (1981).

b) ALPHA = X.XX; give the alpha value according to the size of confidence interval required. ($1-\alpha$ = confidence interval probability).

c) TRANSFORM=LOG; the data (y_{hi} values) are transformed by the following transformation previous to the calculation of stratum means and variances;

$$Z_{hi} = \text{LOG } (Y_{hi} + 1).$$

= SQRT; The data (Y_{hi} values) are transformed by the following transformation previous to the calculation of stratum means and variances;

$$Z_{hi} = (Y_{hi})^{\frac{1}{2}}.$$

d) CALCULATION=INVARIANCE; the stratum means are calculated from transformed data (transformation specified above) and then retransformed before calculation of the overall strata estimates by the following;

1) $Y'_h = \text{exp. } (\bar{Z}_h) - 1.0,$

if TRANSFORM=LOG is specified.

2) $Y'_h = (Z_h)^2$, if

TRANSFORM=SQRT is specified

The stratum variances are retransformed by assuming that the relationship between the mean and variance in the transformed environment is the same as in the retransformed environment.

= (default: BEFORE); all calculations with respect to the stratified mean and total estimates plus the confidence limits are calculated before retransforming.

VII ?END: This statement is used as a delimiter between separate analyses. A second series of control statements if required can be inserted after this statement.

VIV ?FINISH: Terminal statement for the analysis.

SOME EXAMPLES

In this section we present some examples of the use of the Control Statements and the resulting output. For brevity only, two examples will be given for the first and one example will be given for the second of the following options. PROGRAM=NOAGELENGTH and PROGRAM=AGELENGTH.

I. PROGRAM=NOAGELENGTH (DEFAULT STATEMENT)

Example A) A stratified analysis is requested for numbers and weights caught of cod for a survey carried out by the research vessel A. T. Cameron (Trip 290) in ICNAF/NAFO Div. 3L (northern Grand Bank) in the period May-June 1979. This is the most basic use of the program. The control statements required are as follows.

```
?START
TITLE=EXAMPLE:  A. T. Cameron, Trip 290/79  3L  Cod
 ?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=COD
TOW=1.8
WING=45.0
?ESTIMATE
METHOD=STANDARD
ALPHA=0.05
?END
?FINISH
```

The output that results from these statements is shown on the next three pages and is divided into four sections.

The first section presents the control statements and points out errors, if any. (Note: An error in the control statements is considered to be of a terminal nature and execution will terminate after this Section.)

The second section of the output lists any sets that were denoted as unsuccessful, and the number of records which enter the analysis is then printed.

The third section lists the set details with numbers and weights standardized to a 30-minute tow. If any of the strata encountered here have less than two sets, then these strata are removed from the analysis and the strata numbers are listed. If any strata are being combined, this information would be presented in this section with the first combined group denoted by the letter "A".

The fourth section of the output presents the analysis of the data. The UNITS column is the number of 30-minute tows possible in the strata (N_h from the notation section) and the 'TOTAL NO' column is simple the 'UNITS' column times the 'AV/SET' column.

1

STRATIFIED ANALYSIS PROGRAMS

CARD DECK FOR SELECTION # 1

```
?START
TITLE=EXAMPLE A:  A.T. CAMERON  TRIP 290/79  3L  COD

?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=COD
TOW=1.8
WING=45.0

?ESTIMATE
METHOD=STANDARD
ALPHA=0.05

?END
```

2

```
ANALYSIS FOR TRIP  290 1979
             VESSEL 3
             ICNAF  3L

SET # 211 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 267 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 286 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 327 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

NUMBER OF VALID SETS FOUND 140
```

(3) EXAMPLE A: A.T. CAMERON TRIP 290/79 3L COD

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

COD

NUMBERS AND WEIGHTS PER STANDARD 30 MINUTE TOW

STRATUM	SET	NUMBER	WT(KGS)
328.	348.	7.00	9.08
328.	349.	1.00	8.17
328.	350.	2.00	0.01
328.	351.	0.0	0.0
328.	352.	3.00	5.45
341.	296.	8.00	24.97
341.	345.	14.00	36.77
341.	346.	10.00	34.96
341.	347.	2.00	0.91
341.	353.	7.00	25.88
341.	354.	1.00	1.82
342.	297.	1.00	1.36
342.	298.	5.00	11.35
342.	299.	4.00	20.43
342.	300.	2.00	4.09
343.	301.	35.00	61.74
343.	302.	9.00	8.17
343.	306.	16.00	24.97
343.	307.	10.00	25.88
344.	210.	119.00	155.27
344.	212.	166.00	190.68
345.	213.	23.00	73.55
345.	214.	8.00	26.79
345.	215.	18.00	38.59
345.	216.	18.00	41.31
346.	217.	32.00	40.41
346.	218.	10.00	33.14
346.	219.	10.00	19.52
346.	220.	33.00	38.59
347.	225.	83.00	109.41
347.	226.	98.00	147.10
347.	227.	88.00	112.59
347.	228.	42.00	48.58
348.	229.	0.0	0.0
348.	230.	1.00	5.45
348.	239.	28.00	73.55
348.	240.	44.00	53.57
348.	241.	26.00	59.93
348.	305.	40.00	76.27
349.	294.	31.00	66.28
349.	295.	33.00	72.64
349.	303.	27.00	51.30
349.	304.	18.00	35.87
349.	308.	39.00	62.65
349.	309.	8.00	25.88
349.	312.	22.00	73.55
⋮	⋮	⋮	⋮
388.	264.	11.00	24.06
388.	266.	2.00	4.09
388.	273.	8.00	10.44
389.	268.	3.00	3.18
389.	271.	37.00	24.97
389.	272.	20.00	15.44
389.	274.	35.00	27.69
390.	277.	9.00	5.90
390.	278.	1.00	0.68
390.	321.	56.00	54.48
390.	322.	24.00	23.15
390.	329.	10.00	11.35
391.	276.	86.00	79.00
391.	324.	49.00	51.30
391.	326.	53.00	44.49
391.	328.	23.00	23.15
392.	323.	24.00	20.60
392.	325.	19.00	18.16

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L COD

ANALYSIS FOR TRIP 290 979
VESSEL 3
ICNAF 3L

COD

NUMBERS

STRATUM	NO.SET	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
328	5	13.00	2.60	114023.	296459.	7.30
341	6	42.00	7.00	118151.	827058.	24.00
342	4	12.00	3.00	43913.	131738.	3.33
343	4	78.00	19.50	39409.	768470.	121.67
344	2	285.00	142.50	112146.	15980790.	1104.50
345	4	67.00	16.75	107492.	1800491.	39.58
346	4	85.00	21.25	64931.	1379774.	168.92
347	4	311.00	77.75	73788.	5737026.	606.92
348	6	139.00	23.17	159136.	3686652.	355.37
349	7	178.00	25.43	158686.	4035151.	107.62
388	3	21.00	7.00	27098.	189687.	21.00
389	4	95.00	23.75	61628.	1463658.	248.92
390	5	100.00	20.00	111170.	2223402.	473.50
391	4	211.00	52.75	21168.	1116618.	668.25
392	2	43.00	21.50	10884.	234013.	12.50

TOTAL	TOTAL UPPER	TOTAL LOWER	AVERAGE MEAN	AVERAGE UPPER	AVERAGE LOWER
91499280.	113918352.	69080160.	33.14	41.27	25.02

EFFECTIVE DEGREES OF FREEDOM= 21
STUDENTS T-VALUE= 2.08 ALPHA=0.05

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L COD

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

COD

WEIGHTS

STRATUM	NO.SETS	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
328	5	22.71	4.54	114023.	517890.	18.94
341	6	125.31	20.88	118151.	2467583.	250.91
342	4	37.23	9.31	43913.	408716.	72.76
343	4	120.76	30.19	39409.	1189748.	508.70
344	2	345.95	172.97	112146.	19398432.	626.93
345	4	180.24	45.06	107492.	4843587.	400.47
346	4	131.66	32.91	64931.	2137188.	89.29
347	4	417.68	104.42	73788.	7704945.	1677.11
348	6	268.77	44.79	159136.	7128497.	1135.64
349	7	388.17	55.45	158686.	8799568.	344.54
388	3	38.59	12.86	27098.	348573.	104.10
389	4	71.28	17.82	61628.	1098206.	122.84
390	5	95.56	19.11	111170.	2124681.	460.44
391	4	197.94	49.48	21168.	1047504.	530.97
392	2	46.76	23.38	10884.	254475.	54.50

TOTAL	TOTAL UPPER	TOTAL LOWER	AVERAGE MEAN	AVERAGE UPPER	AVERAGE LOWER
129181424.	155749360.	102613456.	46.79	56.42	37.17

EFFECTIVE DEGREES OF FREEDOM= 26
STUDENTS T-VALUE= 2.06 ALPHA=0.05

Example B. This example will use the same data as Example A with the addition of the use of the COMSTR option to combine certain strata and the use of the LOG transform with the INVARIANCE option for calculations. The control statements required are as follows:

```
?START
TITLE=EXAMPLE B:  A.T. CAMERON TRIP 290/79 3L  COD  COMBINING STRATA
?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=COD
TOW=1.8
WING=45.0
?SELECT2
COMSTR=(1)  328,341,342,343,344,345
COMSTR=(2)  346,347,348,349
?ESTIMATE
TRANSFORM=LOG
CALCULATION=INVARIANCE
METHOD=STANDARD
ALPHA=0.05
?END
?FINISH
```

The output is presented as for Example A.

1

STRATIFIED ANALYSIS PROGRAMS

CARD DECK FOR SELECTION # 1

```
?START
TITLE=EXAMPLE B:  A.T. CAMERON  TRIP 290/79  3L  COD  COMBINING STRATA

?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=COD
TOW=1.8
WING=45.0

?SELECT2
COMSTR=(1) 328,341,342,343,344,345
COMSTR=(2) 346,347,348,349

?ESTIMATE
TRANSFORM=LOG
CALCULATION=INVARIANCE
METHOD=STANDARD
ALPHA=0.05

?END
```

2

```
ANALYSIS FOR TRIP  290 1979
             VESSEL 3
             ICNAF  3L

SET # 211 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 267 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 286 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.

SET # 327 TRIP # 290 YEAR 79 VESSEL # 03 WAS UNSUCCESSFUL AND HAS BEEN DROPPED.


NUMBER OF VALID SETS FOUND 140
```

3

EXAMPLE B: A.T. CAMERON TRIP 290/79 3L COD COMBINING STRATA

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

COD

NUMBERS AND WEIGHTS PER STANDARD 30 MINUTE TOW

STRATUM	SET	NUMBER	WT(KGS)
A	210.	119.00	155.27
A	212.	166.00	190.68
A	213.	23.00	73.55
A	214.	8.00	26.79
A	215.	18.00	38.59
A	216.	18.00	41.31
A	296.	8.00	24.97
A	297.	1.00	1.36
A	298.	5.00	11.35
A	299.	4.00	20.43
A	300.	2.00	4.09
A	301.	35.00	61.74
A	302.	9.00	8.17
A	306.	16.00	24.97
A	307.	18.00	25.88
A	345.	14.00	36.77
A	346.	10.00	34.96
A	347.	2.00	0.91
A	348.	7.00	9.08
A	349.	1.00	8.17
A	350.	2.00	0.01
A	351.	0.0	0.0
A	352.	3.00	5.45
A	353.	7.00	25.88
A	354.	1.00	1.82
B	217.	32.00	40.41
B	218.	10.00	33.14
B	219.	10.00	19.52
B	220.	33.00	38.59
B	225.	83.00	109.41
B	226.	98.00	147.10
B	227.	88.00	112.59
B	228.	42.00	48.58
B	229.	0.0	0.0
B	230.	1.00	5.45
B	239.	28.00	73.55
B	240.	44.00	53.57
B	241.	26.00	59.93
B	294.	31.00	66.28
B	295.	33.00	72.64
B	303.	27.00	51.30
B	304.	18.00	35.87
B	305.	40.00	76.27
B	308.	39.00	62.65
B	309.	8.00	25.88
B	312.	22.00	73.55
⋮	⋮	⋮	⋮
391.	276.	86.00	79.00
391.	324.	49.00	51.30
391.	326.	53.00	44.49
391.	328.	23.00	23.15
392.	323.	24.00	28.60
392.	325.	19.00	18.16

STRATA COMBINED

CODE	STRATUM NO.
A	345 344 343 342 341 328
B	349 348 347 346

4

EXAMPLE B: A.T. CAMERON TRIP 290/79 3L COD COMBINING STRATA

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

COD

NUMBERS

STRATUM	NO.SETS	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
A	25	195.79	7.83	535133.	4190884.	19.89
B	21	471.66	22.46	456541.	10253866.	64.80
350	9	191.17	21.24	155458.	3302085.	74.87
363	8	139.72	17.46	133614.	2333498.	81.88
364	8	123.89	15.49	211456.	3274553.	22.27
391	4	190.91	47.73	21168.	1010300.	42.67
392	2	42.72	21.36	10884.	232496.	1.18

TOTAL	TOTAL UPPER	TOTAL LOWER	AVERAGE MEAN	AVERAGE UPPER	AVERAGE LOWER
42229856.	46143264.	38316432.	15.30	16.71	13.88

EFFECTIVE DEGREES OF FREEDOM= 18
STUDENTS T-VALUE= 2.10 ALPHA=0.05

EXAMPLE B: A.T. CAMERON TRIP 290/79 3L COD COMBINING STRATA

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

COD

WEIGHTS

STRATUM	NO.SETS	TOTAL	AV./SET	UNITS	TOTAL NO	VAR.
A	25	357.27	14.29	535133.	7647468.	56.81
B	21	872.07	41.53	456541.	18958720.	145.85
350	9	383.82	42.65	155458.	6629701.	182.83
363	8	290.33	36.29	133614.	4849080.	205.78
364	8	234.65	29.33	211456.	6202374.	37.66
391	4	181.21	45.30	21168.	958972.	34.32
392	2	45.63	22.81	10884.	248321.	4.90

TOTAL	TOTAL UPPER	TOTAL LOWER	AVERAGE MEAN	AVERAGE UPPER	AVERAGE LOWER
67298240.	72046912.	62549536.	24.38	26.10	22.66

EFFECTIVE DEGREES OF FREEDOM= 35
STUDENTS T-VALUE= 2.03 ALPHA=0.05

II PROGRAM = AGELENGTH

EXAMPLE A. To demonstrate the AGELENGTH program we will use the SELSTR option in order to reduce the amount of output. The data used will form the same research cruise as in the first two example but the species of concern will be American Place. Only one sex, males, is to be analysed. The control statements required are shown below.

```
?START
TITLE=EXAMPLE A: A.T. CAMERON  TRIP 290/79  3L  AM PLAICE  AGELENGTH
PROGRAM=AGELENGTH ?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=COD
TOW=1.8
WING=45.0
?SELECT2
SEX=MALE
?AGELENGTH SEXES=ONE ?ESTIMATE
METHOD=STANDARD
ALPHA=0.05
?END
/FINISH
```

The output that results from these statements can be divided into five sections. Sections one and two are identical to those produced for the NOAGELENGTH option shown previously.

The third section of the output gives the AGE-LENGTH key used for this analysis.

Section Four lists the set details for this analysis. Note that the output for each set lists the results by age.

The final section of the output presents the summary table for this run. Again, the results are presented by age group.

STRATIFIED ANALYSIS PROGRAMS

(1)

CARD DECK FOR SELECTION # 1

```
?START
TITLE=EXAMPLE A:  A.T. CAMERON  TRIP 290/79  3L AM PLAICE  AGELENGTH
PROGRAM=AGELENGTH

?SELECT1
VESSEL=03
TRIP=79290
ICNAF=3L
SPECIES=AMPLAICE
TOW=1.8
WING=45.0

?SELECT2
SELSTR=328,341,342,343

?SELECT3
SEX=MALE

?AGELENGTH
SEXES=ONE

?ESTIMATE
METHOD=STANDARD
ALPHA=0.05

?END
```

(2)

```
ANALYSIS FOR TRIP  290 1979
             VESSEL 3
             ICNAF  3L

NUMBER OF VALID AGE & GROWTH RECORDS FOUND 433

NUMBER OF VALID SETS FOUND  19

NUMBER OF MALE FREQUENCIES FOUND  19
```

3

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

AGE/LENGTH KEY

SPECIES: AM PLAICE
SEX: MALE

	AGE IN YEARS																													
LENGTH	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	27	28	29	29+	SUM
4.5	3	1																													4
6.5		5																													5
8.5		1	6																												7
10.5			2	1																											3
12.5				6	4																										10
14.5				10	6	1																									17
16.5				2	15	2																									19
18.5					7	13																									20
20.5					3	15	3	1																							22
22.5					1	9	9	1																							20
24.5						2	13	7																							22
26.5						2	6	7	2	1	1																				19
28.5						2	5	12	1	2																					22
30.5							3	6	5	4	1																				19
32.5							5	7	12	5	1																				30
34.5							2	3	10	6	3																				24
36.5							1	4	12	8	3																				28
38.5								2	5	15	4																				26
40.5								1	6	14	6																				27
42.5							1		1	6	14	6	1																		29
44.5									1	4	7	7	2																		21
46.5										5	5	7	2																		19
48.5											3	6	5																		14
50.5												4	2																		6
	3	7	8	19	36	46	48	51	55	70	48	30	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	433

4

AGE COMPOSITION-NUMBERS PER STANDARD TOW

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

SPECIES: AM PLAICE
STRATUM:328
SEX: MALE

AGE	SET DETAILS					SET STATISTICS		TOTAL ABUNDANCE
IN YEARS	348	349	350	351	352	AVG.	VAR.	(1000'S)
1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	0.0	0.0	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	0.0
4.0	0.0	3.01	2.50	2.77	0.0	1.66	2.32	188.90
5.0	0.49	11.10	8.19	7.15	0.29	5.44	23.40	620.54
6.0	2.66	18.13	10.37	9.04	3.60	8.76	38.56	998.88
7.0	8.77	17.38	10.34	3.48	8.54	9.70	25.11	1106.15
8.0	12.93	15.11	6.17	2.28	8.12	8.92	26.69	1017.36
9.0	13.31	8.42	1.19	0.61	4.41	5.59	28.27	637.23
10.0	10.74	6.54	0.85	0.48	3.62	4.45	18.33	507.11
11.0	3.67	2.30	0.39	0.18	1.43	1.60	2.08	181.89
12.0	0.33	0.0	0.0	0.0	0.0	0.07	0.02	7.60
13.0	0.10	0.0	0.0	0.0	0.0	0.02	0.00	2.17
UNKNOWN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	53.00	82.00	40.00	26.00	30.00	46.20	509.20	5267.83

ESTIMATION TYPE:STANDARD TRANSFORMATION TYPE:NONE

AGE COMPOSITION-NUMBERS PER STANDARD TOW

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

SPECIES: AM PLAICE
STRATUM:343
SEX: MALE

AGE	SET DETAILS				SET STATISTICS		TOTAL ABUNDANCE
IN YEARS	301	302	306	307	AVG.	VAR.	(1000'S)
1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	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
4.0	0.0	0.0	0.11	0.0	0.03	0.00	1.04
5.0	1.66	1.75	1.96	1.46	1.71	0.04	67.25
6.0	19.08	21.42	8.88	17.35	16.68	29.86	657.36
7.0	58.31	72.85	24.65	50.84	51.66	407.86	2036.01
8.0	75.27	100.42	32.64	57.39	66.43	818.91	2617.89
9.0	49.56	76.20	23.96	36.69	46.60	498.68	1836.56
10.0	37.21	59.26	19.01	27.81	35.82	299.43	1411.76
11.0	13.80	19.86	6.56	11.31	12.88	30.67	507.69
12.0	1.69	0.21	0.21	1.77	0.97	0.78	38.19
13.0	0.41	0.03	0.03	0.38	0.22	0.04	8.48
UNKNOWN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	257.00	352.00	118.00	205.00	233.00	9581.95	9182.21

ESTIMATION TYPE: STANDARD TRANSFORMATION TYPE: NONE

AGE COMPOSITION-NUMBERS PER STANDARD TOW

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

SPECIES: AM PLAICE
STRATUM:342
SEX: MALE

AGE	SET DETAILS				SET STATISTICS		TOTAL ABUNDANCE
IN YEARS	297	298	299	300	AVG.	VAR.	(1000'S)
1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.0	0.0	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
4.0	1.29	2.41	0.0	0.0	0.93	1.35	40.64
5.0	3.25	13.05	1.52	0.34	4.54	33.63	199.39
6.0	9.22	37.00	9.01	5.80	15.26	212.49	670.00
7.0	16.77	65.98	23.19	16.87	30.70	562.04	1348.33
8.0	16.90	78.21	23.90	23.17	35.55	819.05	1560.89
9.0	10.59	46.77	12.84	13.57	20.94	297.97	919.71
10.0	9.77	36.12	9.20	10.95	16.51	171.47	725.05
11.0	3.20	12.03	3.66	3.82	5.68	18.01	249.32
12.0	0.0	0.33	0.54	0.37	0.31	0.05	13.63
13.0	0.0	0.10	0.13	0.11	0.08	0.00	3.63
UNKNOWN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	71.00	292.00	84.00	75.00	130.50	11621.62	5730.57

ESTIMATION TYPE:STANDARD TRANSFORMATION TYPE:NONE

AGE COMPOSITION-NUMBERS PER STANDARD TOW

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH

ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

SPECIES: AM PLAICE
STRATUM:341
SEX: MALE

AGE	SET DETAILS						SET STATISTICS		TOTAL ABUNDANCE
IN YEARS	296	345	346	347	353	354	AVG.	VAR.	(1000'S)
1.0	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	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	0.0	0.0
4.0	1.18	3.26	1.98	0.0	0.11	1.93	1.41	1.55	166.18
5.0	2.07	8.92	5.11	3.23	6.35	14.04	6.62	18.99	782.30
6.0	10.65	29.30	15.00	20.56	23.35	35.66	22.42	84.10	2648.90
7.0	21.40	56.05	33.82	29.29	35.97	31.12	34.61	135.42	4088.92
8.0	27.30	66.84	48.05	24.98	43.07	27.05	39.55	269.60	4672.75
9.0	16.67	40.76	39.14	13.36	25.05	12.57	24.59	161.31	2905.46
10.0	14.72	34.14	35.00	10.87	22.00	11.88	21.44	118.73	2532.59
11.0	5.34	14.02	12.96	3.70	6.86	4.81	7.95	19.58	939.03
12.0	0.54	3.34	2.31	0.0	0.21	0.78	1.20	1.77	141.44
13.0	0.13	1.37	0.64	0.0	0.03	0.17	0.39	0.28	46.26
UNKNOWN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	100.00	258.00	194.00	106.00	163.00	140.00	160.17	3536.94	18923.80

ESTIMATION TYPE:STANDARD TRANSFORMATION TYPE:NONE

5

EXAMPLE A: A.T. CAMERON TRIP 290/79 3L AM PLAICE AGELENGTH
ANALYSIS FOR TRIP 290 1979
VESSEL 3
ICNAF 3L

AGE COMPOSITION-NUMBERS PER STANDARD TOW

SUMMARY TABLE
SPECIES: AM PLAICE
SEX: MALE

AGE IN YEARS	TOTAL NUMBERS	UPPER LIMIT	LOWER LIMIT	MEAN PER TOW	UPPER LIMIT	LOWER LIMIT	D.F.
1.0	0.	0.	0.	0.0	0.0	0.0	0
2.0	0.	0.	0.	0.0	0.0	0.0	0
3.0	0.	0.	0.	0.0	0.0	0.0	0
4.0	396755.	630607.	162903.	1.26	2.00	0.52	8
5.0	1669478.	2445332.	893624.	5.29	7.75	2.83	10
6.0	4975141.	6370190.	3580088.	15.77	20.19	11.35	12
7.0	8579405.	10539873.	6618933.	27.19	33.41	20.98	12
8.0	9868883.	12481855.	7255906.	31.28	39.56	23.00	11
9.0	6298951.	8230664.	4367236.	19.97	26.09	13.84	12
10.0	5176502.	6751893.	3601109.	16.41	21.40	11.41	12
11.0	1877922.	2473936.	1281908.	5.95	7.84	4.06	10
12.0	200862.	373378.	28345.	0.64	1.18	0.09	5
13.0	60540.	127831.	-6751.	0.19	0.41	-0.02	5
UNKNOWN	0.	0.	0.	0.0	0.0	0.0	0
TOTAL	39104416.	48570432.	29638400.	123.95	153.95	93.94	12

ESTIMATION TYPE:STANDARD TRANSFORMATION TYPE:NONE

CONFIDENCE LEVEL: 0.95%

****-ONE OR MORE OF THE LOWER LIMITS IN THE ABOVE
TABLE IS LESS THAN OR EQUAL TO ZERO. VARIANCE IS TOO LARGE FOR
VALID CONFIDENCE LIMITS ****

REFERENCES

Anon. 1979. Codification of survey stratification schemes for the Northwest Atlantic. Annual Meeting June 1979, ICNAF Summ. Doc. 79/VI/24, Ser. No. 5443, 16 p.

Arnason, A. N., and L. Baniuk. 1980. A computer system for mark-recapture analysis of open populations. J. Wildl. Manage. 44: 325-332.

Cochran, W. G. 1977. Sampling techniques. John Wiley & Sons, New York, N.Y. Third Edition, 428 p.

Dixon, W. J. 1977. BMDP-77. Biomedical Computer Programs. P-Series. Univ. of Calif. Press, Berkeley, Calif. 880 p.

Grosslein, M. D. 1971. Report of the ICNAF Working Group on Coordinated Groundfish Surveys. ICNAF Res. Doc. 71/32, Ser. No. 2502, 24 p.

Grosslein, M. D., and A. T. Pinhorn. 1971. Progress in development of a coordinated groundfish survey in the ICNAF area. ICNAF Res. Doc. 71/128, Ser. No. 2634, 28 p.

Halliday, R. G., and A. C. Kohler. 1971. Groundfish survey programmes of the St. Andrews Biological Station, Fish. Res. Board Can. - Objectives and characteristics. ICNAF Res. Doc. 71/35, Ser. No. 2520, 11 p.

Pinhorn, A. T. 1971. Objectives and characteristics of existing and proposed groundfish surveys by the Fisheries Research Board of Canada, Biological Station, St. John's, Newfoundland. ICNAF Res. Doc. 71/36, Ser. No. 2527, 12 p.

Smith, S. J. 1981. A comparison of estimator of location for skewed populations-with application to groundfish trawl surveys. In W. G. Doubleday and D. Rivard [ed.] Proceedings of the Groundfish Trawl Survey Workshop. Can. Spec. Pub. Fish. Aquat. Sci. (In press).

APPENDIX 1: FILE SPECIFICATIONS AND SAMPLE JOB STREAMS

Depending on the application being run (AGELENGTH or NOAGELENGTH) the STRAP program may read data from a variety of master files. The table given below summarizes the file usage by the program.

File name	Contents	When required
FT17F001	Contains stratum areas records. Each record has the following format: Cols 1-3 - Identifying stratum number. Must be numeric and unique within the file. Cols 4-7 - Area of the stratum in square nautical miles. Cols 8-11 - Upper limit of depth range for the stratum. Note: The STRAP program assumes that this file is sorted by ascending order of stratum number.	Both AGELENGTH and NOAGELENGTH
FT19F001	Contains the set details records. Layouts of the records in this file are given in Appendix 2 Note: The STRAP program assumes that this file is sorted such that the "catch" records follow directly the set to which they belong.	Both AGELENGTH and NOAGELENGTH
SPECIN	Contains the program control statements required for the run. Format of these statements is described in this report.	Both AGELENGTH and NOAGELENGTH
FT18F001	Contains the age and growth records. Layout of these records is given in Appendix 2.	Only for an AGELENGTH run
FT16F001	Contains the length frequency records. Layout of these records is given in Appendix 2.	Only for an AGELENGTH run

B. Sample job stream for a NOAGELENGTH run. This particular set of job control statements was used to produce the Example B output in this report.

```
//    EXEC  STRAP
//FT17F001 DD DSN=G70141R.STRATUM.AREAS,DISP=SHR,DCB=BUFNO=1
//FT19F001 DD DSN=F7014100.TRIPS,UNIT=(TAPE,,DEFER),VOL=SER=000461,
//             DISP=OLD
//SPECIN   DD DSN=G70141R.EXAMPLEB.DATA,DISP=SHR
```

C. Sample job stream for an AGELENGTH run. This particular set of job control statements was used to produce the Example A AGELENGTH output in this report.

```
//    EXEC  STRAP
//FT17F001 DD DSN=G70141R.STRATUM.AREAS,DISP=SHR,DCB=BUFNO=1
//FT18F001 DD DSN=F7010500.PLA.AANDG,UNIT=TAPE,VOL=SER=004842,
//             DISP=OLD,LABEL=(9,SL)
//FT19F001 DD DSN=F7014100.TRIPS,UNIT=TAPE,VOL=SER=000461,
//             DISP=OLD
//FT16F001 DD DSN=F7010500.PLA.FREQ,UNIT=TAPE,VOL=SER=002241,
//             DISP=OLD
//           DD DSN=F7010500.PLA.FREQ,UNIT=TAPE,VOL=SER=002241,
//             DISP=OLD,LABEL=(2,SL)
//SPECIN   DD DSN=G70141R.EXAMPLEC.DATA,DISP=SHR
```

APPENDIX 2: DATA FORMATS – ST. JOHN'S CODING SPECS
A: GROUNDFISH RESEARCH SET DETAILS (CODING SPECIFICATIONS)

SET RECORD CARD FORMAT

No.	Field	Card Columns
1	Card type	1
2	Vessel	2-3
3	Trip No.	4-6
4	Set No.	7-9
5	Year	10-11
6	Month	12-13
7	Day	14-15
8	Set type	16-17
9	Stratum or Line	18-20
10	ICNAF Division	21-22
11	Unit Area	23-25
12	Light Condition	26-28
13	Wind Direction	29
14	Wind Force	30
15	Sea	31
16	Type Bottom	32
17	Time (Midpoint)	33-36
18	Duration of Set	37-39
19	Distance Towed	40-42
20	Operation of Gear	43
21	Depth (Mean)	44-47
22	Depth (Minimum)	48-51
23	Depth (Maximum)	52-55
24	Depth (Bottom if MWT)	56-59
25	Temperature (Surface)	60-62
26	Temperature (Fishing Depth)	63-65
27	Position (Latitude)	66-70
28	Position (Longtitude)	71-75
29	Position Method	76
30	Gear	77-80

CATCH RECORD CARD FORMAT

No	Field	Card Columns	
1	Card Type	1	
2-20		2-43	Same as Set Record
21	Species	47-50	
22	Catch Number	55-60	
23	Catch Weight	64-70	

Note: When the set and catch records are transferred to magnetic tape storage the records are expanded to 97 columns as follows:

(1) For a set record columns 1-80 are identical to the card format and column 81-97 are blank.

(2) For a catch record columns 1-80 are identical to the set record to which the catch record belongs and

Columns 81-84 = species code
Columns 85-90 = catch number for the species
Columns 91-97 = catch weight for the species (in kilograms to 2 decimal places)

Set Record

Card Type	1 (1)	Card Type	5 = set record 6 = catch record

			New	Old
Vessel	2-3	Inv II	1	1
	(2)	MARINUS	2	2
		A.T. CAMERON	3	3
		PARR	4	4
		MATTHEW	5	5
		E.E. PRINCE	6	6
		SHAMOOK	7	7
		ANTON DOHRN	8	8
		Charter Boat	9	9
		BEOTHIC VENTURE	10	B
		WALTHER HERWIG	11	H
		CAPE FAREWELL	12	F
		GULF GUNN	13	G
		HILLSBOROUGH	14	A
		KESTREL	15	K
		CAPE HUNTER	16	C
		ZERMATT	17	Z
		CRYOS	18	D
		SPANISH PAIRS	19	S
		GADIS ATLANTICA	20	X
		NFLD. HAWK	21	E
		CANSO CONDOR	22	
		LRNST HAECKEL	23	
		KRISTINA LOGOS	24	
		ZAGREB	25	

Trip No.	4-6 (3)	Actual trip number of vessel	
Set No.	7-9 (3)	Actual set number of vessel. Should start with 1 in January of each year.	
Year	10-11 (2)	1977=77	
Month	12-13 (2)	Jan=01	Dec=12

Day	14-15 (2)	Actual day
Set Type	16-17 (2)	Survey 1 Sampling 2 Searching 3 Tagging 4 Savings Gear 5 Experimental 6 Diurnal Studies 8 Other 7 Food & Feeding 9
Stratum or Line	18-20 (3)	Actual stratum fished " line fished

Division	21-22 (2)	Subarea 0 = 0- 1A-1F 2G-2J 3K 3N 3Q=3PN 3L 3Ø 3M 3P=3Ps 4R 4U=4VN 4S 4V=4VS 4T 4W
Unit Area	23-25 (3)	Nfld. area grid map - square eg. L30, K29, P16, etc

Light Condition	26-28 (3)	Light Meter Light readings in foot candles 0-975
		Prorating of light intensity 976-993
		General use:
		Dark 994 Moon light 995 Dusk & Dawn 996 Dull (overcast, fog, rain) 997 Bright but hazy 998 Bright sunlight 999

Wind Direction	29 (1)	Calm = 0 N = 1 NE = 2 E = 3 SE = 4	S = 5 SW = 6 W = 7 NW = 8

code to the nearest direction

Wind force	30 (1)	Beaufort Scale (0-9)

Sea	31 (1)	Standard Sea Code (0-9)

Type of Bottom	32 (1)	Mud Sandy Mud Sand (Sand & Shells) Fine Gravel (Sand & Gravel) Coarse Gravel (Rock & Gravel) Boulders Rocks Other	1 2 3 4 5 6 7 8
Time (Midpoint)	33-36 (4)	24 hour clock in NST 3.15 PM = 1515	
Duration of Set	37-39 (3)	Length of set in minutes	
Distance	40-42 (3)	Distance towed in nautical miles to 1 decimal 2.5 miles = 025	

Operation of Gear	43 (1)	1- Normal, no damage. 2- Normal, some damage to net, but catch not affected. 3- Unsuccessful, net badly damaged and catch affected. Usually repeated in same position. 4- Unsuccessful, depth range covered was too large. 5- Unsuccessful, not due to damage. e.g.: Net not on bottom. Doors locked. Codend untied, etc.

Depth (Mean)	44-47 (4)	Actual mean depth fished in meters. Usually derived by reading sounder paper for the set. If MWT is used this depth is mean depth of net from the surface.
Depth (Minimum)	48-51 (4)	Actual minimum depth recorded on sounder during set in Meters. If MWT is used this is the minimum depth of the net from surface during the set.
Depth (Maximum)	52-55 (4)	Actual maximum depth recorded on sounder during set in Meters. If MWT is used this is the maximum depth of the net from the surface.
Depth (Bottom if Midwater Gear)	56-59 (4)	Mean depth of bottom in Meters over which MWT gear was fished.
Temperature (Surface)	60-62 (3)	Surface temperature in degrees Celcius. 9 in first position designates Minus. e.g. 1.2 = 012, 0.0 = 900, -1.2 = 912.
Temperature (Fishing Depth or Bottom)	63-65 (3)	Bottom or fishing depth (if MWT) temperature in degrees Celcius. 9 in first position designates minus. e.g. 1.2 = 012, 0.0 = 900, -1.2 = 912.

Position (Latitude)	66-70 (5)	Latitude at start of set in degrees and minutes (to 1 decimal) 47°30'30" = 47305	
Position (Longtitude)	71-75 (5)	Longtitude at start of set in degrees and minutes (to 1 decimal) 57°45'30" = 57455	
Position Method	76 (1)	Unknown Dead Reckoning Radar Decca Loran Satellite navigation	0 1 2 3 4 5
Gear	77-80 (4)	See Appendix A	

CATCH RECORD

Card Type	1 (1)	Card Type -6
	2-43	Duplicate card columns 2-43 from the set record card.
Species	47-50 (4)	Species code
Number	55-60 (6)	Catch number of the above species.
Weight	64-70	Catch weight of the above species in kilograms to 2 decimals.

APPENDIX 2: DATA FORMATS – ST. JOHN'S CODING SPECS
B: GROUNDFISH RESEARCH AGE AND GROWTH (CODING SPECIFICATIONS)

AGE AND GROWTH

RESEARCH

No.	Field	Card Columns
1	Card Type	1
2	Species	2-4
3	Vessel	5-6
4	Trip	7-9
5	Set No.	10-12
6	Year	13-14
7	Month	15-16
8	Day	17-18
9	Gear	19-22
10	ICNAF Division	23-24
11	Unit Area	25-27
12	Depth Fished	28-31
13	Depth Bottom	32-35
14	Temperature	36-38
15	Sample Type	39
16	Specimen No.	40-44
17	Length	45-47
18	Sex	48
19	Maturity	49-51
20	Age	52-53
21	Edge	54
22	Reliability	55
23	Spawning Age	56-57
24	Round Weight	58-61
25	Gutted Weight	62-65
26	Gonad Weight	66-69
27	Stomach	70-74
28	Girth	75-77
29	Parasite Type	78
30	No. of Parasites	79-80

Card Type	1 (1)	Standard ageing sheet	1

Species	2-4 (3)	Cod	103
		Haddock	203
		Redfish Ment.	303
		Redfish Marinus	313
		Halibut x	403
		Am. Plaice	503
		Yellowtail	513
		Witch	523
		Turbot	533
		Rock cod	113
		Blue hake	701
Vessel	5-6 (2)	Inv. II	1
		Marinus	2
		A.T. Cameron	3
		Parr	4
		Matthew	5
		E.E. Prince	6
		Shamook	7
		Anton Dohrn	8
		Charter Boat	9
		Beothic Venture	10
		Walter Herwig	11
		Cape Farewell	12
		Gulf Gunn	13
		Hillsborough	14
		Nfld. Kestrel	15
		Cape Hunter	16
		Zermatt	17
		Cryos	18
		Spanish Pairs	19
		Gadus Atlantica	20
		Nfld. Hawk	21
		Canso Condor	22
		Ernst Heckel	23
		Kristina Logos	24

Trip	7-9 (3)	Actual trip number of vessel
Set No.	10-12 (3)	Actual set number of vessel. Consecutive numbers starting in January of each year with 1.
Year	13-14 (2)	1977 = 77
Month	15-16 (2)	Jan = 01, Dec = 12
Day	17-18 (2)	Actual day
Gear	19-22 (4)	Otter trawl 10 " " (lined) 11 " " (covered) 12 " " (ATC B (5-3)) 13 " " (" C (5-4)) 14 " " (" D (5-4.5)) 15 " " (" E (5 3/8-5)) 16
* Left justify in Col 19-20		

Gillnet by size:
3 1/2" mesh - 8350
5" mesh - 8500
6" mesh - 8600
7" mesh - 8700
8" mesh - 8800

Midwater trawl	30
Danish seine	40
Purse seine	50
Trap (cod)	60
Trap (herring)	61
Pair trawl	70
Shrimp trawl	71
Gillnet	80
Longline	90
Linetrawl	91
Handline	92
Jigger	93
Spinner	94
Beach seine	45

Division 23-24 (2)

Area Zero = 0-

1A - 1F
1U = Subarea 1
2G - 2J
2U = Subarea 2
3K - 3Ø
3P = 3PS
3Q = 3PN
3U = Subarea 3
4R - 4T
4U = 4VN
4V = 4VS
4W - 4X
4Z = Subarea 4

Unit Area	25-27 (3)	Squared map grid eg: K29, L30, etc.
Depth Fished	28-31 (4)	Actual depth fished in meters
Depth (Bottom)	32-35 (4)	Actual bottom depth in meters. Use where depth fished is not bottom depth such as midwater trawl.
Temperature	36-38 (3)	Degrees celcius to 1 decimal. 9 in leftmost position designates minus. eg: 1.2 = 012, 0.0 = 900, -1.2 = 912
Sample type	39 (1)	Sea Random 1 Sea Category 2 Lab Random 5 Lab Category 6 Sea Stratified 8 Lab Stratified 9 Tagging rejects 3
Specimen No.	40-44 (5)	Consecutive Numbers 1 - 99999

Length	45-47 (3)	Actual length in centimeters	
Sex	48 (1)	Male Female Unknown	1 5 Blank
Maturity	49-51	See Appendix A.2	
Age	52-53 (2)	Actual age in years	
Edge	54 (1)	NT T NØ Ø-CØ, WØ, Ø Ø + NT Ø Tip	1 2 3 4 5 6
		Ø+NT used only when T edge is considered to be that of the next year zone.	
Reliability	55 (1)	Poor Fair Good Excellent	1 2 3 4

Spawning age	56-67 (2)	Age at first spawning in years
Round weight	58-61 (4)	KGS to 2 decimals 2.55 KGS = 0255
Gutted weight	62-65 (4)	KGS to 2 decimals 1.99 KGS = 0199
Gonad weight	66-69 (4)	Grams 650 grams = 0650
Stomach	70-74 (5)	Col 70 = degree of fullness in 10ths 10/10 = 9 Col 71-72 = main stomach content Col 73-74 = secondary stomach content See Appendix A.3 for stomach content codes.
Girth	75-77 (3)	Millimeters
Parasite type	78 (1)	Lernaeocera 1 Sphyrion 2 Old Heads 3
No. of parasites	79-80 (2)	Actual number of above parasite.

APPENDIX A.2

COD AND HADDOCK MATURITY CODES

Col. 42-44

MALE		FEMALE	
Immature	100	Immature	500
Spent L	110	Spent L	
Mat P	140	No observation on old eggs	510
- Mat A-P	141	Old eggs present	511
- Mat B-P	142	No old eggs present	512
Partly spent	150	Mat A-P	520
Spent P	160	Mat B-P	530
Spent P Mat N		Mat C-P	540
Milt in testes & VD	170	Spent P	
Milt in testes	171	No observation on old eggs	560
Milt in VD	172	Old eggs present	561
No milt	173	No old eggs present	562
No observation on milt	174	Spent P Mat AN	
Mat N	180	No observation on old eggs	570
Mat N (IMM)	190	Old eggs present	571
Mat	200	No old eggs present	572
Imm condition	210	Mat A-N	580
Doubtful	220	Mat A-N (IMM)	590
Spent L Mat P		Mat	600
No observation on milt	250	IMM condition	610
Milt in testes & VD	251	Doubtful	620
Milt in testes	252	Spent L Mat AP	
Milt in VD	253	No observation on old eggs	650
No milt	254	Old eggs present	651
Other	300	No old eggs present	652
No maturity	310	Other	700
		No maturity	710

Maturity Unknown = blank

APPENDIX A.2

FLOUNDER MATURITY CODES

Col. 42-44

MALE		FEMALE	
Immature	10	Immature	50
Spent L	11	Spent L	51
	12	Mat A-P	52
	13	Mat B-P	53
Mat P	14	Mat C-P	54
Partly spent	15	Partly spent	55
Spent P	16	Spent P	56
Spent P Mat N	17	Spent P Mat A-N	57
Mat N	18	Mat A-N	58
Mat N (IMM)	19	Mat A-N (IMM)	59
Mat	20	Mat	60
IMM condition	21	IMM condition	61
Doubtful	22	Doubtful	62
No maturity	23	No maturity	63
Spent L Mat P	25	Spent L Mat A-P	65
Other abnormal	30	Other abnormal	70

APPENDIX A.1

GEAR CODES

Research Vessels

Col 77-80

	Manilla	Nylon	Courlene
Lined O/T	0001	0041	0051
Covered O/T	0100	0140	0150

Codend Size

	3"	4"	4.5"	5"	6"
Standard Net (No liner or cover, by Codend size)	0002	0003	0004	0005	0006

Roller Type

	Disc	Rubber	Steel
Standard lined net variations in rollers	0010	0011	0012

35A Marinus Net, Unlined, 3.5" codend, used on Inv	0200
" " " Lined, " " " " "	0201
" " " Covered, " " " " "	0202
3/4 35 Net, lined, used on one warp	0203
" " " " used on two warps	0204
36 Net, standard, unlined	0209
Redfish Net, Unlined, rubber rollers	0210
" " " wooden rollers	0213
" " " rollers not specified	0212

APPENDIX A.1

Floatless Net, unlined	0215
Pacific Coast Net, Unlined	0216
Balloon Net	0217
Westerbeke	0218
	3900
Danish Seine	4000
Purse Seine	5000
Trap	6000
Midwater Trawl	7250
Standard Net - 35, 36, 41.5, etc. used midwater	7251
Beam Trawl	7300
Gill Net (No. of nets may be designated by using: 8 nets = 8008)	8000
Longline, Type not specified	9000
" Japanese	9002
" Midwater	9003
" Deep water	9004
" Overnight set	9005
Linetrawl	9100
Shrimp Net	9400

APPENDIX A.1

Mesh Experiments on INV II

Nets unlined and without cover, coded by codend size.

3	mesh	codend	0030
3.5	"	"	0035
4	"	"	0040
4.5	"	"	0045
5	"	"	0050
5.5	"	"	0055
6	"	"	0060

Mesh Experiments on MARINUS

35 + 35A net - no liner or cover

3	mesh	codend	3003
4	"	"	3004
5	"	"	3005

Net	Mesh	Floats	Rollers	Code
B	$\frac{6-4}{6-4}$	19	18' 6" 36' 6"	3011
C	$\frac{4-4}{4-4}$	19	"	3012
D	$\frac{8-4}{8-4}$	19	"	3013
E	$\frac{12-4}{12-4}$	19	"	3014
E	"	24	"	3015
E	$\frac{12-4}{12-4}$	39	18' 6" 36' 6"	3016
[illegible]	$\frac{6-3}{}$	19	"	3017
F	"	5	"	3018
F	"	10	"	3019

APPENDIX A.1

Net	Mesh	Floats	Rollers	Code
F	6-3 / 6-3	19	46'	3021
F	"	29	18' 6" 36' 6"	3022
F	" (½ wing)	10	"	3023
F	" "	19	"	3024
G	8-3 / 8-3	19	"	3025
G	"	10	"	3026
H	8-3 / 6-3	19	"	3027
H	"	10	"	3028
I	12-3 / 6-3	19	"	3029
I	"	5	"	3030
I	12-3 / 6-3	10	18' 6" 36' 6"	3031
J	6-3 / 4½-3	19	"	3032
J	"	10	"	3039
K	8-3 / 4½-3	19	"	3033
L	12-3 / 4½-3	19	"	3034
L	"	10	"	3035
L	"	29	"	3036
M	4½-3 / 4½-3	19	"	3037
M	"	10	"	3038

Mesh Experiments on ATC

Gear has not been coded.
Gear field is left blank.

Stramin Net	Size not specified	7000
" "	2 meter	7002
" "	3 meter	7003

APPENDIX A.1

Handline	9500
Jigger - Type not specified	9550
" - Norwegian	9551
- Squid	9552
- Nfld.	9553
Spinner	9600
Sneller Reel	9601
Lures	9602
Fish Pot, used with longline	9700
Dutch Herring Trawl	9750
Sand Eel trawl (used ATC 148)	9760
Standard 36 net lined throughout with 1 1/8" netting	9762
Norwegian Shrimp Trawl	9763
Commercial Otter Trawl (Portugese type used on ZERMATT)	9764
16 foot shrimp tryout	9765
Sputnik 1600 shrimp trawl	9766

APPENDIX A.2

REDFISH MATURITY CODING

	Column 40	41
Sex and maturity not known	0	1
Abnormal (not specified) Male	9	0
IMM Condition Male	9	1
Abnormal (not specified) Female	9	5
IMM Condition Female	9	6
Large number eggs not developing	9	7
10% or more eggs degenerating Female	9	8

MALES

Immature	1	0
Mat N (imm) or IMM, Mat N.	1	5
Mature	2	0
Mat P	2	1
Mat P, milt in VD	2	2
Partly spent	2	3
Spent, old milt in VD	2	4
Spent P (Spent)	2	5
Spent P, Mat N	2	6
Mat N	2	7
Spent L, Mat P	2	8
Spent L	2	9
Maturity not known or doubtful	3	0
Maturing	3	1

FEMALES

Maturity not known or doubtful	4	0
Immature	5	0
Mature	6	0
Mat AN (imm)	6	1
Mat AN	6	2
Mat AN Spent P) with or without OEP	6	3
Mat AP Spent L)	6	4
Mat AP	6	5
Mat B-C, clearing	6	6
Eggs clear no sign of development	6	7
Mature, eggs developing, stage not specified	7	0
Pre larval stage. Early cell division to cell cap stage	7	1
Pre larval stage. Neural fold to larvae completely round	7	2
Pre larval stage. No details	7	3
Larvae developing. No eye pigment	7	4

FEMALES - Continued

Larvae well developed.	1-20% hatched	7	7
Larvae well developed.	21-70% hatched	7	8
Larvae well developed.	71-95% hatched	7	9
Larvae well developed.	96-100% hatched. Larvae with well developed yolk sac	8	0
Larvae well developed.	96-100% hatched. Yolk sac used up larvae ready for extrusion	8	1
Partly spent, 1000 or more larvae remain		8	2
Spent P old larvae remain		8	3
Spent P OEP		8	4
Spent P		8	5
Spent L old larvae remain		8	6
Spent L OEP		8	7
Spent L		8	8

APPENDIX A.3

CODING SHEET
FOR COD STOMACH CONTENTS

01 Rock and wood
02 Seaweed
03 Seal
04 Whelk egg case
05 Spawn
06 Skate egg case
07 Fish larvae
08 Mackerel
09 Cunner
10 Fish
11 Cod
12 Herring
13 Redfish
14 Capelin
15 Haddock
16 Deep sea fish
17 Lantern fish
18 American plaice
19 Offal and bait
20 Invertebrates
21 Euphasiids
22 Shrimp
23 Amphipods
24 Crab
25 Brittlestars
26 Polychaete worms
27 Sea urchins
28 Squid & Octopii
29 Shellfish
30 Digested
31 Fluid
32 Jellyfish
33 Clams
34 Sipunculid
35 Sea mouse
36 Sea cucumber
37 Sea squirt
38 Starfish
39 Mussel
40 Everted
41 Scallop
42 Snipe eel
43 Sand dollar
44 Road crab
45 Tube worm
46 Sponge
47 Hake
48
49 Dogfish
50 Arrow worms
51 Sea gooseberry (ctenophore)
52 Whelk
53 Shrimp (other than Pandalus)
54 Sea anemones
55 Pteropods (Blackberry)
56 Pteropods (Clione)
57 Basket stars
58 Lea louse (fish doctor)
59 Copepods
60 Serrivomer
61 Stomias
62 R.H. Grenadiers
63 Eelpout
64 Lancet fish
65 Viper fish
66 Wolffish
67 Mailed sculpin
68 Hook-eared sculpin
69 Sculpin
70 Turbot
71 Lumpfish
72 4-Bearded rockling
73 Shanny
74 Sea snail
75 Launce
76 Rock eel
77 Smelt
78 Wolf-eel
79 Witch
80 Alligator fish
81 Lumpenus maculatus
82 Grenadier
83 Stickleback
84 Hagfish
85 Gephyrean worm
86 Cumaceans
87 Sea Potato
88 Rock Gunnel (tansy)
89 Tape worm
90 Thorny skate
91 Arctic cod
92 Long nose eel
93 Isopods
94 Blenny
95 Caprillids
96 Rock cod
97 Yellowtail
98
99

03000 = Empty
9---- = Full or 9/10
-4000 = Everted

APPENDIX 2: DATA FORMATS – ST. JOHN'S CODING SPECS
C: GROUNDFISH RESEARCH LENGTH FREQUENCIES (CODING SPECIFICATIONS)

The following coding specs can be used for all species of groundfish research frequencies.

Cols. 1-2 - Vessel	Old	New		
Inv. II	1	1	Canso Condour	22
Marinus	2	2	Ernst Haeckel	23
A.T. Cameron	3	3	Kirstina Logos	24
Parr	4	4	Zagreb	25
Mathew	5	5		
E.E. Prince	6	6		
Shamook	7	7		
Anton Dohrn	8	8		
Charter Boat	9	9		
Beothic Venture	B	10		
Walter Herwig	H	11		
Cape Farewell	F	12		
Gulf Gun	G	13		
Hillsborough	A	14		
Kestrel	K	15		
Cape Hunter	C	16		
Zermatt	Z	17		
Cryos	D	18		
Spanish Pairs	S	19		
Gadus Atlantica	X	20		
Newfoundland Hawk	E	21		

Cols. 3-5 - Cruise No.

Vessel trip number.

Cols. 6-8 - Stratum

Cols. 9-11 - Set

Cols. 12-13 - Day

Cols. 14-15 - Month

Cols. 16-17 - Year

Cols. 18-19 - ICNAF Division

Enter number and letter except:

3PN - 3Q
3Ps - 3P
4VN - 4U
4Vs - 4V
0 - 0-

Col. 20 - Type Experiment

Survey	- 1	Savings Gear	- 5	food and feeding - 9
Sampling	- 2	Experimental	- 6	
Searching	- 3	Other	- 7	
Tagging	- 4	Diurnal Studies	- 8	

Cols. 21-24 - Species

	New	Old
Cod	103	223
Haddock	203	227
Redfish (Mentella)	303	333
Redfish (Marinus)	313	334
Redfish (doubtful)	323	512
Greenland Halibut	533	513
Am. Plaice	503	515
Yellowtail	513	516
Witch	523	
Atlantic Halibut		

For all other species, including the oddfish, use the groundfish distribution codes.

Cols. 25-28 - Number in Sample

Number of males and number of females.

Cols. 29-30 - Ratio

Ratio equals percentage of catch measured. If total catch is measured, code 00.

Col. 31 - Sex

For sexed frequencies use $\frac{1}{5}$ to denote $\frac{\text{males}}{\text{females}}$ - 1 - 5

For unsexed frequencies, leave blank.

Col. 32 - Gear

Otter trawl	- Blank	Shrimp trawl plus tickler chain	6
Midwater trawl	- 1	#41 semi-balloon trawl	7
Shrimp trawl	- 2	#16 shrimp tryout net	8
Longline	- 3		9
Handline	- 4		
Otter trawl plus tickler chain	- 5	Use a letter in col. 32 for gears exceding code 9	

Col. 33 - Day and Night

		Code
Used for Redfish - Day	- 0600-1800	1
- Night	- 1800-0600	2

Col. 34 - Blank

Col. 35 - Grouping

Oddfish - 1 cm grouping - code as 1
Redfish - 1 cm grouping - code as 1
Flatfish - 2 cm grouping - code as 2
Cod - 3 cm grouping - code as 3

Cols. 36-38 - Starting Length Group

Starting length in 14 cm group being punched.

Cols. 39-80 - (For Keypunch Operator)

14-3 digit fields representing numbers in the 14 length groups starting with the length in the previous field.

When transfered to magnetic tape each length frequency has the following format:

Cols. 1-38 - as described above

Cols. 39-338 - 100 three digit fields representing the numbers for each length group (e.g. the numbers for length group 15 would be in the 15th field i.e. cols. 81-83).