NOAA Technical Memorandum NMFS-SEFC-18

CONSUMER RISK SIMULATION MODEL USERS GUIDE

Office of Data Processing and Statistics

July 1980

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Center
Charleston Laboratory
P. O. Box 12607
Charleston, South Carolina 29412

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U.S. DEPARTMENT OF COMMERCE
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National Oceanic and Atmospheric Administration
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National Marine Fisheries Service
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CHAPTER ONE

INTRODUCTION

SIMULATION MODEL

The solution of large, complex system problems often requires great investments in time and money which may not be available. Fortunately, in these situations scientists can often use a mathematical tool, the simulation model, in order to better understand the system under investigation as well as to test proposed solutions to system problems. Modules, each representing an event (activity) of the system, are constructed and linked together to study the behavior of events including interrelationships. The behavior of an event and interrelationships is portrayed by appropriate probability distribution functions.

After the initial model is constructed, a test data set or sets is entered into the model to determine how realistically it portrays the true situation. Several iterations of the model may be required before the model is considered validated; that is to say, before the model is considered to realistically mimic the system. As mentioned previously, events are often modelled by using probability distribution functions which randomly select data from a data base or actually represent data by using a computer technique known as a random number generator. Because the model is using random data points, the results of a particular run can not be assumed to precisely reflect the true situation. Thus, depending upon the inherent variability of the system under study, several or many runs must be made in order to obtain an average value or result that closely approximates the true situation.

Background of Consumer-Risk Model

As part of its response to FDA's Federal Register Notice on mercury, NMFS, in 1978, presented to that agency the results of a study using a computer simulation

model which incorporated NMFS data on mercury levels in fish and shellfish with data on seafood consumption to estimate the intake of mercury by U.S. consumers of fishery products. It also permitted an evaluation of alternative action levels in assuring consumer safety.

The model was developed under contract by Dr. Richard Krutchkoff, who had previously developed a computer simulation model to assess the potential effect of kepone upon seafood consumers in the Chesapeake Bay region.

The Krutchkoff model, although useful, was extremely difficult to employ, particularly if substances other than mercury were to be studied. The NMFS needed a more generalized version of the mercury model in order to study a wide range of components commonly found in seafood products. Also, the NMFS wanted a model that could be used by non-programmers so that NMFS scientists and their colleagues could use the model with a minimum of difficulty. In early 1979 the Charleston Laboratory of the NMFS initiated work to generalize and streamline the model. This guide is a result of that work and describes in detail how the generalized version of the consumer-risk model works. The major driving force of the revised model is an interactive auxilliary program that more readily allows a user to run the primary program as well as to vary input covering a multitude of situations.

The first use of the generalized model has been to assess the intake of cadmium by seafood eaters, therefore, the user guide will rely heavily upon the cadmium work to illustrate various capabilities of the model. However, the reader should realize that any adequate data base can be used in place of cadmium provided its format is compatible with that of the model and appropriate consumption data are available.

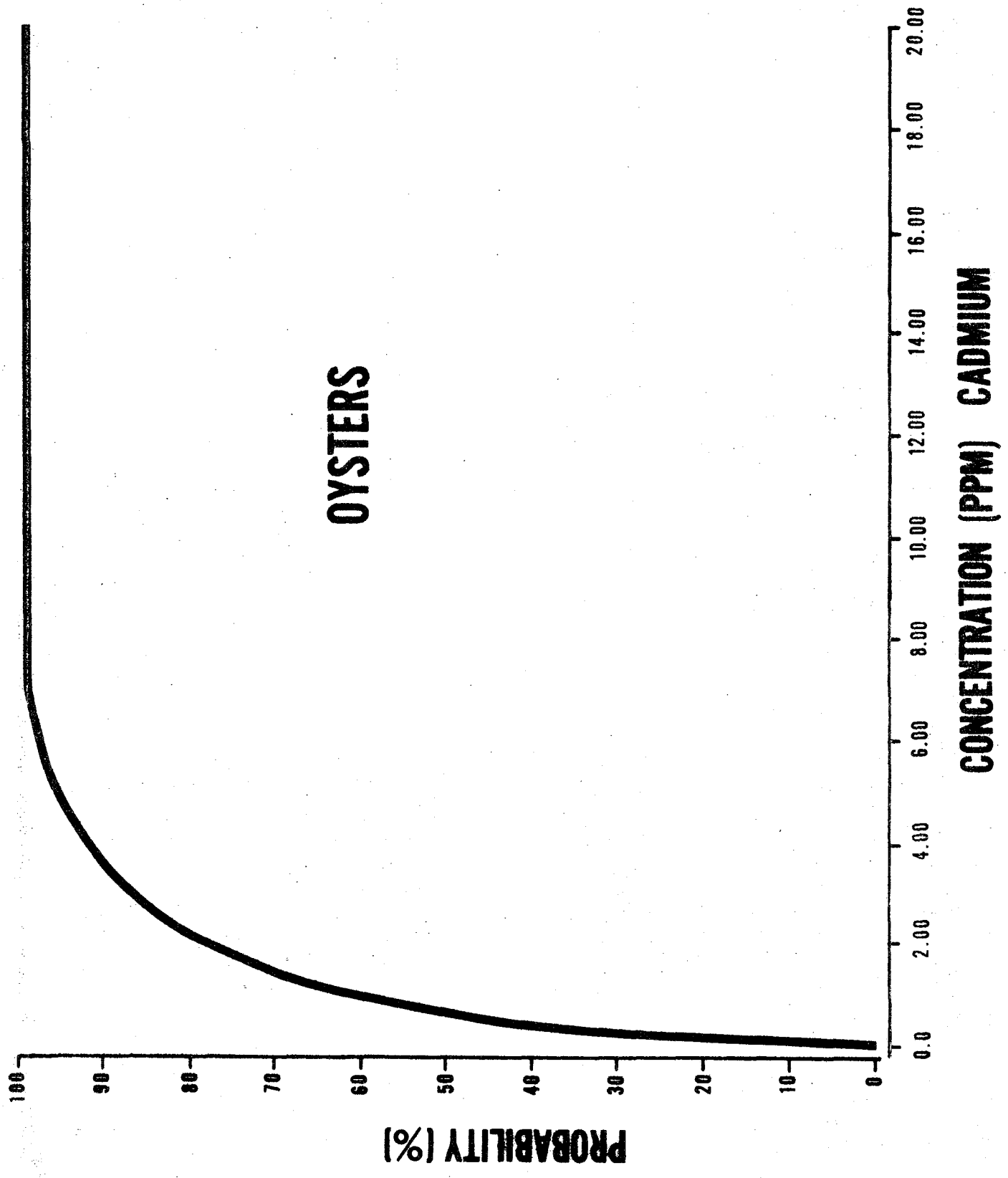
General Operation of the Model

The NMFS consumer-risk model was designed as two interrelated modules. The first module, labelled the species module, assesses contaminant levels within each species of fish (fishery product) eaten by consumers. The second module, labelled the consumer module, actually "feeds" seafood products to the consumers.

The model has a number of features which make it quite realistic. For instance, seafood products are harvested over a wide range of locations throughout the year. Moreover, fish come in a variety of sizes and, depending upon the contaminant and species involved, it may be necessary to assign different contaminant values according to size (age) of the fish or the location in which the fish were harvested. At this point it is necessary to point out that the contaminant data base consists of information derived from capturing fish from surveys and not from the marketplace. However, in general, the sizes and harvest locations of seafood products are well known and there is no reason to suspect that contaminant levels derived from field surveys should be different from fish in the marketplace. Because size and location of capture information are available, it is quite easy to model these differences using certain capabilities of the model. For instance, if one believed that 80% of flounder consumed by the public weighed equal to or less than 500 gm and 20% weighed over 500 gm, one would use the weight option to divide flounder into those two categories. Further, if 65% of the flounder were taken in the North Atlantic and 35% from the South Atlantic one would use the location option. Given this information the model would examine the data base and divide flounder data into the four groups that had been specified (North Atlantic over 500 gms, and less than 500 gms; and South Atlantic over 500 gms and less than 500 gms.) and then calculate the mean and standard deviation of contaminant levels particular to those groups. The derivation of these parameters follows.

Dr. Krutchkoff, while developing the mercury model, examined the national contaminant data base to determine the best fit for values of mercury, and later cadmium. He determined that the data were best fit by the lognormal distributions and utilized a computer program to fit and plot the data. The cumulative distribution function of cadmium values in oysters is shown here in Figure 1. Once cumulative probability distribution functions are accessed for the contaminant and associated seafood products under investigation, the means and standard deviations

Figure 1. Cumulative distribution function of cadmium values in oysters.



of the contaminant in each product can be estimated readily utilizing standard statistical procedures.

Two other parameters of interest are the action level of a contaminant and the corresponding level of enforcement which are controlled by the Food and Drug Administration. If the contaminant level in a seafood product is below the action level, it is considered safe for human consumption. The level of law enforcement determines the level of testing of products for contaminants in the marketplace by the FDA. The model allows one to vary this parameter from 0 to 100%. For example, in the mercury report a 75% level of law enforcement was used.

Detailed Discussion of Operation of Model

The user initiates a run by determining the location, month, and weight characteristics of seafood products to be selected for a particular problem, then one sets an action level and an enforcement level. The species module examines each seafood product for its contaminant level relative to the action level. If the item exceeds the action level, it is eligible for rejection depending upon the law enforcement level used. Characteristic of simulation models, the program uses a random number generator to randomly reject fish whose contaminant level exceed the action level. The use of the random number generator explains why results can vary somewhat from run to run if the law enforcement level is less than 100%.

The program collects the non-rejected fish one by one, then, a weighted mean and standard deviation for each seafood product is calculated as follows (Krutchkoff, 1978).

If X_i represents the contaminant level of fish i, and

if W_i represents the weight in grams of fish i, then

weighted mean = $\Sigma W_i X_i / \Sigma W_i$.

Weighted means for location/weight/month groups are used to calculate the final species weighted mean. This is done by combining each group according to prespecified proportions (i.e. 80% or 20% for weight in flounders or 35% or 65% for

locations). The species contaminant information is transferred to the consumer module for use in its calculations.

After every specie's weighted mean is calculated the program checks on the final option of the species module, the substitution option. If the user wishes to substitute one or more species' data for another, he may in any proportion he wishes. Also, he may substitute a mean and standard deviation for any species. This allows for data manipulation by the user when new information becomes available.

The consumer module, based on seafood consumption information obtained by a survey conducted by NPD Research, Inc. during 1973-74 (See p.11-14 mercury report), feeds each panelists the accepted fish from each species reported by that panelist and then calculates each person's average daily contaminant intake. Just as there was a maze-like structure for the species module, the same is true of this module.

Before entering the maze, the program gathers the basic demographic information associated with each consumer; namely, state of residence, age, and sex. Then, it examines his estimated seafood consumption for a month including such information as species eaten, portion size in gm, and number of meals eaten in a month. In the NPD survey some individuals indicated that they did not consume seafood and some neglected to record either sex or age. These data are used where appropriate in order to make inferences concerning seafood consumption by the general public.

The user (investigator) can ask the program to consider as many or as few consumers as he wishes by specifying the exact group(s) he wishes to examine. Discrete groups are formulated by specifying the following: the state, sex, age range, whether or not to include those who did not eat seafood or those whose sex or age was not recorded, and the exact species to be eaten or not eaten. Once a person qualifies as a member of a group, his weight is estimated for later use and his mean daily intake of contaminant is calculated.

The daily intake of a contaminant is defined as the intake of that contaminant for a year divided by 365 (Krutchkoff, 1978). Since the contaminant level in fishery products can be considered a lognormal random variable, the daily intake, which is the average of many independent lognormal variables, can be considered a normally distributed random variable. The mean and variance of the daily intake are calculated as follows (Krutchkoff, 1978).

Mean = $\Sigma 12 Fr_i Q_i u_i / 365$

variance = $\Sigma (12 Fr_i Q_i)^2 s_i^2 / (365)^2$ where

u_i = mean contaminant level of specie i

s_i^2 = variance of contaminant level in species i

Fr_i = average frequency of eating species i per month

Q_i = average size of portion when eating species i (quantity)

The frequency and quantity can be altered (increased or decreased) if the user wishes to investigate extreme eating habits.

Once the mean and variance of the contaminant level for the daily intake of a person has been calculated, the allowed daily intake (ADI) for that person is computed. The ADI for person i is calculated as follows.

personal ADI = ADI (wt_i) / 70 kg

ADI = WHO/FDA suggested allowed daily intake in mcgrams per 70 kg

wt_i = average weight of person i based on his sex and age (see Table 6)

The program determines the % population at risk and not at risk at various confidence levels. This allows the investigator to gain a better perspective of consumer risk. For example, if the 95th percentile of the individual's daily intake distribution is below his personal ADI then one is 95% confident that this person's daily intake is below the allowed level. This person is said not to be at risk (see Figure 2). However, if the individual's 95th percentile is greater than his personal allowed level, one must say that this person has a higher than 5% risk of exceeding his personal allowed intake level (see Figure 3).

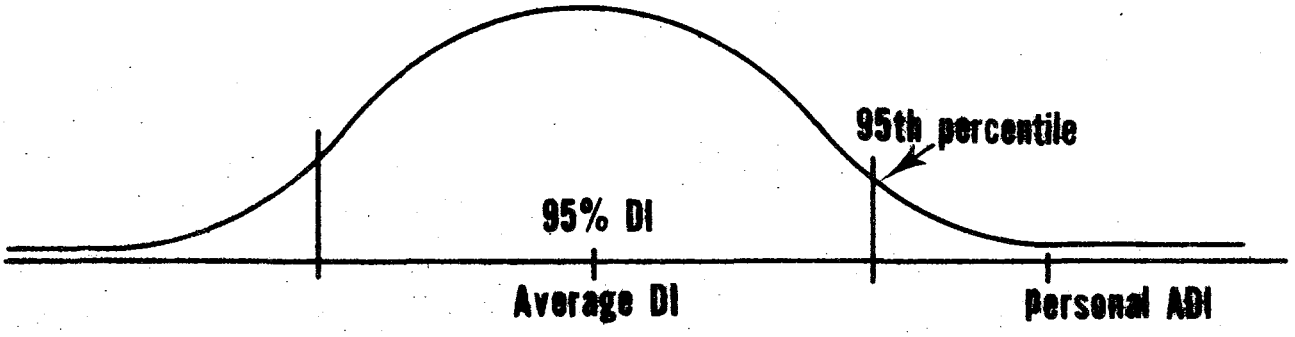


Figure 2. Illustration showing sample case in which the consumer is not at risk because the distribution of his daily intake is below his personal ADI.

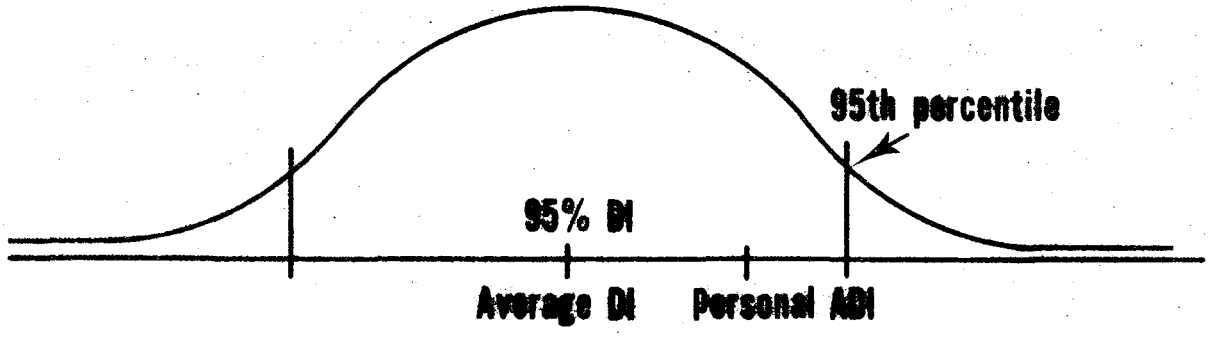


Figure 3. Illustration showing sample case in which the consumer is at a 5% probability risk because his daily intake includes his personal ADI.

The program determines the % population at risk and not at risk for specified percentiles. This allows the investigator to gain a better perspective of consumer risk.

Repeated model runs allow the investigator to spot meaningful trends. The trends indicate which species constitute a potential health risk, which action level(s) would provide a reasonable safety factor for consumers, and identifies consumers at risk including information such as their age, sex, and state of residence.

The remainder of this report provides additional information for those who would like to use the consumer-risk model. Detailed information concerning the content and development of the contaminant and consumption data files are found in appendices. Suggestions for adding new features to the model are found in the programmers section. Two example runs illustrating all major options of the consumer-risk model are also included in appendices.

CHAPTER TWO

USER GUIDE

DESCRIPTION OF USE OF MODEL BY NON-PROGRAMMERS

This section of the guide is designed for non-programmers and gives a general overview of model operations as well as detailed instructions concerning use of the model. A careful examination of this section will allow the reader to operate the model and to understand the various outputs that he may wish to produce. Figure 4 shows the symbols used in the user guide.

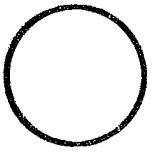
Figure 5, illustrates the major features of the model and shows how it works. The longer, more detailed diagram that follows (Figure 6) illustrates the step by step operation of the model. Explanatory comments are found in the right margin. These illustrate the sequence of questions and responses that occur while using the model. Explanatory notes are found on the bottom of the page and are designed to answer the more technical questions concerning operation of the model. The notes are not complex, but are of great assistance when using the model; particularly, if the user is not entirely familiar with terminal procedures. Additional information such as species and location codes are found in appendices and are referenced in notes.

Questions and commands printed by the program are found in square boxes and user responses are found in circles or ovals. Two example runs illustrating the use of the model are found in Appendix G. Finally, the reader should note that the present program has been developed on a Honeywell 66/80 computer which is located in Macon, Georgia, USA.

At this point the user has supplied all necessary information for the model to run successfully. The user now waits for the finished job. He may log off the

TERMINAL QUESTION

USER RESPONSE



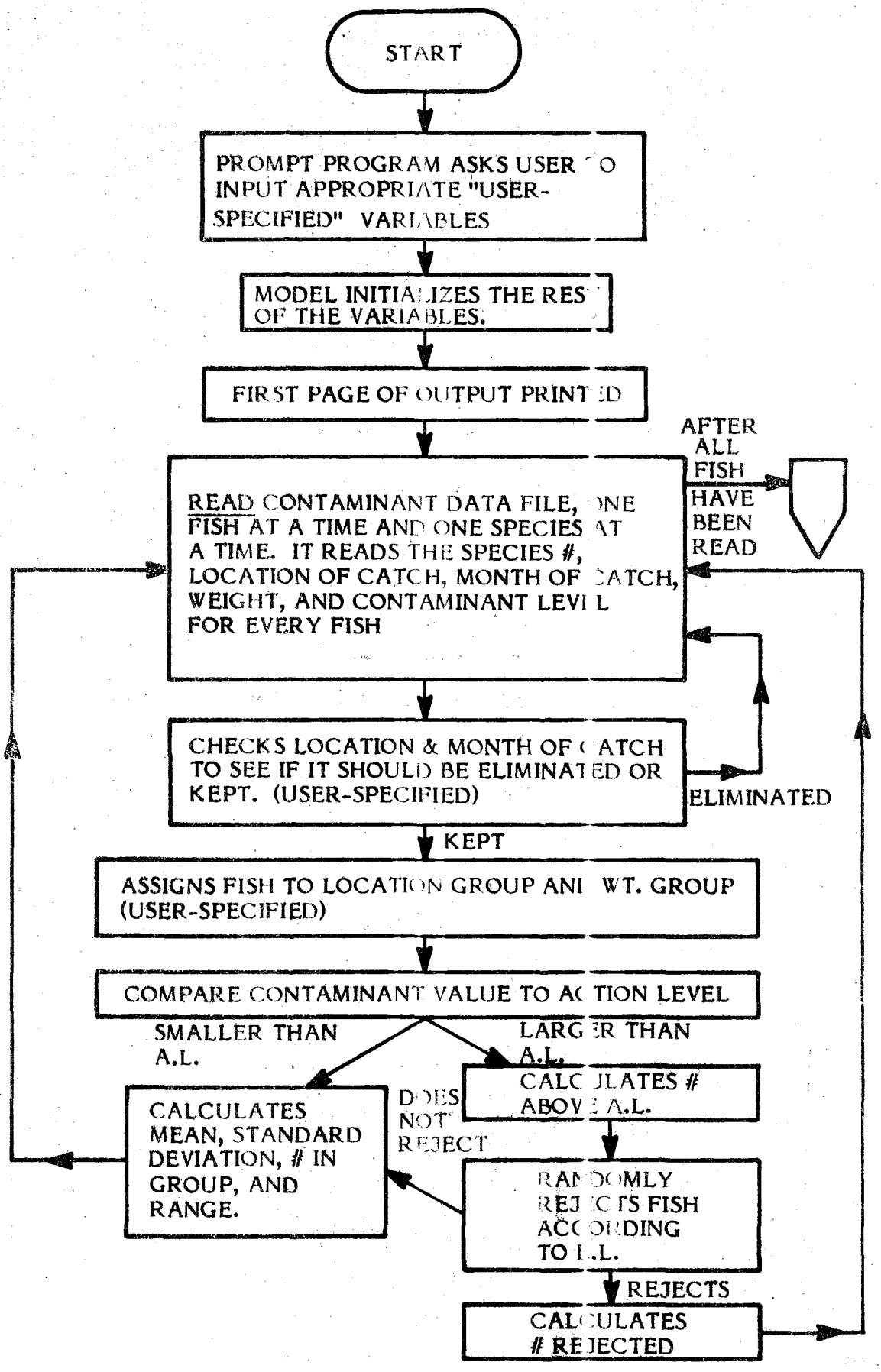
USER OPTIONS

NOTES

CONTINUED

Figure 4. Key to symbols in detailed user instructions.

Figure 5. General operations of consumer-risk simulation model.



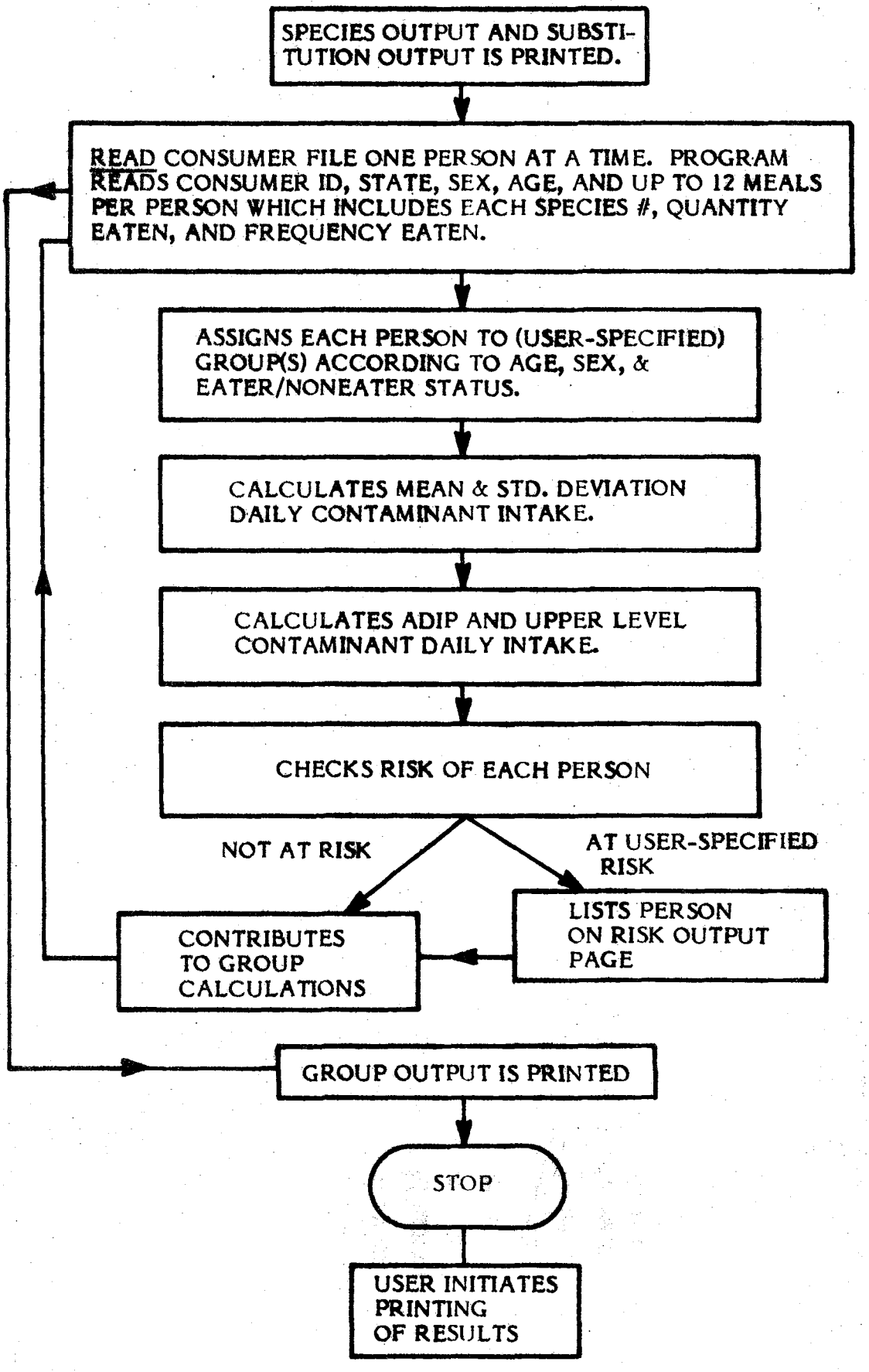
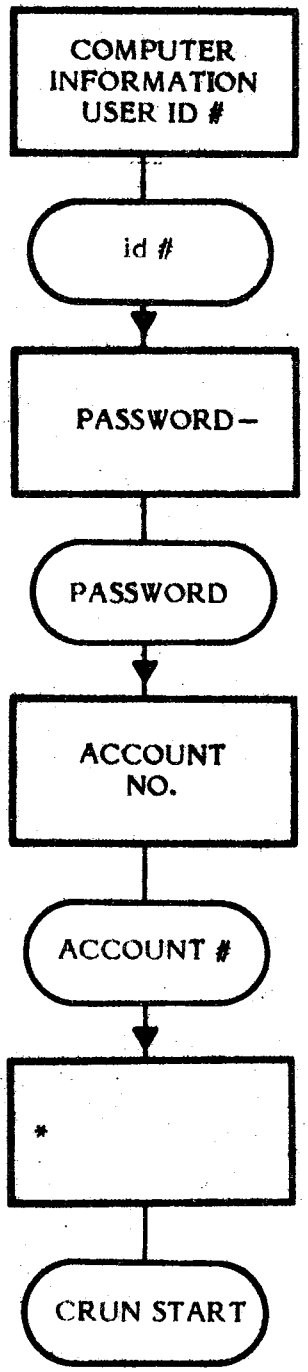
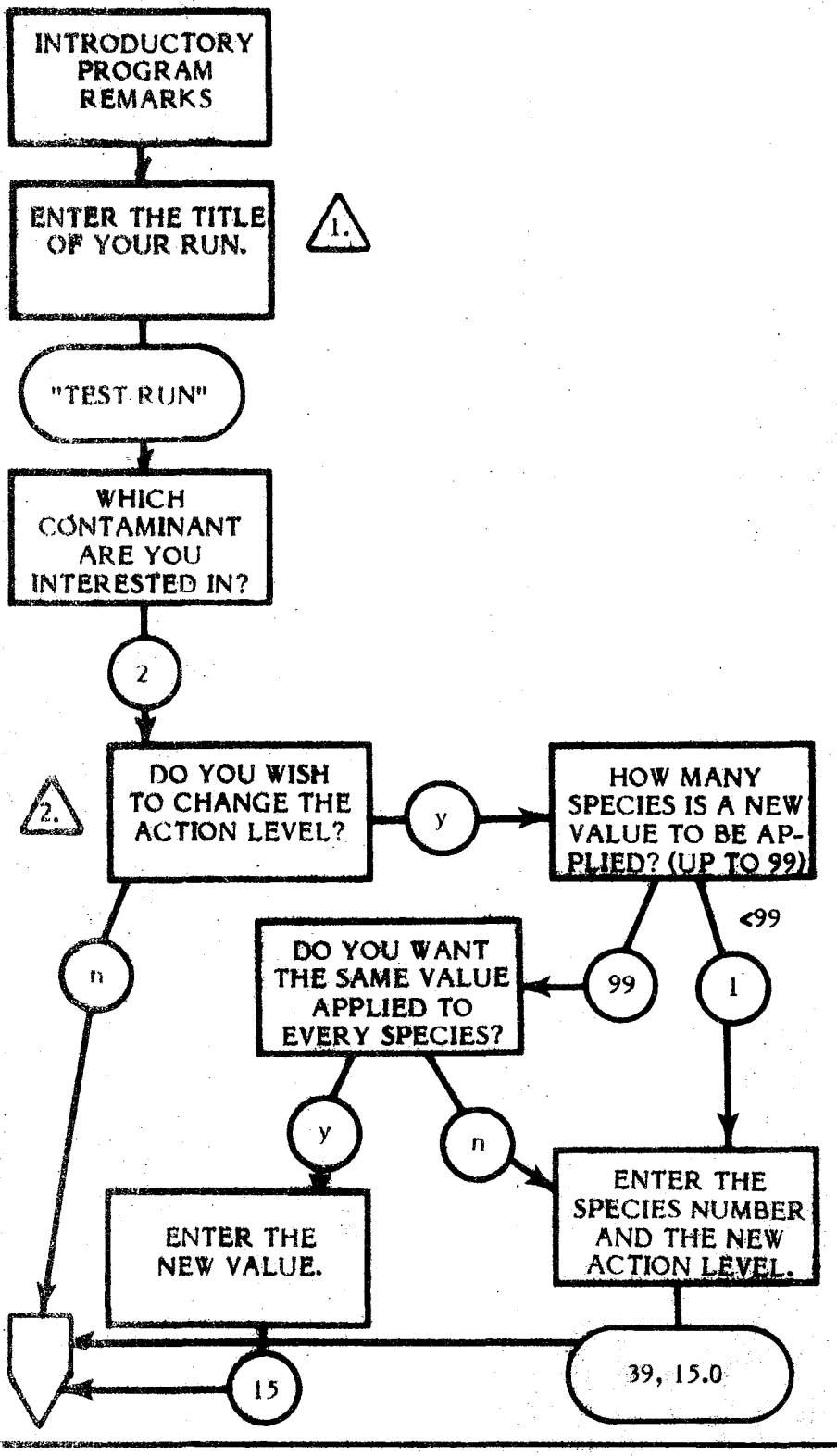

SPECIES OUTPUT AND SUBSTITUTION OUTPUT IS PRINTED.
READ CONSUMER FILE ONE PERSON AT A TIME. PROGRAM READS CONSUMER ID, STATE, SEX, AGE, AND UP TO 12 MEALS PER PERSON WHICH INCLUDES EACH SPECIES #, QUANTITY EATEN, AND FREQUENCY EATEN.
ASSIGNS EACH PERSON TO (USER-SPECIFIED) GROUP(S) ACCORDING TO AGE, SEX, & EATER/NONEATER STATUS.
CALCULATES MEAN & STD. DEVIATION DAILY CONTAMINANT INTAKE.
CALCULATES ADIP AND UPPER LEVEL CONTAMINANT DAILY INTAKE.
CHECKS RISK OF EACH PERSON
NOT AT RISK
AT USER-SPECIFIED RISK
CONTRIBUTES TO GROUP CALCULATIONS
LISTS PERSON ON RISK OUTPUT PAGE
GROUP OUTPUT IS PRINTED
STOP
USER INITIATES PRINTING OF RESULTS

Figure 6. Detailed user instructions for consumer-risk model.

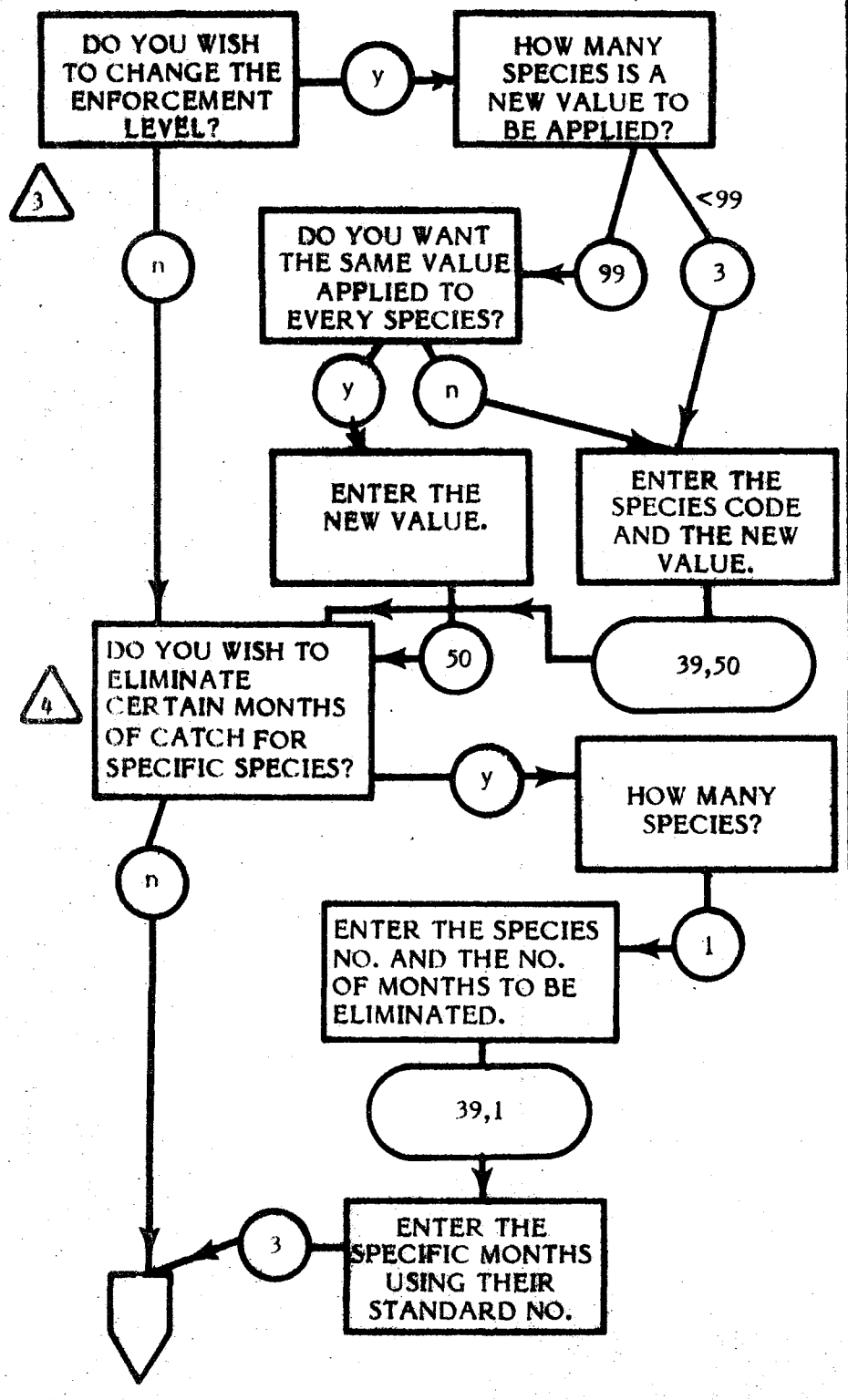
QUESTION-RESPONSE	COMMENTS
	Once the user is communicating with the computer either by dialing up or direct line, some communication information is printed. Enter your id number. Enter your password. Enter your account #. The asterisk indicates that the user is connected to the computer. The user is now ready to start the system.

NOTES: A carriage return CR must be hit after the user enters the appropriate response. Assume that a CR was hit after all responses in the ovals. The responses found in this guide are strictly example responses. The user should also assume that within these examples more than one response is required, although only one of them is actually seen in the guide. For an exact question/response session see the sample runs in Appendix G.

QUESTION-RESPONSE	COMMENTS
	The title must be entered. The title may be up to 72 characters long "Test Run" is title for this run. Mercury = 1 Cadmium = 2 Arsenic = 3 User is interested in Cadmium Default Values: 5.0 ppm - Mercury 20.0 ppm - Cadmium 100.0 ppm - Arsenic y = Yes n = No The same action level is being implemented. Left - 15.0 AL on all Right - 15.0 AL on Oysters

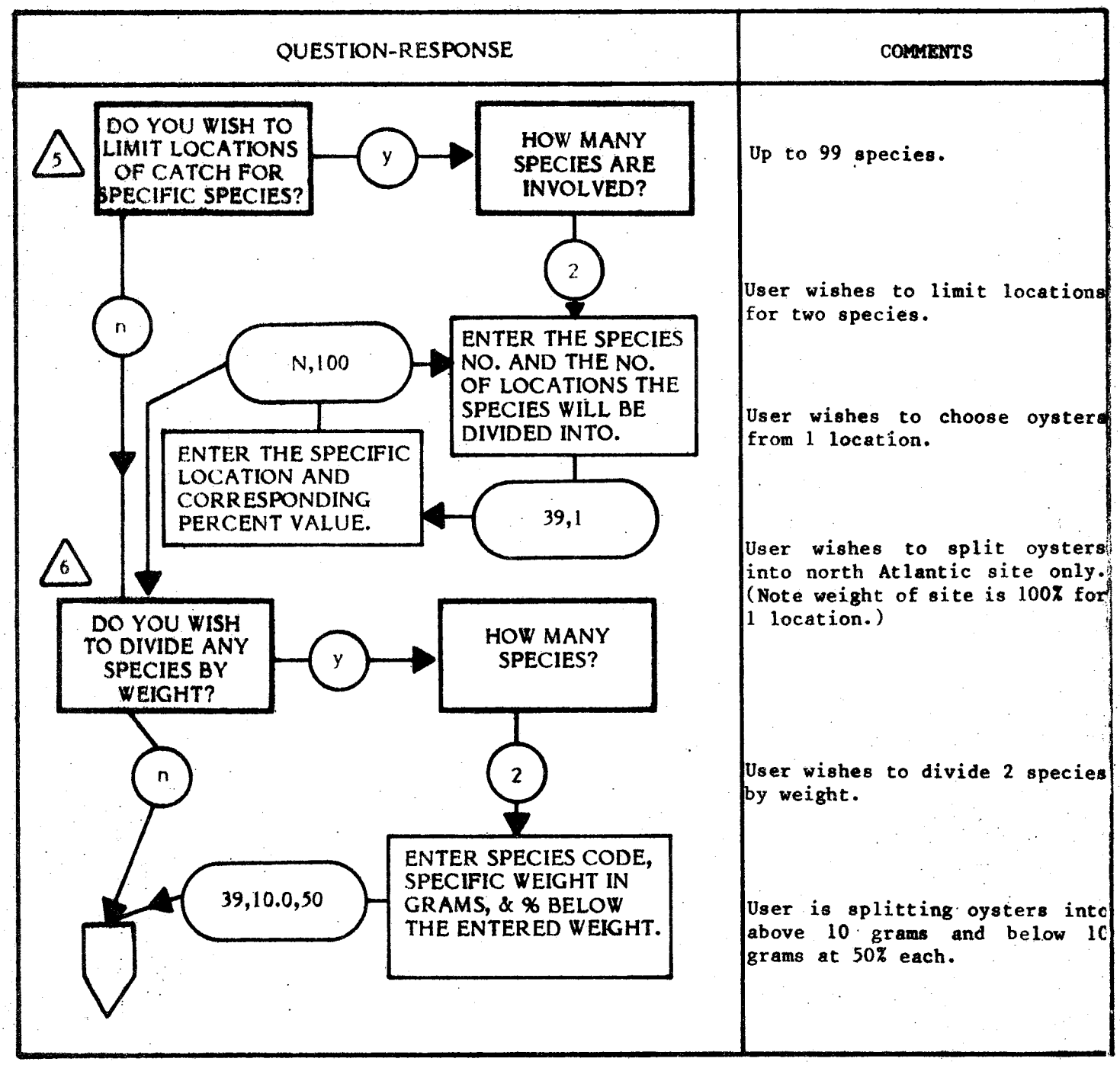
NOTES: 1. The title allows the user to identify each of his runs with any identifier he wishes. The * sign printed by the program tells the user the program is waiting for a response.

2. Species codes are on p. A-1. The program keeps track of how many new values and/or species the user wants. It will not continue to the next option until the specified number of entries are entered.

QUESTION-RESPONSE	COMMENTS
	Default enforcement level is 100%. 50% EL has been entered for all species on the left and for oysters on the right. Remember that two more responses are necessary on the right since user requested 3 species. User wishes to eliminate months for one species. User eliminated March (3) from the oyster (39) data.

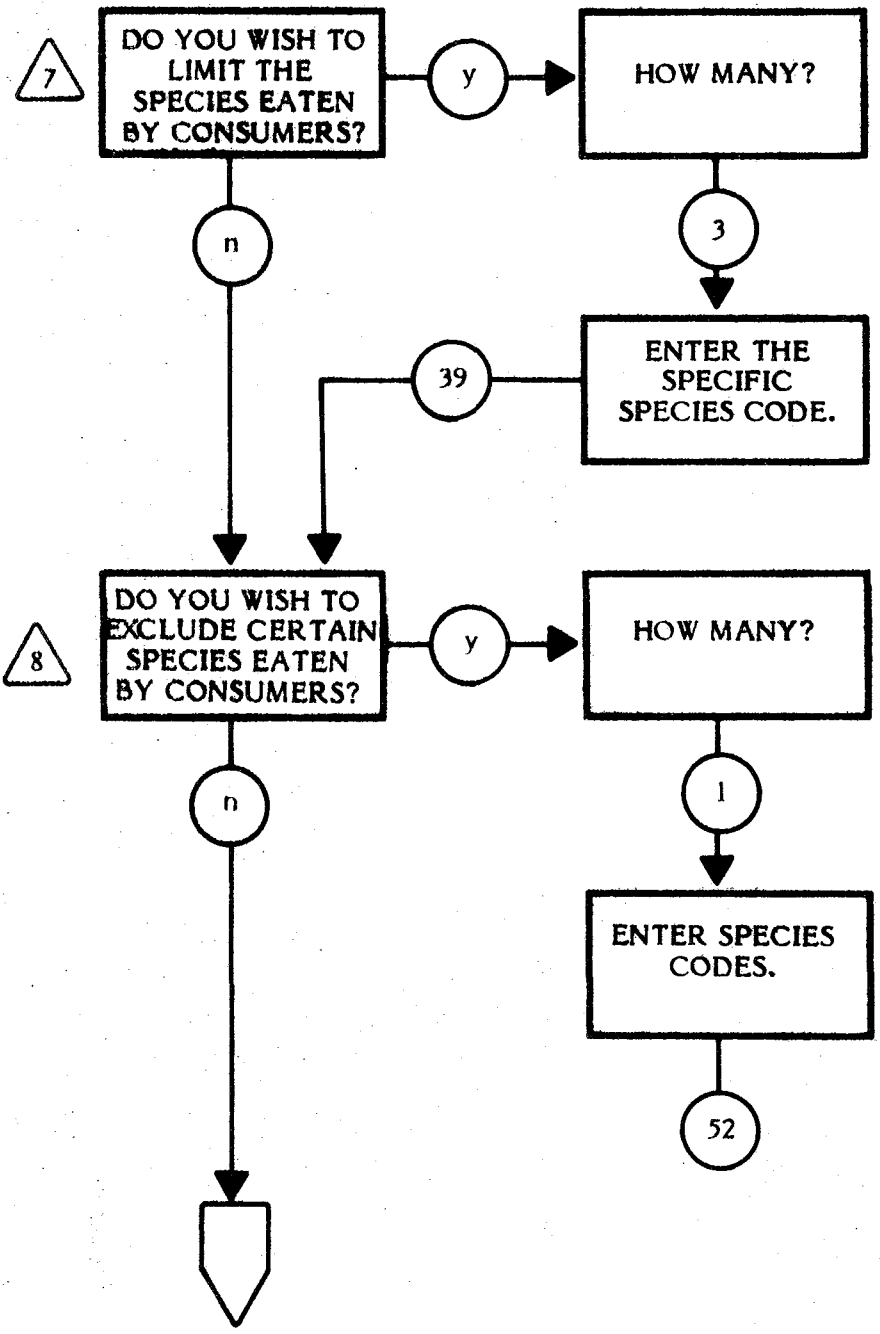
NOTES: 3. This option controls the number of fish that are randomly rejected once they are above the action level. It represents the law enforcement involved in enforcing the action level.

4. This option isolates certain months of catch for specific species. For example, the user may be interested in looking at flounders caught in January and February and how those fish affect consumers. Appendices D and E give months in which species were sampled.



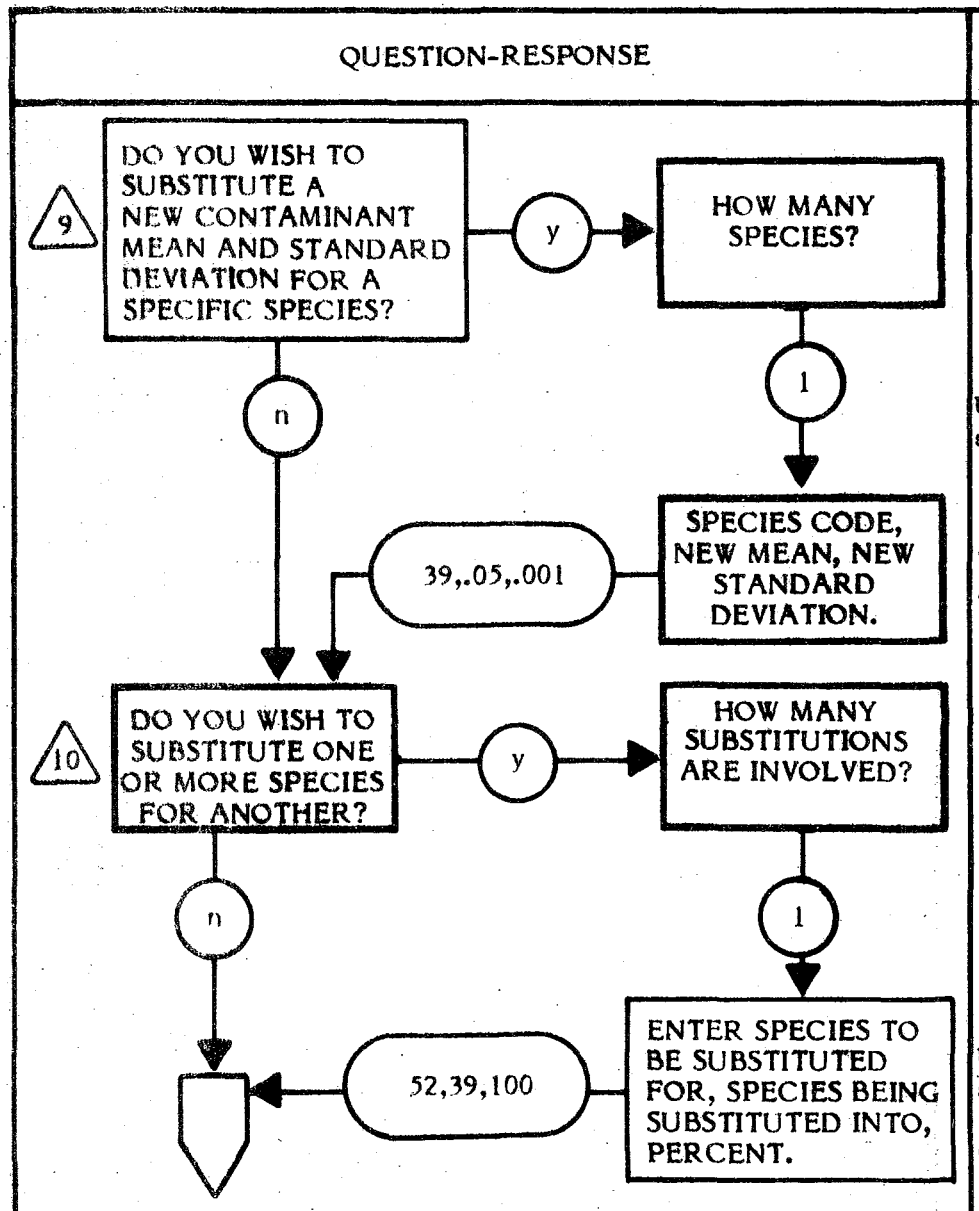
NOTES: 5. This option allows the user to weight certain species by location of catch. For example, if the user believes that consumers eat only flounders from the north and south Atlantic at a ratio of 3 to 1, he can respond to the program by entering N,75 (N=north Atlantic and 75=75%) and S,25 (S=south Atlantic and 25=25%) for flounders. When limiting a species by location, the summation of the percentages must be 100%. (75+25) An error will occur if one of the chosen locations is not included in the data file for that species. The user should check Appendices D and E for locations sampled. Location codes are in Appendix B.

6. This option allows any species to be split into two groups according to weight. For example, the user may believe that consumers eat more flounders with a wet weight over 25 grams than smaller flounders at a ratio of 4 to 1. The user would then enter 22,25.,20 (22=flounders, 25=weight, and 20=20% below 25 grams). Because some fish in the data file have the average weight of the species entered for their weight, those particular fish would not be included in either group since their original weight was never recorded. Some weight divisions have already been included in the data. These may be overridden, however, if the user wishes, by responding to this option. For default values for Cd and Hg see Appendices D and E (Tables 4, 5).

QUESTION-RESPONSE	COMMENTS
	User wishes to include consumers who ate at least three species. One per line: One of those species is oysters. There are two more to be entered. User wishes to exclude consumers who ate 1 species. That species is smelt.

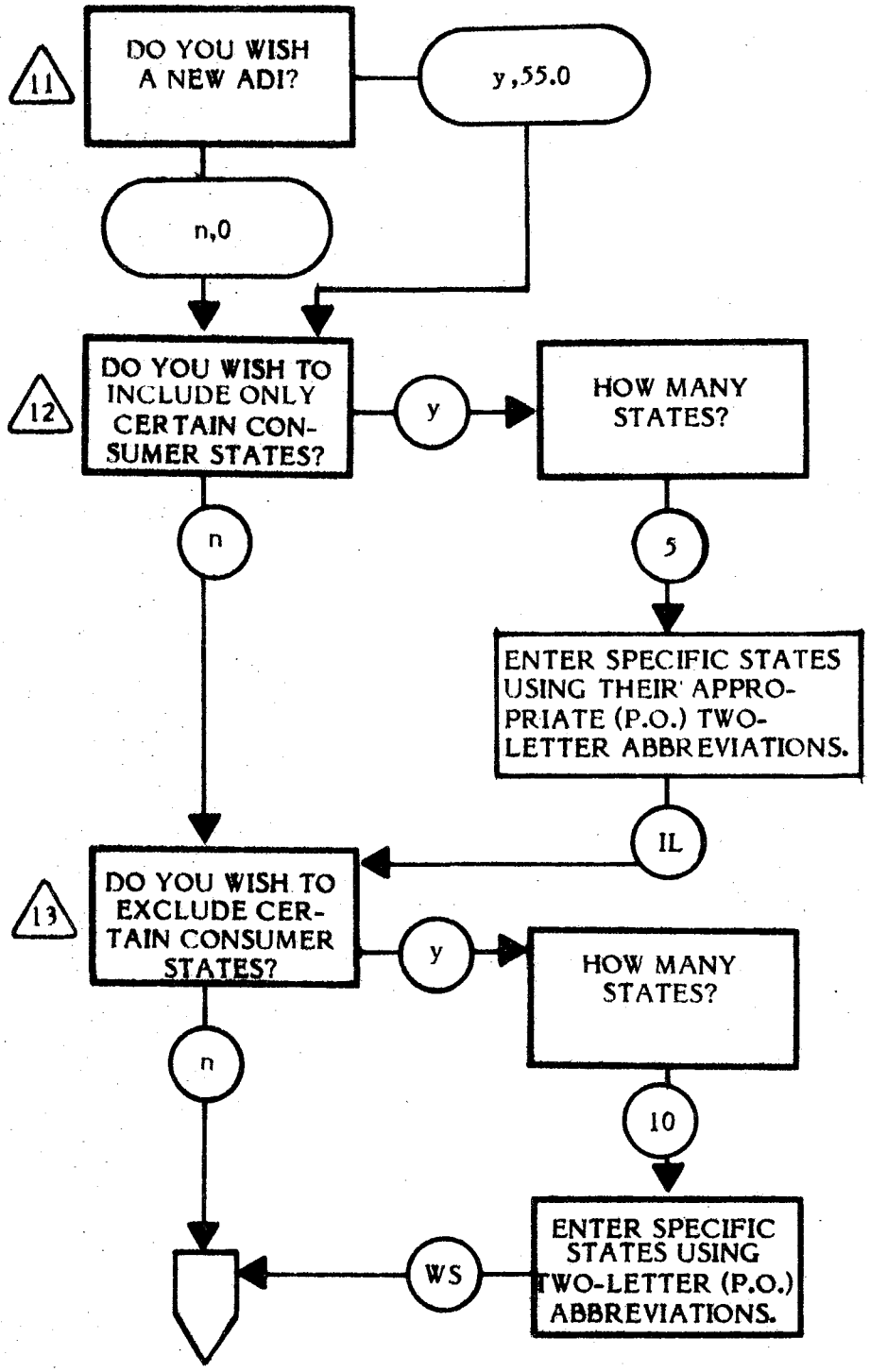
NOTES: 7. The user can isolate consumers who ate any species or combination of species. For example, the user may wish to consider only oyster eaters. He would then enter 1 after the HOW MANY? question and then enter 39 after the ENTER SPECIFIC SPECIES CODE command.

8. The previous option and this one are virtually the same. However, the user should use this option if he wishes to exclude a small number of species to be eaten. For example, if the user wants only flounder and oyster eaters, it would be easier to use option 7. If he wants to consider consumers who ate everything except oysters and flounders he should use this option.



NOTES: 9. This option can be implemented for more than one purpose. It is used to substitute a new mean and standard deviation for any species. See next option for a detailed explanation. Mean and standard deviations are in ppm.

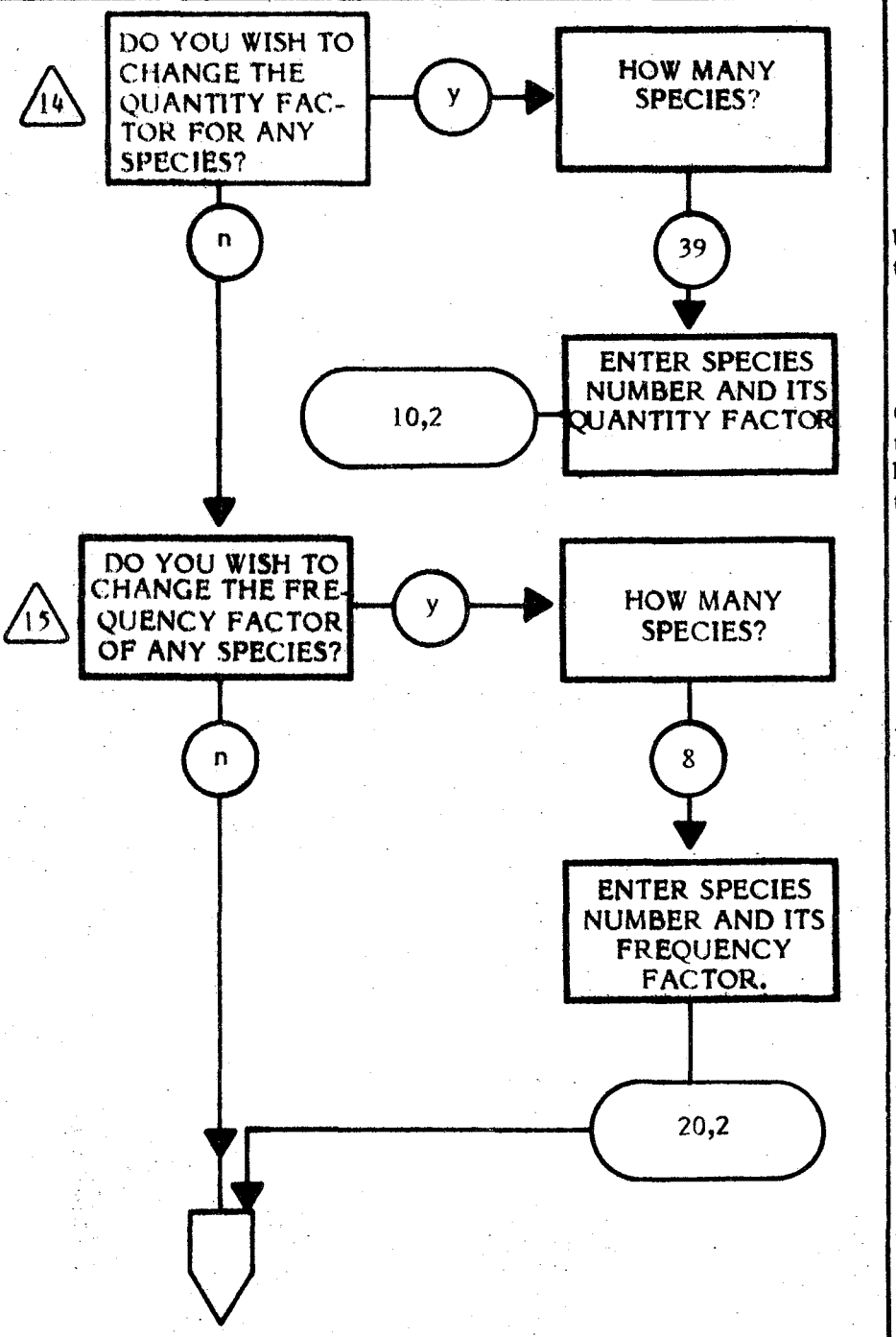
10. The substitution option can be very powerful. There are many substitutions already built into the system. For contaminant values see Appendices D and E. The contaminant data file did not always have a sample of every species eaten by a consumer. Therefore, a single species or a group of species known to have similar contaminant values was substituted for that missing species. The user can change these substitutions if he wants. The result of the substitution will be listed on the substitution page of the output. The user should insure that the total percentage for one species is 100%. Otherwise, an error will occur. An example of weighted substitutions would be substituting 50% Northern Inshore Lobster and 50% Northern Offshore Lobster for Northern Lobster. Substituting data for another species can be done as follows. On the species code list note that numbers 77-80 are labeled new data. On option #9 enter the new mean and standard deviation under the code 77, 78, 79 or 80. Then on option 10 substitute all of this new data or in combination with other species as appropriate. For example, the user believes that the consumer eats shrimp having new data values half of the time and having old data values half of the time. After entering the new data on option 9 he would enter 51,51,50 and 51,77,50 on this option. (51=old shrimp, 77=new data, 50=50%).



NOTES: 11. The ADI represents the accepted allowed daily intake of a contaminant from any source.

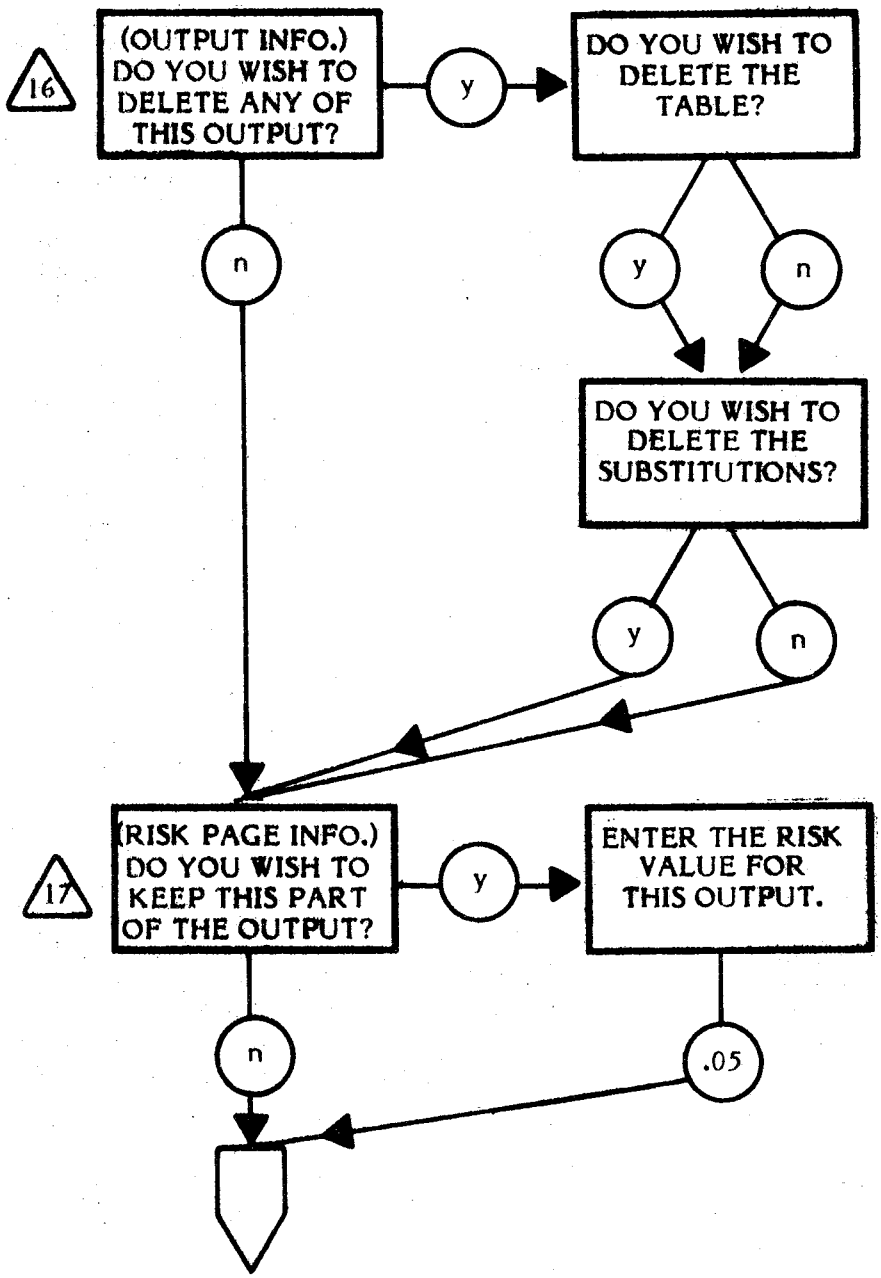
12. State codes are found in Appendix C. Options 12 and 13 are equivalent. Just as it was possible to include or exclude a species that was consumed, it is possible to include or exclude consumer states. If the user wishes to look only at consumers from South Carolina, he would enter 1 after HOW MANY STATES? and SC after the next command in option 12.

13. If, however, the user wishes to look at consumers from every state but SC, he could enter 49 states on option 12 or simply enter SC on option 13.

QUESTION-RESPONSE	COMMENTS
	User wishes to change 39 quantity factors. One of the 39 new quantity factors is for butterfish (10) and he wishes to increase it by two times. User wishes to change 8 species frequency of consumption factor. User changed the frequency of consuming dolphin (20) by 2 times.

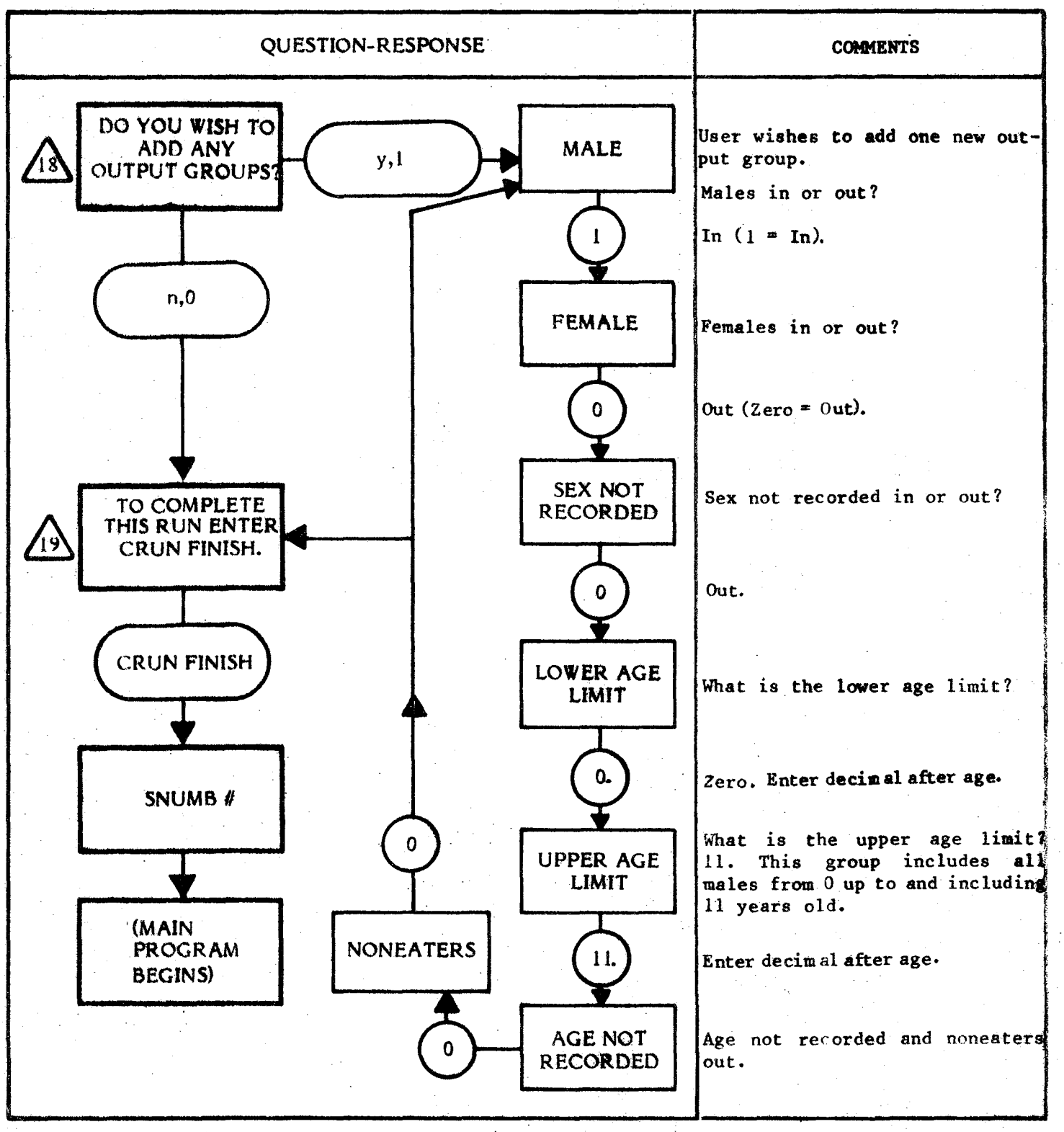
NOTES: 14. A quantity factor refers to the average amount (in grams) of fish consumed by a consumer during one meal. All default quantity factors are 1.0 interpreted to mean that the meals are left as is (or multipied by 1.0). If the user wishes to increase the quantity of consumed oysters by two, he enters 39,2.0. (39=oysters and 2.0=new quantity factor).

15. The frequency factor refers to how often a consumer eats a certain fish per month. The default frequency factors are 1.0 meaning the frequency of consuming a species is left as is. To decrease the frequency of eating oysters by 1/2, simply enter 39,.5 on this option. (39=oysters and .5=new frequency factor).

QUESTION-RESPONSE	COMMENTS
	After answering yes, the user wishes to delete part or all of the species output. Then he indicates which part he wishes to delete. User wishes to look at consumers at a 5% risk.

NOTES: 16. There are two types of species output that the user may wish to delete if he does not need it. An example of these types are in Appendix G. He may delete one or the other or both by first answering Y to the first question of this option and then the appropriate answers to the next two questions. If he answers no to the first question, the program prints both outputs.

17. See Appendix G for an example of this output. The user may keep the output or delete it. If he keeps it, he must specify the risk value. That is, he must decide at what % the consumers should be at risk to be listed. If he enters .05, the consumers who are at 5% risk are listed. If he enters .001, the consumers who are at .1% risk are listed.



NOTES: 18. This last option refers to the last pages of output. (See Appendix G). Two output groups are always printed. They are (A) every consumer and (B) every consumer who ate seafood. If other output groups are desired, the following variables determine the group: sex for which males, females and sex not recorded are considered; age for which a lower age limit, an upper age limit, and age not recorded are considered; and eater/noneater of seafood. The program lists every variable for the user to respond to for each additional output group. See comments for an example. Also see the second sample run in Appendix G.

19. The last instruction of the program tells the user how to finish running the model. Record the SNUMB# for identifying the run. The next page tells how to list the resulting output.

system and occasionally check or remain on the system until the computer notifies him that the job is completed. The status of the job is checked by entering JSTS (SNUMB #) (enter the recorded snumb#). The computer responds with the status of the run. The job is complete when the computer response is OUTPUT WAITING.

Once the user receives that response he should enter CRUN PRINT. After the program responds with a list of commands and finally an asterisk(*), enter LIST and the entire output will be listed. Depending on the terminal/printer setup the user may wish to have this printed on a printer.

LOGGING OFF

Whenever the user wishes to get off the system he enters BYE. The computer prints two logging off messages and then disconnects. The time the user logged on, the time of logging off, and the date will be printed for reference.

A description of the output follows.

OUTPUT DESCRIPTION

Title Page

The title page is always the first page of printed output. The minimum information found on this page is the title, date, and time of execution of the run. See Figure 6 for an example. Other information that could appear on the title page includes: a list of species to be eaten or not to be eaten, a list of new frequencies of consumption per month for species, a list of new quantities per meal for species, and a list of states included or excluded. For examples, see the sample output in Appendix G.

Figure 7. Example of title page (first page of output).

THE TITLE OF THIS RUN IS AL = 5 (75% EL) ON SHELLFISH ONLY RUN #9

TODAY'S DATE IS 05/25/79. THE TIME IS 11.698.

Species Output

The species table follows the title page when it is printed. This table can be deleted from the output by responding appropriately to option 16. The following information is contained in the species table.

NAME: Listed under this heading is the name of the species or subspecies. This is sometimes followed by the weight group label and percentages as shown on page G-8 of sample run 1 in Appendix G.

ON FILE: Total number of data points for that species on the contaminant file.

PER WT &/OR LOC: Number of individual data points within the species found in that weight group and/or location of catch.

ACTION LEVEL:

VALUE -- Actual action level value.

ABOVE -- Number in weight and/or location group above the action level.

% ABOVE -- % of data points in weight and/or location group above the action level.

EL: Enforcement level.

REJECTED: # -- Number in weight and/or location group rejected because it was greater than the action level.

% -- % in weight and/or location group rejected.

TOTAL: Total number used in calculations after rejection.

CONTAMINANT:

RANGE -- Range of the remaining contaminant levels.

MEAN/SD -- Mean and standard deviation of contaminant level calculated from accepted fish in the species.

LOCATION:

NAME -- Name of the particular location of catch if pertinent.

% -- Percent of weight placed on the location. Errors occurring from eliminating months of catch never sampled for a particular species or from limiting locations of catch to a location never sampled will be indicated on this page by a print-out of 3 asterisks within the row of the species involved.

Substitution Page

The first item on this page lists the species and the associated contaminant values (mean and standard deviation) previously selected for substitution by the user (See sample run 2 in appendix G). The next item printed shows the percentage of species assigned to meals consumed but not identified to seafood product during the NPD survey. The assigned percentages equal the mixture of species in all meals where seafood products were identified. After this listing, substitutions for individual species are shown in the following manner: the original species for which data are lacking is given and it is underlined and the replacement species and the extent of replacement (100%, 50% etc.) is shown under the underlining (See substitution page of sample run 2 in appendix G). The reader should note that any species must be entirely replaced. For example, consider the substitution for bass in Figure 10. If one inadvertedly entered only 29.00% sea bass for bass, the computer would print an error message; namely, "THESE DO NOT SUM TO 100%". The printing of the substitution page is optional (option 16). If the substitution page is printed, the contaminant information is optional, but the species substitution information will always be printed.

Consumer Risk

The printing of this page is optional, however, it lists individuals at a selected risk which would interest most users. Appendix G shows people at different risk levels (5% = 0.05 and 1% = 0.01). The output also shows the group from which the consumers were selected and the ADI for the run. Information for each person at risk includes their identification number, state of residence, sex, age, daily contaminant intake data and the seafood products they consumed. The daily intake information includes the estimated personal average daily intake, the allowed daily intake, and the estimated upper limit daily intake. When the risk value is 0.05, the upper limit for the personal daily intake is the 95th percentile of the estimated daily intake distribution. Similarly, the 99th percentile is the comparable upper limit when the risk value is 0.01. Notice that when the upper limit exceeds the allowed intake, the consumer is defined as "at risk" and may be printed on the consumer risk page. The program can list up to 12 meals per person. The species consumed, the average quantity of a species consumed per meal, and the average number of times the species is consumed during the month are also listed. Appendix A gives abbreviations for species names.

Group Risk

The final page(s) are always printed and describe the probability of risk for each output group. The top two lines of each group output gives a description of the group listing the parameters of sex, age, eater/noneater status, ADI, and total number in the group. Two small tables are found side by side just below the 2 top lines which list the % population not at risk (on left) and at risk (on right). Sample run number one (appendix G) shows the results pertaining to two output groups. Sample run number two shows the results pertaining to three groups. The user may list up to 20 different output groups using option 18.

CHAPTER THREE

PROGRAMMERS GUIDE

Overview

Figure 8 shows the major features of the consumer-risk model. Figure 9 is a flow diagram illustrating how the program operates.

Program Description

The system consists of two FORTRAN programs. The first, called the prompting program, is a straight forward, simply written program which prompts the user for appropriate responses. Its function is to allow the user to enter values for variables found in the main program without changing the main program. The user may change any variable already assigned a default value in the main program or keep the default value. After the user responds to the prompting program, the response is written onto an answer file which is later read by the main program. After every response is recorded, the prompting program instructs the user on how to run the main program, which is submitted in batch mode.

The main program consists of eight sections (all marked by comment statements). The first section initializes variables and also assigns appropriate default values to some of the variables. The second and third sections read the abbreviated names file and the names file respectively. The abbreviated species name and the entire species name are associated with a species code. (Appendix A).

The fourth section reads the answer file and writes the first page of output. This section is written as a series of linked subsections which first check the initial user response (Y or N) and then functions accordingly. (i.e. a Y response indicates that the variable must be read and a N response tells the program to go on to the next Y/N response.) An example of the answer file is found in Table 1. This particular file was generated by sample run number one found in Appendix G.

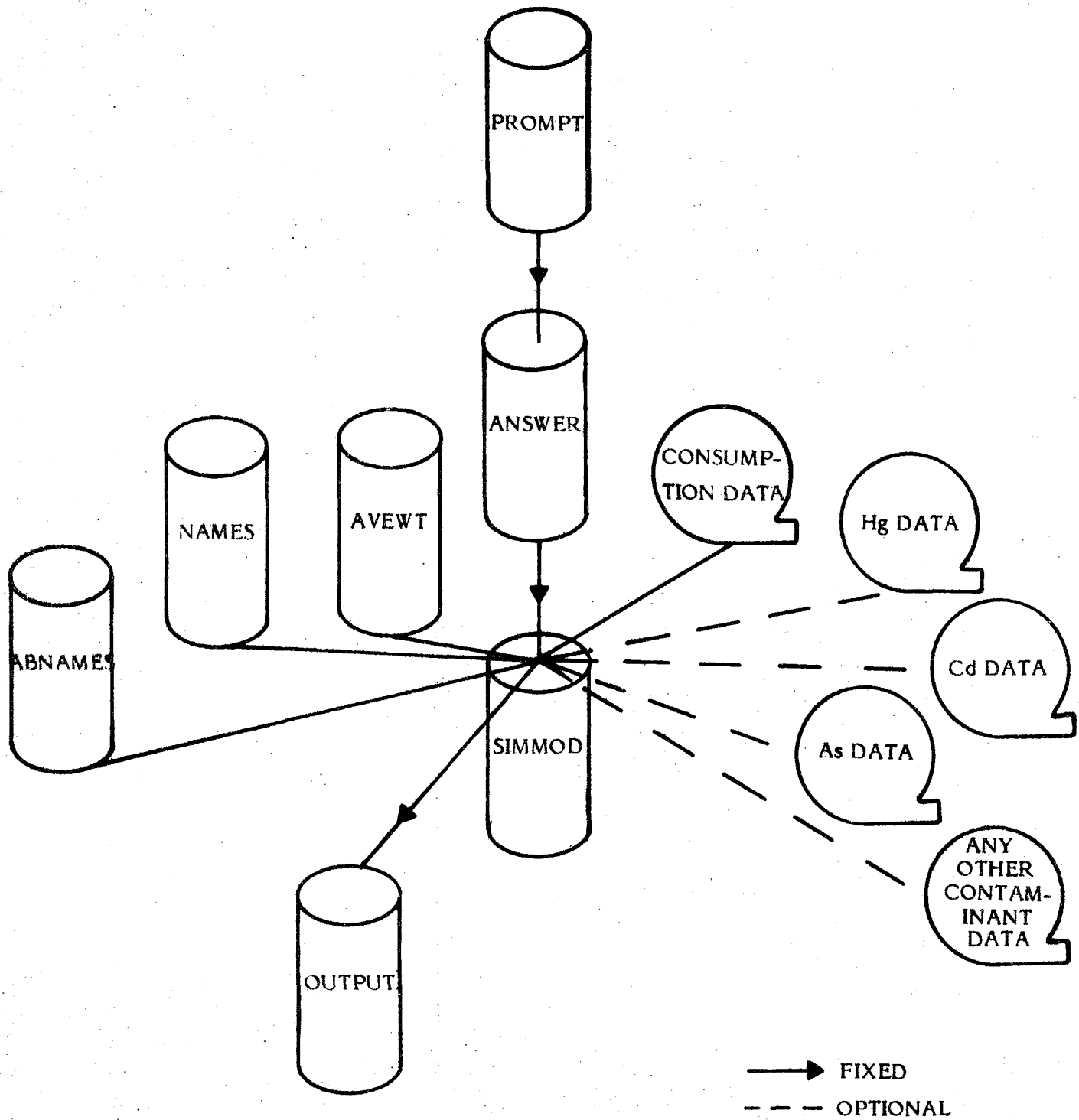


Figure 8. System overview of the consumer-risk model.

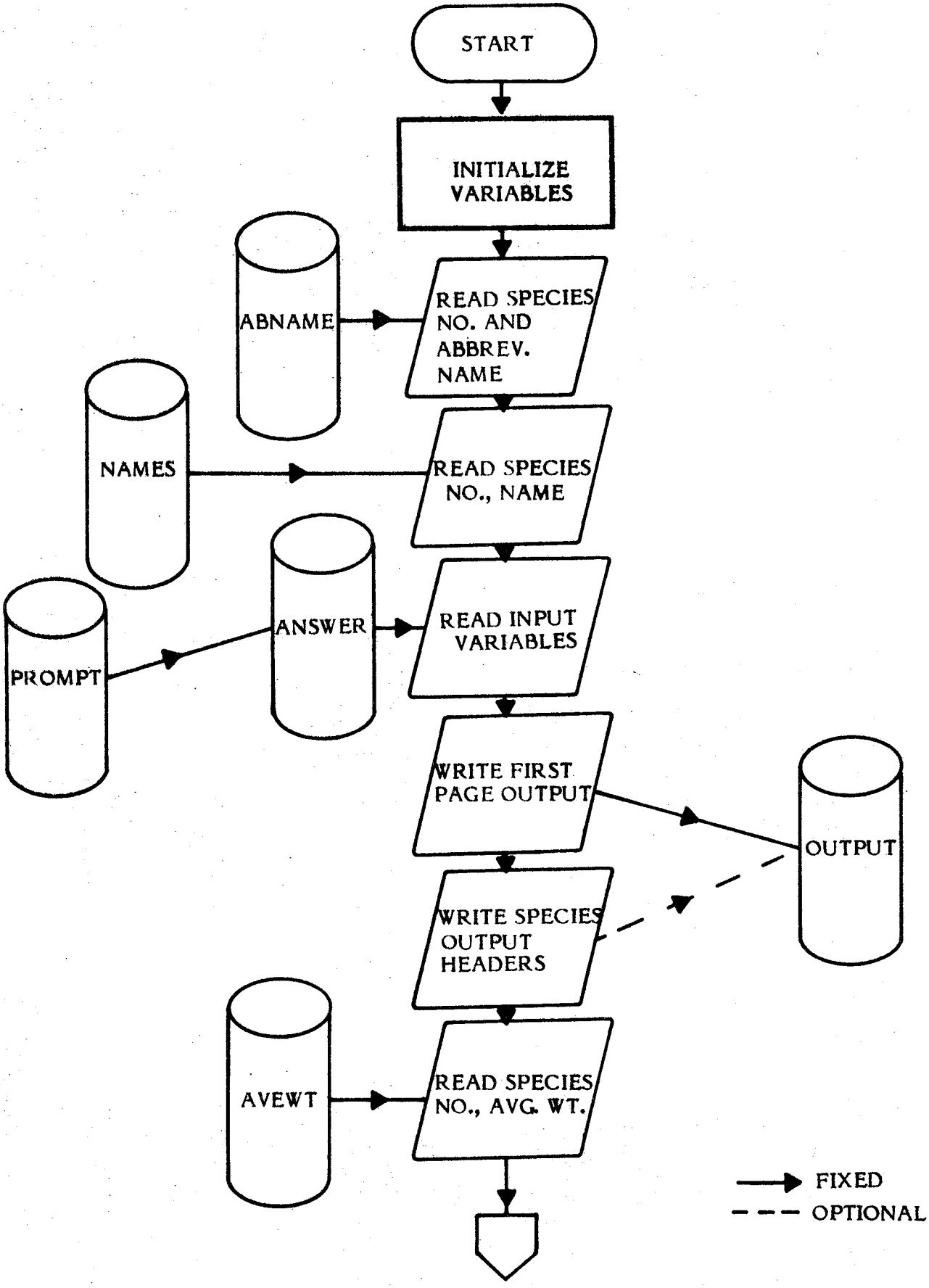
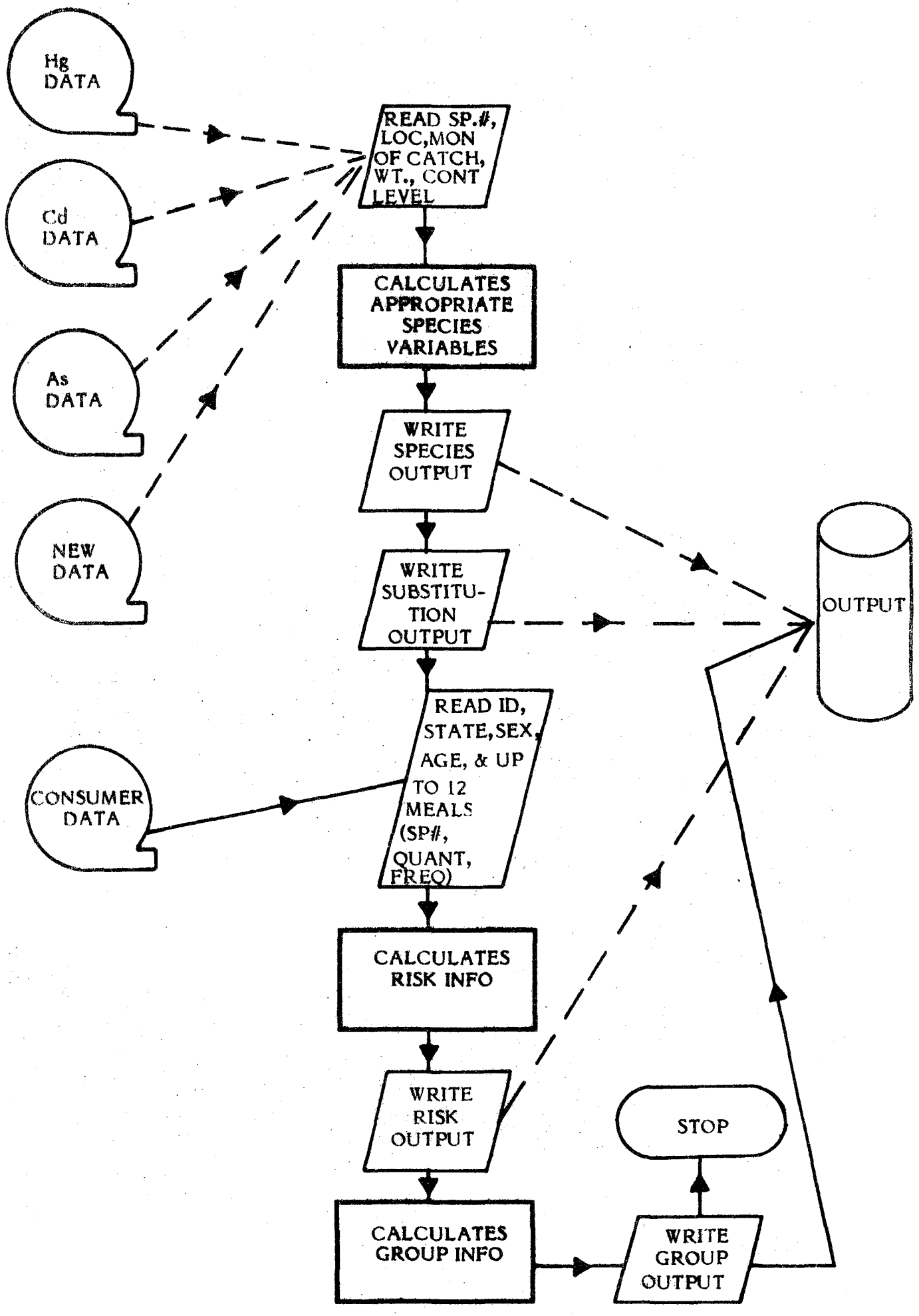


Figure 9. Computer programming steps for using consumer-risk models.


Hg DATA
Cd DATA
As DATA
NEW DATA
READ SP.#, LOC,MON OF CATCH, WT., CONT LEVEL
CALCULATES APPROPRIATE SPECIES VARIABLES
WRITE SPECIES OUTPUT
WRITE SUBSTITU-TION OUTPUT
OUTPUT
CONSUMER DATA
READ ID, STATE,SEX, AGE, & UP TO 12 MEALS (SP#, QUANT, FREQ)
CALCULATES RISK INFO
WRITE RISK OUTPUT
STOP
CALCULATES GROUP INFO
WRITE GROUP OUTPUT

The fifth section reads the average weight file. This file is used to compare the weight of each fish to its species average weight. If the two weights are equal this indicates that the fish in the contaminant file was not weighed originally. Unweighed fish would not be used if the user had split that species into two groups according to weight.

The sixth section reads the contaminant data file, performs calculations, and writes the species output and the substitution output. It reads the first record of the file, initializes variables, performs some calculations, and then reads the second record with a different read statement. The program then functions as if it were in a nested DO LOOP with GO TO statements directing the action. The outside loop acts upon each species while the inside loop acts upon each fish within the species. Finally, the output is written.

Section seven reads the consumption data file, calculates average daily intakes for each consumer, and then writes the risk output page and the group risk output page. Basically, a consumer's record is read, the program determines if the consumer meets the user group criteria (state of residence, species eaten, etc.), calculates his personal ADI and upper limit daily intake, and then writes that person's statistics on the risk output page provided the consumer is at risk.

Section eight represents six subroutines. The month and location subroutines recode month or location codes into familiar abbreviations. The MIXES subroutine assigns the default substitutions discussed in Appendices D and E. The MERCURY, CADMIUM, and ARSENIC subroutines assign the default values of variables unique to that contaminant's data file. The arsenic data file is not presently available on the system although its default variables have been determined.

The time of executing the main program has been set at .025 cpu hrs on the JCL commands, however, this figure may only be used when the consumption data is on disc storage rather than tape. The contaminant data are on tape. The average cost per run using disc input is approximately $35.00.

Table 2 lists the variable definitions. A listing of the prompting program follows next in Table 3. Table 4 lists the main program.

Table 1. Answer File for Sample Run #1 in Appendix G.

TEST RUN FOR USERS GUIDE

```
 2
 Y 99
 1  5.0
 2  5.0
 3  5.0
 4  5.0
 5  5.0
 6  5.0
 7  5.0
 8  5.0
 9  5.0
10  5.0
11  5.0
12  5.0
13  5.0
14  5.0
15  5.0
16  5.0
17  5.0
18  5.0
19  5.0
20  5.0
21  5.0
22  5.0
23  5.0
24  5.0
25  5.0
26  5.0
27  5.0
28  5.0
29  5.0
30  5.0
31  5.0
32  5.0
33  5.0
34  5.0
35  5.0
36  5.0
37  5.0
38  5.0
39  5.0
40  5.0
41  5.0
42  5.0
43  5.0
44  5.0
45  5.0
```

Table 1. Continued.

46	5.0
47	5.0
48	5.0
49	5.0
50	5.0
51	5.0
52	5.0
53	5.0
54	5.0
55	5.0
56	5.0
57	5.0
58	5.0
59	5.0
60	5.0
61	5.0
62	5.0
63	5.0
64	5.0
65	5.0
66	5.0
67	5.0
68	5.0
69	5.0
70	5.0
71	5.0
72	5.0
73	5.0
74	5.0
75	5.0
76	5.0
77	5.0
78	5.0
79	5.0
80	5.0
81	5.0
82	5.0
83	5.0
84	5.0
85	5.0
86	5.0
87	5.0
88	5.0
89	5.0
90	5.0
91	5.0
92	5.0
93	5.0
94	5.0
95	5.0
96	5.0
97	5.0
98	5.0
99	5.0

Table 1. Continued.

```
N 0
Y  2
14 3
 211 8
16 2
 1 6
Y  1
48 2
N  65.00S  35.00
Y  1
 3    15.35.00
N 0
N 0
N 0
N 0
N 0.
N 0
N 0
N 0
N 0
N
Y
 0.050
N  0
```

Table 2. Variable Definitions.

Variable Name	Index Range		Definition
Param(I,1)		I=1-99	Number of fish in species I on contaminant file
Param(I,2)		I=1-99	Action level for species I
Param(I,3)		I=1-99	Enforcement level for species I
Param(I,4)		I=1-99	Mean contaminant level of species I
Param(I,5)		I=1-99	Standard deviation contaminant level of species I
Param(I,6)		I=1-99	Dividing weight of species I
Param(I,7)		I=1-99	Percent below dividing weight of species I
Param(I,8)		I=1-99	Percent above dividing weight of species I
Param(I,9)		I=1-99	Weight of currently read fish in species I
Param(I,10)		I=1-99	Contaminant level of currently read fish in species I
Param(I,11)		I=1-99	Substituted mean contaminant level for species I
Param(I,12)		I=1-99	Substituted standard deviation contaminant level for species I
Loc(I,1)		I=1-99	Location of catch for currently read fish in species I
Loc(I,J)	I=1-99	J=2-8	Location of catch to be included in species I
Ploc(I,J)	I=1-99	J=1-7	Percent weight placed on location J in species I
Moel(I,1)		I=1-99	Month of catch for currently read fish in species I
Moel(I,J)	I=1-99	J=2-7	Jth month of catch to be eliminated in species I
Calc(1,J,K)	J=1-7	K=1-2	Number of fish used at location J and weight group K
Calc(2,J,K)	J=1-7	K=1-2	Number of fish above action level at location J and weight group K
Calc(3,J,K)	J=1-7	K=1-2	Percent of fish above action level at location J and weight group K

Table 2. Continued.

Variable Name	Index Range		Definition
Calc(4,J,K)	J=1-7	K=1-2	Number of fish rejected at location J and weight group K
Calc(5,J,K)	J=1-7	K=1-2	Percent of fish rejected at location J and weight group K
Calc(6,J,K)	J=1-7	K=1-2	Sum of weighted contaminant levels at location J and weight group K
Calc(7,J,K)	J=1-7	K=1-2	Sum of square of weighted contaminant levels at location J and weight group K
Calc(8,J,K)	J=1-7	K=1-2	Sum of weights of fish at location J and weight group K
Calc(9,J,K)	J=1-7	K=1-2	Mean contaminant level at location J and weight group K
Calc(10,J,K)	J=1-7	K=1-2	Second non-central contaminant level moment at location J and weight group K
Calc(11,J,K)	J=1-7	K=1-2	Final number of fish at location J and weight group K
Mix(I,J)	I=1-99	J=1-99	Percent weight placed on substituting species J for species I
Min(I,J)	I=1-7	J=1-2	Minimum contaminant level at location I and weight group J
Max(I,J)	I=1-7	J=1-2	Maximum contaminant level at location I and weight group J
Abname(I)		I=1-99	Abbreviated name for species I
Name(I,J)	I=1-99	J=1-7	Name of species I (split into 7 parts)
Iwa(I)		I=1-90	Average weight of species I
Mon(I)		I=1-6	Name of Ith month eliminated
Lin(I,J)	I=1-99	J=1-7	Name of Jth location for species I
Std(I,J)	I=1-7	J=1-2	Standard deviation contaminant level at location I and weight group K
ADI			Allowed daily intake
ADIP			Personal allowed daily intake

Table 2. Continued.

Variable Name	Index Range	Definition
Ulev		Upper level daily intake
Adiwt(I,J)	I=1-7 J=1-3	Average weight of a person in age group I and sex group J
Rslv(I)	I=1-6	Risk value at level I
Lev(I)	I=1-6	Z-value of a normal distribution at risk level I
Qf(I)	I=1-99	Quantity factor for species I
Ff(I)	I=1-99	Frequencv factor for species I
Q(I)	I=1-99	Quantity of species I eaten
Fr(I)	I=1-99	Frequency of eating species I
Mn		Mean contaminant level for consumer
Sd		Standard deviation contaminant level for consumer
Stin(I)	I=1-25	Ith included state of residence
Stout	I=1-25	Ith excluded state of residence
Spin(I)	I=1-99	Ith specie to be eaten by consumers
Spout(I)	I=1-99	Ith species not to be eaten by consumers
Rsk(I,J)	I=1-20 J=1-6	Number of people at risk in output group I at level J
Nnr(I)	I=1-6	Number of people not at risk at level I
Pnr(I)	I=1-6	Percent of people not at risk at level I
Par(I)	I=1-6	Percent of people at risk at level I
Gr(I,1)	I=1-20	Group variable "male in or out" for group I
Gr(I,2)	I=1-20	Group variable "female in or out" for group I
Gr(I,3)	I=1-20	Group variable "sex not recorded in or out" for group I
Gr(I,4)	I=1-20	Lower age limit for group I
Gr(I,5)	I-1-20	Upper age limit for group I

Table 2. Continued.

Variable Name	Index Range	Definition
Gr(I,6)	I=1-20	Group variable "age not recorded in or out" for group I
Gr(I,7)	I=1-20	Group variable "noneaters in or out" for group I
Gr(I,8)	I=1-20	Total number of people in group I

Table 3. Listing of Prompting Program.

```
0010      DIMENSION AI1(99),AI2(99),AI3(99),AI4(99),AI5(99),AI6(99),AI7(99)
0020      DIMENSION AI8(99),AI9(99,2),AI11(25),AI13(99),AI14(99)
0030      DIMENSION AI19(20,7)
0040      DIMENSION AR1(99),AR2(99),AA3(99,6),AA4(99,7),AR4(99,7),AR5(99,2)
0050      DIMENSION AR8(99,2),AR9(99),AR13(99),AR14(99)
0060      CHARACTER *2 AA11(25),AA12(25),AA
0070      INTEGER AI1,AI2,AI3,AI4,AI5,AI6,AI7,AI8,AI9,AI13,AI14,AI19
0080      INTEGER AA3
0090      CHARACTER *1 ANS1,ANS2,ANS3,ANS4,ANS5,ANS6,ANS7,ANS8,ANS9,ANS10
0100      CHARACTER *1 ANS11,ANS12,ANS13,ANS14,ANS15,ANS16,ANS17,ANS18,ANS19
0110      CHARACTER TITLE*1 (72)
0120      CHARACTER *1 AA4
0130      PRINT,"  "
0140      PRINT,"  "
0150      PRINT,"  "
0160      PRINT,"           CONTAMINANT/CONSUMER RISK SIMULATION MODEL"
0170      PRINT,"  "
0180      PRINT,"     THIS  IS A PRELIMINARY PROGRAM FOR THE "
0190      PRINT,"CONTAMINANT/CONSUMER RISK SIMULATION MODEL."
0200      PRINT,"  "
0210      PRINT,"       HAVE THE USER GUIDE IN FRONT OF YOU FOR"
0220      PRINT,"REFERENCE.  FOR EXAMPLE THE SPECIES CODES ARE FOUND"
0230      PRINT,"IN THE USER GUIDE."
0240      PRINT,"  "
0250      PRINT,"       THE PROGRAM WILL ASK YOU IF YOU WANT TO CHANGE"
0260      PRINT,"A CERTAIN VARIABLE.  IF YOU DON'T A DEFAULT VALUE IS"
0270      PRINT,"AUTOMATICALLY CHOSEN FOR THAT PARTICULAR VARIABLE.  THE"
0280      PRINT,"PROGRAM LISTS THAT VALUE AS DOES THE USER GUIDE."
0290      PRINT,"  "
0300      PRINT,"       ANSWER EVERY QUESTION.  ENTER Y FOR YES AND N"
0310      PRINT,"FOR NO."
0320      PRINT,"  "
0330      PRINT,"***********************"
0340      PRINT,"ENTER THE TITLE OF YOUR RUN.  "
0350      PRINT,"  "
0360      PRINT,"THIS WILL BE PRINTED AT THE TOP OF MOST PAGES OF YOUR"
0370      PRINT,"OUTPUT.  PLEASE RESTRICT YOUR TITLE TO ONE LINE."
0380      READ(5,4) (TITLE(N),N=1,72)
0390 4    FORMAT(72A1)
0400      WRITE(30,5) (TITLE(N),N=1,72)
0410 5    FORMAT(72A1)
0420      PRINT,"  "
0430      PRINT,"*************************************************"
0440      PRINT,"              INPUT FORMULATION"
0450      PRINT,"*************************************************"
0460      PRINT,"  "
0470      PRINT,"*************************"
0480      PRINT,"  "
0490      PRINT,"WHICH CONTAMINANT ARE YOU INTERESTED IN?"
0500      PRINT,"MERCURY = 1.  CADMIUM = 2.  ARSENIC = 3."
0510      READ,NCONT
0520      WRITE(30,282) NCONT
0530 282  FORMAT(1X,I1)
0540      PRINT,"  "
0550      PRINT,"*******************"
0560      PRINT,"DO YOU WISH TO CHANGE THE ACTION LEVEL?  (DEFAULT VALUES ARE
0570     & 5.0 PPM   FOR MERCURY, 20.0 PPM FOR CADMIUM AND 100.0
0580     &  PPM FOR ARSENIC.)"
0590      READ,ANS1
0600      IF(ANS1.EQ."N") WRITE(30,20) ANS1
0610 20   FORMAT(1X,A1," 0")
```

```
0620       IF(ANS1.EQ."Y") CALL PROM(ANS1,AI1,AR1)
0630       PRINT,"  "
0640       PRINT,"********************"
0650       PRINT,"DO YOU WISH TO CHANGE THE LEVEL OF ENFORCEMENT?  (DEFAULT"
0660       PRINT," VALUE IS   100 %)"
0670       READ,ANS2
0680       IF(ANS2.EQ."N") WRITE(30,20) ANS2
0690       IF(ANS2.EQ."Y") CALL PROM(ANS2,AI2,AR2)
0700       PRINT,"  "
0710       PRINT,"********************"
0720       PRINT,"DO YOU WISH TO ELIMINATE CERTAIN  MONTHS OF CATCH FOR SPECIFIC
0730      & SPECIES?  (DEFAULT IS NO MONTHS ELIMINATED.)"
0740       READ,ANS3
0750       IF(ANS3.EQ."Y") GO TO 10
0760       WRITE(30,20) ANS3
0770       GO TO 40
0780  10   PRINT,"HOW MANY SPECIES?"
0790       READ,J3
0800       WRITE(30,302) ANS3,J3
0810  302  FORMAT(1X,A1,1X,I2)
0820       DO 30 I=1,J3
0830       PRINT,"ENTER THE SPECIES NUMBER AND THE NUMBER OF MONTHS TO"
0840       PRINT," BE ELIMINATED.  (UP TO 6 MONTHS.)"
0850       READ,AI3(I),N3
0860       WRITE(30,24) AI3(I),N3
0870  24   FORMAT(1X,I2,1X,I1)
0880       PRINT,"ENTER THE SPECIFIC MONTHS (ONE PER LINE) USING THEIR
0890      &STANDARD NUMBER. I.E. JANUARY = 1, FEBRUARY = 2."
0900       DO 25 JJ=1,N3
0910       READ,AA3(I,JJ)
0920  25   CONTINUE
0930       WRITE(30,26) (AA3(I,JJ),JJ=1,N3)
0940  26   FORMAT(1X,6(I2))
0950  30   CONTINUE
0960  40   PRINT,"  "
0970       PRINT,"**********************"
0980       PRINT,"DO YOU WISH TO LIMIT LOCATIONS OF CATCH FOR SPECIFIC"
0990       PRINT," SPECIES?       (DEFAULT IS ALL LOCATIONS INCLUDED.)"
1000       READ,ANS4
1010       IF(ANS4.EQ."Y") GO TO 50
1020       WRITE(30,20) ANS4
1030       GO TO 80
1040   50  PRINT,"HOW MANY SPECIES ARE INVOLVED?"
1050       READ,J4
1060       WRITE(30,302) ANS4,J4
1070       DO 60 I=1,J4
1080       PRINT,"ENTER THE SPECIES NUMBER AND THE NUMBER OF LOCATIONS
1090      & THE SPECIE"
1100       PRINT,"WILL BE DIVIDED INTO.  (UP TO 7.)"
1110       READ, AI4(I),N4
1120       WRITE(30,24) AI4(I),N4
1130       PRINT,"ENTER  SPECIFIC LOCATION AND CORRESPONDING PERCENT
1140      & VALUE.    SEE USER  GUIDE FOR LOCATION CODES AND
1150      &AN ENTRY EXAMPLE."
1160       DO 70 JJ=1,N4
1170       READ,AA4(I,JJ),AR4(I,JJ)
1180   70  CONTINUE
1190       WRITE(30,72) (AA4(I,JJ),AR4(I,JJ),JJ=1,N4)
1200   72  FORMAT(1X,7(A1,1X,F6.2))
1210    60 CONTINUE
1220  80   PRINT,"  "
1230       PRINT,"**********************"
1240       PRINT,"DO YOU WISH TO DIVIDE ANY SPECIE BY WEIGHT?  "
```

```
      PRINT,"(FOR DEFAULT VALUES SEE USER GUIDE)"
      READ,ANS5
      IF(ANS5.EQ."Y") GO TO 90
      WRITE(30,20) ANS5
      GO TO 110
 90   PRINT,"HOW MANY SPECIES?"
      READ,J5
      WRITE(30,302) ANS5,J5
      PRINT,"ENTER SPECIES CODE, THE SPECIFIC WEIGHT IN GRAMS, AND"
      PRINT," THE PERCENTAGE BELOW THE ENTERED WEIGHT. (IN THAT ORDER.)"
      DO 100 I=1,J5
      READ,AI5(I),AR5(I,1),AR5(I,2)
100   CONTINUE
      WRITE(30,672) (AI5(I),AR5(I,1),AR5(I,2),I=1,J5)
672   FORMAT(1X,I2,F6.0,F5.2)
110   PRINT,"  "
      PRINT,"*****************************"
      PRINT,"DO YOU WISH TO LIMIT THE SPECIES EATEN BY CONSUMERS?"
      PRINT," (DEFAULT IS ALL SPECIES INCLUDED.)"
      READ,ANS6
      IF(ANS6.EQ."Y") GO TO 120
      WRITE(30,20) ANS6
      GO TO 140
120   PRINT,"HOW MANY?"
      READ,J6
      WRITE(30,302) ANS6,J6
      PRINT,"ENTER SPECIFIC SPECIES CODE (ONE PER LINE)."
      DO 130 I=1,J6
      READ,AI6(I)
130   CONTINUE
      WRITE(30,752) (AI6(I),I=1,J6)
 752  FORMAT(1X,I2)
140   PRINT,"  "
      PRINT,"*****************************"
      PRINT,"DO YOU WISH TO EXCLUDE CERTAIN SPECIES EATEN BY
     &CONSUMERS?"
      PRINT,"      (DEFAULT IS NO SPECIES EXCLUDED.)"
      READ,ANS7
      IF(ANS7.EQ."Y") GO TO 150
      WRITE(30,20) ANS7
      GO TO 170
150   PRINT,"HOW MANY?"
      READ,J7
      WRITE(30,302) ANS7,J7
      PRINT,"ENTER SPECIES CODES  (ONE PER LINE)."
      DO 160 I=1,J7
      READ,AI7(I)
160   CONTINUE
      WRITE(30,832) (AI7(I),I=1,J7)
832   FORMAT(1X,I2)
170   PRINT,"  "
      PRINT,"*************************"
      PRINT,"DO YOU WISH TO SUBSTITUTE A NEW CONTAMINANT MEAN AND
     & STANDARD DEVIATON"
      PRINT,"FOR A SPECIFIC SPECIES?  (DEFAULT IS NO SUBSTITUTIONS.)"
      READ,ANS8
      IF(ANS8.EQ."Y") GO TO 180
      WRITE(30,20) ANS8
      GO TO 200
180   PRINT," HOW MANY SPECIES?"
      READ,J8
      WRITE(30,302) ANS8,J8
      PRINT,"SPECIES CODE, NEW MEAN, NEW STANDARD DEVIATION"
```

```
1880       DO 190 I=1,J8
1890       READ,AI8(I),AR8(I,1),AR8(I,2)
1900  190  CONTINUE
1910       WRITE(30,912) (AI8(I),AR8(I,1),AR8(I,2),I=1,J8)
1920  912  FORMAT(1X,I2,1X,2F6.4)
1930  200  PRINT,"  "
1940       PRINT,"*************************"
1950       PRINT,"DO YOU WISH TO SUBSTITUTE ONE OR MORE SPECIES FOR ANOTHER?
1960      & (SEE USER  GUIDE FOR DEFAULT VALUES.)"
1970       READ, ANS9
1980       IF(ANS9.EQ."Y") GO TO 210
1990       WRITE(30,20) ANS9
2000       GO TO 230
2010  210  PRINT,"HOW MANY SUBSTITUTIONS ARE INVOLVED?"
2020       PRINT,"  "
2030       PRINT,"WHEN ENTERING THE NUMBER OF SUBSTITUTIONS "
2040       PRINT,"DO NOT JUST ENTER THE NUMBER OF SPECIES TO BE SUBSTITUTED FOR"
2050       PRINT,"BUT THE TOTAL NUMBER OF SUBSTITUTIONS."
2060       READ,J9
2070       WRITE(30,302)ANS9,J9
2080       PRINT,"ENTER SPECIES  TO BE SUBSTITUTED FOR, "
2090       PRINT,"SPECIES BEING SUBSTITUED INTO, PERCENT."
2100       DO 220 I=1,J9
2110       READ,AI9(I,1),AI9(I,2),AR9(I)
2120  220  CONTINUE
2130       WRITE(30,1032) (AI9(I,1),AI9(I,2),AR9(I),I=1,J9)
2140 1032  FORMAT(1X,I2,I2,F6.2)
2150  230  PRINT,"  "
2160       PRINT,"***********************"
2170       PRINT,"DO YOU WISH A NEW ADI?  (DEFAULT VALUES ARE 72.0MCG/70KG FOR
2180      & CADMIUM,  30.0MCG/70KG FOR MERCURY, AND 500.0MCG/70 KG FOR ARSENIC)"
2190       PRINT,"ANSWER WITH FOLLOWING FORMAT: Y,NEW VALUE OR N,0"
2200       READ,ANS10,AR10
2210       WRITE(30,1072) ANS10,AR10
2220 1072  FORMAT(1X,A1,F4.1)
2230        PRINT,"  "
2240        PRINT,"***************************"
2250       PRINT,"DO YOU WISH TO ONLY INCLUDE CERTAIN CONSUMER STATES?"
2260       PRINT,"  (DEFAULT IS ALL STATES INCLUDED.)"
2270       READ,ANS11
2280       IF(ANS11.EQ."Y") GO TO 240
2290       WRITE(30,20) ANS11
2300       GO TO 260
2310  240  PRINT,"HOW MANY STATES?  (UP TO 25.)"
2320       READ,J11
2330       WRITE(30,302) ANS11,J11
2340       PRINT,"ENTER SPECIFIC STATES USING THEIR APPROPRIATE "
2350       PRINT,"(POST OFFICE) TWO-LETTER ABBREVIATION. (ONE PER LINE)"
2360       DO 250 I=1,J11
2370       READ,AA
2380       AA11(I)=AA
2390  250  CONTINUE
2400       WRITE(30,1162) (AA11(I),I=1,J11)
2410 1162   FORMAT(1X,A2)
2420  260  PRINT,"  "
2430       PRINT,"************************"
2440       PRINT,"DO YOU WISH TO  EXCLUDE CERTAIN CONSUMER STATES?"
2450       PRINT," (DEFAULT IS NO STATES EXCLUDED.)"
2460       READ,ANS12
2470       IF(ANS12.EQ."Y") GO TO 270
2480       WRITE(30,20) ANS12
2490       GO TO 290
2500  270  PRINT,"HOW MANY STATES?  (UP TO 25.)"
```

```
2510       READ,J12
2520       WRITE(30,302)ANS12,J12
2530       PRINT,"ENTER SPECIFIC STATES USING THEIR (POST OFFICE)"
2540       PRINT,"TWO-LETTER ABBREVIATION.(ONE PER LINE)"
2550       DO 280 I=1,J12
2560       READ,AA
2570       AA12(I)=AA
2580 280   CONTINUE
2590       WRITE(30,1162) (AA12(I),I=1,J12)
2600 290   PRINT,"   "
2610       PRINT,"************************"
2620       PRINT,"DO YOU WISH TO CHANGE THE QUANTITY FACTOR FOR ANY SPECIE?"
2630       PRINT,"  (DEFAULT IS QUANTITY FACTORS AS IS.)"
2640       READ,ANS13
2650       IF(ANS13.EQ."Y") GO TO 300
2660       WRITE(30,20) ANS13
2670       GO TO 320
2680 300   PRINT,"HOW MANY SPECIES?"
2690       READ,J13
2700       WRITE(30,302) ANS13,J13
2710       PRINT,"ENTER SPECIES NUMBER AND ITS QUANTITY FACTOR"
2720       DO 310 I=1,J13
2730       READ,AI13(I),AR13(I)
2740 310   CONTINUE
2750       WRITE(30,1332) (AI13(I),AR13(I),I=1,J13)
2760 1332  FORMAT(1X,I2,F5.2)
2770 320   PRINT,"   "
2780       PRINT,"************************"
2790       PRINT," DO YOU WISH TO CHANGE THE FREQUENCY FACTOR FOR ANY SPECIE?"
2800       PRINT,"    (DEFAULT IS FREQUENCY FACTORS AS IS.)"
2810       READ,ANS14
2820       IF(ANS14.EQ."Y") GO TO 330
2830       WRITE(30,20) ANS14
2840       GO TO 350
2850 330   PRINT,"HOW MANY SPECIES?"
2860       READ,J14
2870       WRITE(30,302) ANS14,J14
2880       PRINT,"ENTER SPECIES NUMBER AND ITS FREQUENCY FACTOR."
2890       DO 340 I=1,J14
2900       READ,AI14(I),AR14(I)
2910 340   CONTINUE
2920       WRITE(30,1332) (AI14(I),AR14(I),I=1,J14)
2930 350   PRINT," "
2940       PRINT,"   "
2950       PRINT,"   "
2960       PRINT,"************************************************************"
2970       PRINT,"             OUTPUT       DESIGN"
2980       PRINT,"************************************************************"
2990       PRINT,"NOW WE MUST DESIGN YOUR DESIRED OUTPUT."
3000       PRINT,"AS YOU KNOW THERE ARE SPECIES DATA OUTPUT AND CONSUMER
3010      & RISK OUTPUT."
3020       PRINT,"   "
3030       PRINT,"THE SPECIES OUTPUT CONSISTS OF A TABLE OF INFORMATION"
3040       PRINT,"CONCERNING THE NUMBERS OF FISH PER SPECIE THAT WERE USED"
3050       PRINT,"BY THE MODEL AND A LIST OF ALL SUBSTITUTIONS."
3060       PRINT,"   "
3070       PRINT,"************************"
3080       PRINT,"DO YOU WISH TO DELETE ANY OF THIS OUTPUT?"
3090       READ,ANS15
3100       WRITE(30,1492) ANS15
3110 1492  FORMAT(1X,A1)
3120       IF(ANS15.EQ."Y") GO TO 360
3130       GO TO 370
```

```
3140 360  PRINT,"DO YOU WISH TO DELETE THE TABLE?"
3150      READ,ANS16
3160      WRITE(30,1492) ANS16
3170      PRINT,"DO YOU WISH TO DELETE THE SUBSTITUTIONS?"
3180      READ,ANS17
3190      WRITE(30,1492) ANS17
3200 370  PRINT,"  "
3210      PRINT,"ONE PART OF THE CONSUMER RISK OUTPUT IS A LIST OF"
3220      PRINT,"THOSE CONSUMERS WHO ARE AT A CERTAIN RISK."
3230      PRINT,"  "
3240      PRINT,"************************"
3250      PRINT,"DO YOU WISH TO KEEP THIS PART OF THE OUTPUT?"
3260      READ, ANS18
3270      WRITE(30,1492) ANS18
3280      IF(ANS18.EQ."Y") GO TO 380
3290      GO TO 390
3300 380  PRINT,"ENTER THE RISK VALUE FOR THIS OUTPUT."
3310      READ,AR18
3320      WRITE(30,1632) AR18
3330 1632 FORMAT(1X,F6.3)
3340 390  PRINT,"  "
3350      PRINT,"  "
3360      PRINT,"NOW WE MUST DEFINE THE ACTUAL OUTPUT GROUPS THAT"
3370      PRINT,"YOU WISH TO EXAMINE.  FOR THE DEFAULT GROUPS SEE THE"
3380      PRINT,"USER GUIDE."
3390      PRINT,"  "
3400      PRINT,"************************"
3410      PRINT,"DO YOU WISH TO ADD ANY OUTPUT GROUPS?"
3420      PRINT,"IF SO, ENTER Y AND THEN THE NUMBER OF GROUPS YOU WISH TO"
3430      PRINT,"ADD.  IF NOT, ENTER N AND THEN 0 (ZERO)."
3440      READ,ANS19,J19
3450      WRITE(30,302) ANS19,J19
3460      IF(ANS19.EQ."Y") GO TO 400
3470      GO TO 420
3480 400  PRINT,"  "
3490      PRINT,"  "
3500      PRINT,"FOR EACH GROUP WE MUST PUT IN OR TAKE OUT CERTAIN "
3510      PRINT,"VARIABLES.  THESE VARIABLES (IN ORDER) ARE:"
3520      PRINT,"MALE, FEMALE, SEX NOT RECORDED, LOWEST AGE, UPPER AGE,"
3530      PRINT,"AGE NOT RECORDED, AND  NON-EATERS."
3540      PRINT,"  "
3550      PRINT,"FOR EACH GROUP ENTER 1 FOR IN OR 0 FOR OUT FOR EACH "
3560      PRINT," VARIABLE.  FOR AGE VARIABLES ENTER THE APPROPRIATE  "
3570      PRINT,"NUMBER."
3580      DO 410 I=1,J19
3590      PRINT,"  "
3600      PRINT,"  "
3610      WRITE(6,405) I
3620 405  FORMAT(1X,"ADDITIONAL GROUP NUMBER",2X,I2)
3630      PRINT,"************************************************"
3640      PRINT,"MALE"
3650      READ,AI19(I,1)
3660      PRINT,"FEMALE"
3670      READ,AI19(I,2)
3680      PRINT,"SEX NOT RECORDED"
3690      READ,AI19(I,3)
3700      PRINT,"LOWER AGE LIMIT"
3710      READ,AI19(I,4)
3720      PRINT,"UPPER AGE LIMIT"
3730      READ,AI19(I,5)
3740      PRINT,"AGE NOT RECORDED"
3750      READ,AI19(I,6)
3760      PRINT,"NONEATERS"
```

```
3770        READ,AI19(I,7)
3780 410    CONTINUE
3790        WRITE(30,1952) ((AI19(I,JJ),JJ=1,7),I=1,J19)
3800 1952   FORMAT(1X,3I1,I2,I3,2I1)
3810 420    PRINT,"  "
3820        PRINT,"*****************************************************"
3830        PRINT,"  "
3840        WRITE(6,500) TITLE
3850 500    FORMAT(1X,"THIS RUN IS ENTITLED",/1X,72A1)
3860        PRINT,"  "
3870        PRINT,"TO COMPLETE THIS RUN OF THE MODEL"
3880        PRINT,"                ENTER;  CRUN FINISH"
3890        STOP
3900        END
3910        SUBROUTINE PROM(ANS,AI,AR)
3920        DIMENSION AI(99),AR(99)
3930        INTEGER AI
3940        CHARACTER *1 ANSP
3950        PRINT,"HOW MANY SPECIES IS A NEW VALUE TO BE APPLIED?  (FROM ONE
3960       &  TO 99)"
3970        READ,J
3980        IF(J.EQ.99) GO TO 200
3990 50     PRINT,"ENTER THE SPECIES NUMBER AND THEN THE NEW VALUE."
4000        DO 100 I=1,J
4010 100    READ,AI(I),AR(I)
4020        GO TO 400
4030 200    PRINT,"DO YOU WANT THE SAME VALUE APPLIED TO EVERY SPECIE?"
4040        READ,ANSP
4050        IF(ANSP.EQ."Y") GO TO 250
4060        GO TO 50
4070 250    PRINT,"ENTER THE NEW VALUE."
4080        READ,ARR
4090        DO 300 I=1,99
4100        AR(I)=ARR
4110 300    AI(I)=I
4120 400    WRITE(30,410) ANS,J
4130 410    FORMAT(1X,A1,1X,I2)
4140        DO 500 I=1,J
4150        WRITE(30,510) AI(I),AR(I)
4160 510    FORMAT(1X,I2,1X,F4.1)
4170 500    CONTINUE
4180        RETURN
4190        END

*
```

Table 4. Listing of Main Program in Consumer-Risk Model.

```
0010C                    CONTAMINANT/CONSUMER RISK SIMULATION MODEL
0020C
0030C
0040C ***************************INTRODUCTION*********************************
0050C THIS SIMULATION MODEL PROGRAM SIMULATES THE SEAFOOD
0060C EATING HABITS OF THE AMERICAN CONSUMER AND CALCULATES
0070C THE HEALTH RISK INVOLVED WITH CONTAMINANTS IN EATING
0080C SEAFOOD.  IT USES TWO MAJOR FILES -- A CONTAMINANT/
0090C SPECIES FILE AND A CONSUMER EATING FILE -- AS DATA
0100C INPUT.  THE MODEL FIRST CALCULATES THE MEAN CONTAMINANT
0110C LEVEL PER SPECIE, THEN CALCULATES THE MEAN INTAKE
0120C CONTAMINANT LEVEL IN EACH INDIVIDUAL CONSUMER, AND
0130C FINALLY ESTIMATES THE HEALTH RISK FOR EACH CONSUMER.
0140C ************************************************************************
0150       DIMENSION PARAM(99,12),LOC(99,8),PLOC(99,7),MOEL(99,7)
0160       DIMENSION CALC(11,7,2),LEV(6),QF(99),FF(99),STD(7,2)
0170       DIMENSION MON(6),LIN(99,7),NAME(99,7),IWA(90),NCT(20),MIX(99,99)
0180       DIMENSION XMIX(99),STIN(25),STOUT(25),SPIN(99),SPOUT(99),MNTH(6)
0190       DIMENSION GR(20,8),Q(99),FR(99),ADIWT(7,3),RSLV(6),RSK(20,6)
0200       DIMENSION MIN(7,2),MAX(7,2),NNR(6),PNR(6),PAR(6),SP(12)
0210       DIMENSION ABNAME(99),XNNR(6),TOTAL(6)
0220       CHARACTER *1 LOC,SX,S1,S2
0230       CHARACTER *1 ANS1,ANS2,ANS3,ANS4,ANS5,ANS6,ANS7,ANS8,ANS9,ANS10
0240       CHARACTER *1 ANS11,ANS12,ANS13,ANS14,ANS15,ANS16,ANS17,ANS18,ANS19
0250       CHARACTER *2 STIN,STOUT,ST,S3
0260       CHARACTER *3 LIN,MON,S4,STATUS,S5
0270       CHARACTER *4 NAME
0280       CHARACTER *5 ABNAME
0290       CHARACTER *7 ID
0300       CHARACTER A*8
0310       CHARACTER *10 NCT
0320       CHARACTER TITLE *1 (72)
0330       INTEGER ER,ERR,SPIN,SPOUT,GR,AGE,SP,Q,RSK
0340       REAL MIX,MN,MIN,MAX,NG,LEV,B
0350       DATA ADIWT(1,1)/7./,ADIWT(2,1)/15./,ADIWT(3,1)/31./,
0360      &ADIWT(4,1)/56./,
0370      &ADIWT(5,1)/72./,ADIWT(6,1)/74./,ADIWT(7,1)/74./,ADIWT(1,3)/7./,
0380      &ADIWT(2,3)/15./,ADIWT(3,3)/31./,ADIWT(4,3)/54./,ADIWT(5,3)/70.5/,
0390      &ADIWT(6,3)/69./,ADIWT(7,3)/69./,ADIWT(1,2)/7./,ADIWT(2,2)/15./,
0400      &ADIWT(3,2)/31./,ADIWT(4,2)/52./,ADIWT(5,2)/59./,ADIWT(6,2)/64./,
0410      &ADIWT(7,2)/64./
0420       DATA RSLV(1)/0.50/,RSLV(2)/0.30/,RSLV(3)/0.10/,
0430      &RSLV(4)/0.05/,RSLV(5)/0.01/,RSLV(6)/0.001/
0440       DATA LEV(1)/.0/,LEV(2)/.525/,LEV(3)/1.282/,LEV(4)/1.645/
0450      &,LEV(5)/2.326/,LEV(6)/3.09/
0460       DATA NCT(1)/"MERCURY    "/,NCT(2)/"CADMIUM    "/
0470       DATA NCT(3)/"ARSENIC    "/
0480       DO 1 I=1,99
0490       XMIX(I)=0.
0500       SPIN(I)=0
0510       SPOUT(I)=0
0520       DO 1 J=1,99
0530       MIX(I,J)=0.
0540 1     CONTINUE
0550       DO 2 I=1,99
0560       QF(I)=1.0
0570       FF(I)=1.0
0580       DO 2 J=1,12
0590 2     PARAM(I,J)=0.
0600       DO 3 I=1,99
0610       DO 3 J=1,8
```

```
0620   3    LOC(I,J)="Z"
0630        DO 4 I=1,99
0640        PARAM(I,3)=100.
0650        DO 4 J=1,7
0660        LIN(I,J)="    "
0670        PLOC(I,J)=0.
0680        MOEL(I,J)=99
0690  4     CONTINUE
0700        DO 5 I=1,11
0710        DO 5 J=1,7
0720        CALC(I,J,1)=0.
0730        CALC(I,J,2)=0.
0740   5    CONTINUE
0750        NG=123.456
0760        DO 50 JS=1,25
0770        STIN(JS)="ZZ"
0780    50  STOUT(JS)="ZZ"
0790        ISPE=1
0800        NGR=2
0810        IMIXE=1
0820        IRISKE=1
0830        RISK=.05
0840        IMA=0
0850        IFE=0
0860        INR=0
0870        NEAT=0
0880        DO 18 I=1,20
0890        DO 18 JJ=1,8
0900        GR(I,JJ)=0
0910   18   CONTINUE
0920        DO 19 I=1,2
0930        GR(I,4)=0
0940        GR(I,5)=100
0950        GR(I,6)=1
0960        DO 20 J=1,3
0970        GR(I,J)=1
0980  20    CONTINUE
0990  19    CONTINUE
1000        GR(1,7)=1
1010        GR(2,7)=0
1020        DO 30 I=1,20
1030        DO 30 J=1,6
1040  30    RSK(I,J)=0
1050C ****** READS ABBREVIATED NAMES FILE (ABNAME) ******
1060        DO 16 I=1,99
1070        READ(25,15) ISP,ABNAME(ISP)
1080   15   FORMAT(I2,A5)
1090    16  CONTINUE
1100C ****** READS NAMES FILE ****************************
1110        DO 310 I=1,99
1120        READ(9,308) ISP,(NAME(I,J),J=1,7)
1130  308   FORMAT(1X,I2,7A4)
1140        IF(ISP.EQ.I) GO TO 310
1150        WRITE(20,309) (NAME(I,J),J=1,7)
1160  309   FORMAT(1X,7A4,2X,"THERE IS AN ERROR WHEN READING THE NAMES FILE.")
1170  310   CONTINUE
1180C ****** THIS SECTION READS ANSWER FILE AND WRITES FIRST PAGE OUTPUT*
1190        READ(30,101) TITLE
1200  101   FORMAT(72A1)
1210C **CONTAMINANT**
1220        READ(30,102) NCONT
1230  102   FORMAT(1X,I1)
1240        WRITE(20,200) TITLE
```

```
1250 200  FORMAT("$THE TITLE OF THIS RUN IS ",72A1,///)
1260      CALL DATIM(A,B)
1270      WRITE(20,205) A,B
1280 205  FORMAT("TODAY'S DATE IS ",A8,".",10X,"THE TIME IS ",F6.3,".",///)
1290      GO TO (201,202,203),NCONT
1300 201  CALL MERCURY(MIX,PARAM,ADI)
1310      GO TO 300
1320 202  CALL CADMIUM(MIX,PARAM,ADI)
1330      GO TO 300
1340 203  CALL ARSENIC(MIX,PARAM,ADI)
1350 300  READ(30,103) ANS1,J1
1360 103  FORMAT(1X,A1,1X,I2)
1370      IF(ANS1.EQ."Y") GO TO 104
1380      GO TO 107
1390 104  DO 106 I=1,J1
1400C **ACTION LEVEL**
1410      READ(30,105) ISP,PARAM(ISP,2)
1420 105  FORMAT(1X,I2,1X,F4.1)
1430 106  CONTINUE
1440 107  READ(30,103) ANS2,J2
1450      IF(ANS2.EQ."Y") GO TO 108
1460      GO TO 110
1470 108  DO 109 I=1,J2
1480C **ENFORCEMENT LEVEL**
1490 109  READ(30,105) ISP,PARAM(ISP,3)
1500 110  READ(30,103) ANS3,J3
1510      IF(ANS3.EQ."Y") GO TO 111
1520      GO TO 116
1530 111  DO 115 I=1,J3
1540      READ(30,112) ISP,N3
1550 112  FORMAT(1X,I2,1X,I1)
1560C **MONTHS ELIMINATED**
1570      READ(30,113) (MNTH(N),N=1,N3)
1580 113  FORMAT(1X,6I2)
1590      DO 114 N=1,N3
1600      MOEL(ISP,N+1)=MNTH(N)
1610 114  CONTINUE
1620 115  CONTINUE
1630 116  READ(30,103) ANS4,J4
1640      IF(ANS4.EQ."Y") GO TO 117
1650      GO TO 120
1660 117  DO 119 I=1,J4
1670      READ(30,112) ISP,N4
1680C **LOCATIONS OF CATCH AND % LOCATION**
1690      READ(30,118) (LOC(ISP,N+1),PLOC(ISP,N),N=1,N4)
1700 118  FORMAT(1X,7(A1,1X,F6.2))
1710 119  CONTINUE
1720 120  READ(30,103) ANS5,J5
1730      IF(ANS5.EQ."Y") GO TO 121
1740       GO TO 124
1750 121  DO 123 I=1,J5
1760C **DIVIDING WEIGHT AND % LOWER WEIGHT**
1770      READ(30,122) ISP,PARAM(ISP,6),PARAM(ISP,7)
1780 122  FORMAT(1X,I2,F6.0,F5.2)
1790      PARAM(ISP,8)=1.-PARAM(ISP,7)
1800 123  CONTINUE
1810 124  READ(30,103) ANS6,J6
1820      IF(ANS6.EQ."Y") GO TO 125
1830      GO TO 128
1840 125  DO 127 I=1,J6
1850C **SPECIES EATEN BY CONSUMERS KEPT IN**
1860      READ(30,126) SPIN(I)
1870 126  FORMAT(1X,I2)
```

```
1880 127  CONTINUE
1890      WRITE(20,210) ((NAME(SPIN(I),K),K=1,7),I=1,J6)
1900 210  FORMAT("THIS RUN EXAMINES ONLY THOSE CONSUMERS WHO ATE ",
1910     &7A4,/,5(47X,7A4,/))
1920 128  READ(30,103) ANS7,J7
1930      IF(ANS7.EQ."Y") GO TO 129
1940      GO TO 131
1950 129  DO 130 I=1,J7
1960C **SPECIES EATEN BY CONSUMERS LEFT OUT**
1970      READ(30,126) SPOUT(I)
1980 130  CONTINUE
1990      WRITE(20,215) ((NAME(SPOUT(I),K),K=1,7),I=1,J7)
2000 215  FORMAT("THIS RUN EXCLUDES THOSE CONSUMERS WHO ATE ",
2010     &7A4,/,5(42X,7A4,/))
2020 131  READ(30,103) ANS8,J8
2030      IF(ANS8.EQ."Y") GO TO 132
2040      GO TO 135
2050 132  DO 134 I=1,J8
2060C **SUBSTITUTED NEW MEAN AND STANDARD DEVIATION**
2070      READ(30,133) ISP,PARAM(ISP,11),PARAM(ISP,12)
2080 133  FORMAT(1X,I2,1X,2F6.4)
2090 134  CONTINUE
2100 135  READ(30,103) ANS9,J9
2110      IF(ANS9.EQ."Y") GO TO 136
2120      GO TO 139
2130 136  DO 138 I=1,J9
2140C **SUBSTITUTIONS**
2150      READ(30,137) IS1,IS2,P
2160 137  FORMAT(1X,I2,I2,F6.2)
2170      MIX(IS1,IS2)=P
2180 138  CONTINUE
2190C **NEW ADI**
2200 139  READ(30,140) ANS10,A10
2210 140  FORMAT(1X,A1,F4.1)
2220      IF(ANS10.EQ."Y") ADI=A10
2230      READ(30,103) ANS11,J11
2240      IF(ANS11.EQ."Y") GO TO 141
2250      GO TO 144
2260 141  DO 143 I=1,J11
2270C **CONSUMER STATES IN**
2280      READ(30,142) STIN(I)
2290 142  FORMAT(1X,A2)
2300 143  CONTINUE
2310      WRITE(20,220) (STIN(I),I=1,J11)
2320  220 FORMAT("THIS RUN EXAMINES ONLY THOSE CONSUMERS WHO LIVED IN ",
2330     &25(A2,1X),//)
2340 144  READ(30,103) ANS12,J12
2350      IF(ANS12.EQ."Y") GO TO 145
2360      GO TO 147
2370 145  DO 146 I=1,J12
2380C **CONSUMERS STATES OUT**
2390      READ(30,142) STOUT(I)
2400 146  CONTINUE
2410      WRITE(20,225) (STOUT(I),I=1,J12)
2420 225  FORMAT("THIS RUN EXCLUDES THOSE CONSUMERS WHO LIVED IN ",
2430     &25(A2,1X),//)
2440 147  READ(30,103) ANS13,J13
2450      IF(ANS13.EQ."Y") GO TO 148
2460      GO TO 151
2470 148  DO 150 I=1,J13
2480C **NEW QUANTITY FACTORS**
2490      READ(30,149) ISP,QF(ISP)
2500 149  FORMAT(1X,I2,F5.2)
```

```
2510       WRITE(20,230) (NAME(ISP,K),K=1,7),QF(ISP)
2520 230   FORMAT("THE CONSUMPTION OF ",7A4,1X,"WAS INCREASED BY ",
2530      &F5.2,1X,"TIMES.",//)
2540 150   CONTINUE
2550 151   READ(30,103) ANS14,J14
2560       IF(ANS14.EQ."Y") GO TO 152
2570       GO TO 154
2580 152   DO 153 I=1,J14
2590C **NEW FREQUENCY FACTORS**
2600       READ(30,149) ISP,FF(ISP)
2610       WRITE(20,235) (NAME(ISP,K),K=1,7),FF(ISP)
2620 235   FORMAT("THE FREQUENCY OF CONSUMING ",7A4,1X,"WAS INCREASED
2630      & BY ",F5.2,1X,"TIMES.",//)
2640 153   CONTINUE
2650C **OUTPUT DESIGN (PAGES IN OR OUT)**
2660 154   READ(30,155) ANS15
2670 155   FORMAT(1X,A1)
2680       IF(ANS15.EQ."Y") GO TO 156
2690       GO TO 158
2700 156   READ(30,155) ANS16
2710       IF(ANS16.EQ."Y") ISPE=0
2720 157   READ(30,155) ANS17
2730       IF(ANS17.EQ."Y") IMIXE=0
2740 158   READ(30,155) ANS18
2750       IF(ANS18.EQ."Y") GO TO 159
2760       IRISKE=0
2770       GO TO 161
2780C **RISK VALUE FOR CONSUMER LISTING**
2790 159   READ(30,160) RISK
2800 160   FORMAT(1X,F6.3)
2810 161   READ(30,103) ANS19,J19
2820       IF(ANS19.EQ."Y") GO TO 162
2830       GO TO 165
2840 162   NGR=J19+2
2850       DO 164 I=3,NGR
2860C **ADDITIONAL GROUP VARIABLE SPECIFICATIONS**
2870       READ(30,163) (GR(I,N),N=1,7)
2880 163   FORMAT(1X,3I1,I2,I3,2I1)
2890 164   CONTINUE
2900 165   IF(ISPE.NE.1) GO TO 307
2910C ****** SPECIES OUTPUT HEADERS ****************************
2920       WRITE(20,301) NCT(NCONT)
2930 301   FORMAT("$",50X,"SPECIES DATA ON",2X,A10,//)
2940       WRITE(20,302) TITLE
2950 302   FORMAT(30X,72A1,//)
2960       WRITE(20,303)
2970 303   FORMAT(45X,"#",4X,"# PER",4X,"ACTION LEVEL",11X,"REJECTED",16X
2980      &,"CONTAMINANT",7X,"LOCATION")
2990       WRITE(20,304)
3000 304   FORMAT(44X,"ON",3X,"WT&/OR",10X,"#",6X,"%")
3010       WRITE(20,305)
3020 305   FORMAT(5X,"NAME",34X,"FILE",4X,"LOC",2X,"VALUE",2X,"ABOVE",2X,
3030      &"ABOVE",2X,"EL",4X,"#",5X,"%",5X,"TOTAL",4X,"RANGE",4X,"MEAN/SD",
3040      &3X,"NAME",2X,"%")
3050C ****** READS AVE WEIGHT FILE (AVEWT) **************
3060 307   DO 321 I=1,90
3070       IF(NCONT.EQ.1) READ(8,311)ISP,IWA(I)
3080       IF(NCONT.EQ.2) READ(8,312)ISP,IWA(I)
3090       IF(NCONT.EQ.3) READ(8,313) ISP,IWA(I)
3100 311   FORMAT(I2,I6)
3110 312   FORMAT(I2,6X,I6)
3120 313   FORMAT(I2,12X,I6)
3130       IF(ISP.EQ.I) GO TO 321
```

```
3140       WRITE(20,320)
3150 320   FORMAT(2X,"THERE IS AN ERROR READING AVEWT FILE")
3160 321   CONTINUE
3170       ITP=50+NCONT
3180C ****** READS SPECIES (CONTAMINANT) FILE ************
3190C ****** ORDER READ = SPECIES#, LOCATION OF CATCH, MONTH
3200C OF CATCH, WEIGHT OF FISH, AND CONTAMINANT LEVEL (PPM).
3210C ***************************************************
3220       READ(ITP,400) ISP,LOC(ISP,1),MOEL(ISP,1),PARAM(ISP,9)
3230      &,PARAM(ISP,10)
3240 400   FORMAT(I2,A1,I2,F6.0,F6.3)
3250       IEND=0
3260 401   IF(IEND.EQ.1) GO TO 427
3270       I=ISP
3280       XIN=PARAM(I,3)/100.
3290       DO 450 IMM=1,7
3300       DO 450 INN=1,2
3310       MIN(IMM,INN)=99.
3320       MAX(IMM,INN)=0.
3330 450   CONTINUE
3340       DO 100 IN=1,11
3350       DO 100 JN=1,7
3360       CALC(IN,JN,1)=0.0
3370       CALC(IN,JN,2)=0.0
3380  100  CONTINUE
3390       ER=0
3400       ERR=0
3410C **ESTABLISHES # OF LOCATIONS AND WHETHER OR NOT DIVIDED BY
3420C   WEIGHT**
3430       ILOC=1
3440       IWT=1
3450       IF(PARAM(I,6).NE.0.) IWT=2
3460       IF(LOC(I,2).NE."Z") GO TO 403
3470       PLOC(I,1)=100.
3480       GO TO 405
3490 403   DO 404 IL=2,8
3500       IF(LOC(I,IL).NE."Z") ILOC=IL-1
3510 404   CONTINUE
3520 405   CALL LOCA(LIN,I,LOC)
3530       PLX=0.
3540       DO 406 ILL=1,7
3550 406   PLX=PLX+PLOC(I,ILL)
3560       IF(PLX.LT.99.999.OR.PLX.GT.100.001) ER=1
3570 407   IF(MOEL(I,2).EQ.99) GO TO 408
3580       CALL MONTH(I,ISPE,NAME,MOEL)
3590 408   PARAM(I,1)=PARAM(I,1)+1
3600       IF(LOC(I,2).NE."Z") GO TO 409
3610       LI=1
3620       GO TO 411
3630 409   LI=0
3640C **ASSIGNS LOCATION INDEX (FROM 1 TO 7)**
3650       DO 410 IL=1,7
3660 410   IF(LOC(I,1).EQ.LOC(I,IL+1)) LI=IL
3670       IF(LI.EQ.0) GO TO 416
3680C **ASSIGNS WEIGHT INDEX (1= UNDER WT AND 2= OVER WT)**
3690 411   IF(IWT.EQ.1) GO TO 412
3700       IWET=PARAM(I,9)
3710       IF(IWET.EQ.IWA(I)) GO TO 416
3720       IF(PARAM(I,9).LE.PARAM(I,6)) IW=1
3730       IF(PARAM(I,9).GT.PARAM(I,6)) IW=2
3740       GO TO 413
3750 412   IW=1
3760       PARAM(I,7)=100.
```

```
3770 413   MO=0
3780       DO 414 IM=2,7
3790 414   IF(MOEL(I,1).EQ.MOEL(I,IM)) MO=1
3800       IF(MO.EQ.1) GO TO 416
3810       CALC(1,LI,IW)=CALC(1,LI,IW)+1
3820       IF(PARAM(I,10).LE.PARAM(I,2)) GO TO 415
3830       CALC(2,LI,IW)=CALC(2,LI,IW)+1
3840C **RANDOMLY REJECTS FISH OVER ACTION LEVEL**
3850       IF(UNIFM2(NG,0.5,1.0).GE.XIN) GO TO 415
3860       CALC(4,LI,IW)=CALC(4,LI,IW)+1
3870       GO TO 416
3880 415   CALC(6,LI,IW)=CALC(6,LI,IW)+PARAM(I,9)*PARAM(I,10)
3890       CALC(7,LI,IW)=CALC(7,LI,IW)+PARAM(I,9)*PARAM(I,10)**2
3900       CALC(8,LI,IW)=CALC(8,LI,IW)+PARAM(I,9)
3910C **DETERMINES CONTAMINANT RANGE**
3920       IF(PARAM(I,10).LE.MIN(LI,IW)) MIN(LI,IW)=PARAM(I,10)
3930       IF(PARAM(I,10).GE.MAX(LI,IW)) MAX(LI,IW)=PARAM(I,10)
3940       CALC(11,LI,IW)=CALC(11,LI,IW)+1
3950 416   READ(ITP,400,END=426) ISP,LOC(ISP,1),MOEL(ISP,1)
3960      &,PARAM(ISP,9),PARAM(ISP,10)
3970       IF(ISP.EQ.I) GO TO 408
3980 417   DO 418 ILL=1,ILOC
3990       DO 418 IWW=1,IWT
4000C **CHECKS FOR ERRORS**
4010       IF(CALC(11,ILL,IWW).EQ.0..AND.PLOC(I,ILL).GT..0001) ER=1
4020 418   CONTINUE
4030       IF(IWT.NE.2) GO TO 419
4040       IF(PARAM(I,7).LT.-.0001.OR.PARAM(I,7).GT.100.0001) ER=1
4050       PARAM(I,8)=100.-PARAM(I,7)
4060 419   IF(ER.EQ.0) GO TO 422
4070       IF(ISPE.NE.1) GO TO 421
4080       WRITE(20,420) (NAME(I,K),K=1,7)
4090 420   FORMAT(1X,7A4,2X,"THERE IS AN ERROR IN COMPUTATIONS")
4100 421   ERR=1
4110       GO TO 401
4120 422   DO 424 ILL=1,ILOC
4130       DO 424 IWW=1,IWT
4140C **CALCULATES MEAN, ST. DEV, % REJECTED, AND % ABOVE AL**
4150       CALC(9,ILL,IWW)=CALC(6,ILL,IWW)/CALC(8,ILL,IWW)
4160       CALC(10,ILL,IWW)=CALC(7,ILL,IWW)/CALC(8,ILL,IWW)
4170       CALC(3,ILL,IWW)=100.*(CALC(2,ILL,IWW)/CALC(1,ILL,IWW))
4180       CALC(5,ILL,IWW)=100.*(CALC(4,ILL,IWW)/CALC(1,ILL,IWW))
4190       STD(ILL,IWW)=SQRT(CALC(10,ILL,IWW)-(CALC(9,ILL,IWW)**2))
4200       IF(ISPE.NE.1) GO TO 424
4210       IF(IWT.EQ.2) GO TO 449
4220C ****** SPECIES OUTPUT ****************************************
4230       WRITE(20,423) (NAME(I,K),K=1,7),PARAM(I,1),CALC(1,ILL,IWW),
4240      &PARAM(I,2),CALC(2,ILL,IWW),CALC(3,ILL,IWW),PARAM(I,3)
4250      &,CALC(4,ILL,IWW),CALC(5,ILL,IWW),CALC(11,ILL,IWW),
4260      &MIN(ILL,IWW),MAX(ILL,IWW),CALC(9,ILL,IWW),STD(ILL,IWW)
4270      &,LIN(I,ILL),PLOC(I,ILL)
4280 423   FORMAT(7A4,13X,F6.0,1X,F6.0,1X,F5.2,1X,F6.0,1X,F6.2,2X,F4.0,
4290      &1X,F4.0,1X,F6.2,1X,F6.0,1X,F4.2,1X,F5.2,1X,F4.2,"/",F5.2,1X,
4300      &A3,1X,F6.2)
4310       GO TO 424
4320 449   IF(IWW.NE.1) GO TO 460
4330       WRITE(20,455) ABNAME(I),PARAM(I,6),PARAM(I,7),PARAM(I,1),
4340      &CALC(1,ILL,IWW),PARAM(I,2),CALC(2,ILL,IWW),CALC(3,ILL,IWW)
4350      &,PARAM(I,3),CALC(4,ILL,IWW),CALC(5,ILL,IWW),CALC(11,ILL,IWW),
4360      &MIN(ILL,IWW),MAX(ILL,IWW),CALC(9,ILL,IWW),STD(ILL,IWW),
4370      &LIN(I,ILL),PLOC(I,ILL)
4380 455   FORMAT(A5,1X,"BELOW ",F6.0," GRAMS AT ",F6.2," %",5X,F6.0,1X,
4390      &F6.0,1X,F5.2,1X,F6.0,1X,F6.2,2X,F4.0,1X,F4.0,1X,F6.2,1X,F6.0,1X,
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4400      &F4.2,1X,F5.2,1X,F4.2,"/",F5.2,1X,A3,1X,F6.2)
4410       GO TO 424
4420  460  WRITE(20,465) ABNAME(I),PARAM(I,6),PARAM(I,8),PARAM(I,1),
4430      &CALC(1,ILL,IWW),PARAM(I,2),CALC(2,ILL,IWW),CALC(3,ILL,IWW),
4440      &PARAM(I,3),CALC(4,ILL,IWW),CALC(5,ILL,IWW),CALC(11,ILL,IWW),
4450      &MIN(ILL,IWW),MAX(ILL,IWW),CALC(9,ILL,IWW),STD(ILL,IWW),
4460      &LIN(I,ILL),PLOC(I,ILL)
4470  465  FORMAT(A5,1X,"ABOVE ",F6.0," GRAMS AT ",F6.2," %",5X,F6.0,
4480      &1X,F6.0,1X,F5.2,1X,F6.0,1X,F6.2,2X,F4.0,1X,F4.0,1X,F6.2,1X,
4490      &F6.0,1X,F4.2,1X,F5.2,1X,F4.2,"/",F5.2,1X,A3,1X,F6.2)
4500  424  CONTINUE
4510       DO 425 IMM=1,ILOC
4520       PARAM(I,4)=PARAM(I,4)+(CALC(9,IMM,1)*PARAM(I,7)/100.+CALC(9,IMM,2)
4530      &*PARAM(I,8)/100.)*PLOC(I,IMM)/100.
4540  425  PARAM(I,5)=PARAM(I,5)+(CALC(10,IMM,1)*PARAM(I,7)/100.
4550      &+CALC(10,IMM,2)*PARAM(I,8)/100.)*PLOC(I,IMM)/100.
4560       GO TO 401
4570  426  IEND=1
4580       GO TO 417
4590  427  IF(IMIXE.NE.1) GO TO 510
4600       WRITE(20,500)
4610   500 FORMAT("$",40X,"THIS SECTION LISTS THE SUBSTITUTIONS MADE BY
4620      &SPECIES.",//)
4630   510 DO 530 I=1,99
4640       IF(PARAM(I,11).EQ.0.) GO TO 530
4650       IF(IMIXE.NE.1) GO TO 521
4660C ****** OUTPUT FOR NEW MEAN AND STANDARD DEVIATION ********
4670       WRITE(20,520) (NAME(I,K),K=1,7),PARAM(I,11),PARAM(I,12)
4680   520 FORMAT(1X,7A4,10X,"A MEAN OF",2X,F6.3,2X,"AND A STANDARD DEVIATION
4690      & OF",2X,F6.3,2X,"HAS BEEN SUBSTITUTED FOR THIS SPECIES",//)
4700   521 PARAM(I,4)=PARAM(I,11)
4710       PARAM(I,5)=PARAM(I,12)**2+PARAM(I,4)**2
4720   530 CONTINUE
4730       IF(IMIXE.NE.1) GO TO 541
4740       WRITE(20,540)
4750   540 FORMAT(1X,"THE FOLLOWING OUTPUT ILLUSTRATES HOW A SPECIE WAS
4760      &SUBSTITUTED FOR.")
4770C ****** CHECKS SUBSTITUTIONS AND PRINTS SUBSTITUTION OUTPUT*********
4780   541 DO 550 I=1,99
4790       DO 550 J=1,99
4800   550 XMIX(I)=XMIX(I)+MIX(I,J)
4810       DO 610 I=1,99
4820       IF(XMIX(I).LT..0001) GO TO 610
4830       IF(IMIXE.NE.1) GO TO 591
4840       WRITE(20,560) (NAME(I,K),K=1,7)
4850   560 FORMAT(1X,//,10X,7A4)
4860       WRITE(20,570)
4870   570 FORMAT(10X,"_____________________________________")
4880       DO 590 J=1,99
4890       IF(MIX(I,J).LT..0001) GO TO 590
4900       WRITE(20,580) MIX(I,J),(NAME(J,K),K=1,7)
4910   580 FORMAT(1X,F6.2,1X,"%",2X,7A4)
4920   590 CONTINUE
4930   591 IF(XMIX(I).GT.99.999.AND.XMIX(I).LT.100.001) GO TO 610
4940       WRITE(20,600)
4950   600 FORMAT(11X,"* * * THESE DO NOT SUM TO 100%")
4960       ERR=1
4970   610 CONTINUE
4980       IF(ERR.EQ.1) PRINT,"THERE HAS BEEN AN ERROR"
4990       DO 620 I=1,99
5000       IF(XMIX(I).LT..0001) GO TO 620
5010       PARAM(I,4)=0.
5020       PARAM(I,5)=0.
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      620 CONTINUE
          DO 621 I=1,99
          DO 621 J=1,99
          PARAM(I,4)=PARAM(I,4)+MIX(I,J)*PARAM(J,4)/100.
          PARAM(I,5)=PARAM(I,5)+MIX(I,J)*PARAM(J,5)/100.
      621 CONTINUE
          DO 630 I=1,99
          PARAM(I,5)=PARAM(I,5)-PARAM(I,4)**2
      630 CONTINUE
          IF(IRISKE.NE.1) GO TO 799
C****** CONSUMER RISK OUTPUT HEADERS **********************
          WRITE(20,650) TITLE
      650 FORMAT("$",30X,72A1)
          WRITE(20,651) RISK
      651 FORMAT(1X,//,1X,"THIS PAGE OF OUTPUT LISTS THOSE CONSUMERS
     & AT A RISK OF",F6.3,///)
          WRITE(20,652)
      652 FORMAT(66X,"AGE NOT" 21X,"ADI")
          WRITE(20,653)
      653 FORMAT(24X,"SEX INCLUDED",4X,"AGE ABOVE",4X,"AGE BELOW",4X,
     &"RECORDED",4X,"NONEATERS",4X,"(MCG/70KG)",4X,"RISK",//)
          WRITE(20,654) ADI,RISK
      654 FORMAT(25X,"M,F,NOT REC",8X,"0",11X,"100",10X,"IN",
     &11X,"IN",10X,F5.2,6X,F6.3,///)
          WRITE(20,655)
      655 FORMAT(27X,"DAILY INTAKE (MCG)",15X,"GRAMS",3X,"SERVINGS",
     &12X,"GRAMS",3X,"SERVINGS",12X,"GRAMS",3X,"SERVINGS")
          WRITE(20,656)
      656 FORMAT(41X,"UPPER",7X,"FISH",4X,"PER",6X,"PER",
     &8X,"FISH",4X,"PER",6X,"PER",8X,"FISH",4X,"PER",6X,"PER")
          WRITE(20,657)
      657 FORMAT(3X,"ID",5X,"ST",2X,"SEX",2X,"AGE",4X,"AVE",3X,"ALLOWED",2X,
     &"LIMIT",6X,"EATEN",2X,"SERVING",3X,"MONTH",6X,"EATEN",2X,"SERVING",
     &3X,"MONTH",6X,"EATEN",2X,"SERVING",3X,"MONTH",//)
C****** READS CONSUMER FILE ***************************************
C****** ORDER READS = ID#, STATE, SEX, AGE, AND 12 MEALS HAVING
C****** SP #, QUANTITY EATEN PER MEAL, AND FREQUENCY EATEN PER MONTH.**
C*****************************************************************
      799 READ(11,800,END=845) ID,ST,SX,AGE,(SP(I),Q(I),FR(I),I=1,12)
      800 FORMAT(A7,A2,A1,I2,12(I2,I5,F3.1))
          IMA=0
          IFE=0
          INR=0
          ISX=0
          NEAT=0
          MN=0.
          SD=0.
          NML=0
          STATUS="IN"
          DO 810 I=1,12
      810 IF(SP(I).NE.0) NML=I
C**ASSIGNS NONEATER STATUS**
          IF(NML.EQ.0) NEAT=1
C**KEEPS OR ELIMINATES CONSUMER DUE TO HIS STATE AND/OR SPECIES EATEN**
          IF(STOUT(1).EQ.STIN(1)) GO TO 8
          DO 825 IS=1,25
          IF(STOUT(IS).EQ."ZZ") GO TO 825
          IF(ST.EQ.STOUT(IS)) STATUS = "OUT"
      825 CONTINUE
          IF(STATUS.EQ."OUT") GO TO 799
          IF(STIN(1).EQ."ZZ") GO TO 8
          STATUS="OUT"
          DO 822 IS=1,25
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5660        IF(STIN(IS).EQ."ZZ") GO TO 822
5670        IF(ST.EQ.STIN(IS)) STATUS = "IN"
5680 822    CONTINUE
5690        IF(STATUS.EQ."OUT") GO TO 799
5700  8     IF(SPOUT(1).EQ.SPIN(1)) GO TO 7
5710        IF(SPOUT(1).EQ.0) GO TO 823
5720        STATUS="IN"
5730        DO 824 JSP=1,NML
5740        DO 824 ISP=1,99
5750        IF(SPOUT(ISP).EQ.0) GO TO 824
5760        IF(SP(JSP).EQ.SPOUT(ISP)) STATUS="OUT"
5770 824    CONTINUE
5780        IF(STATUS.EQ."OUT") GO TO 799
5790 823    IF(SPIN(1).EQ.0) GO TO 7
5800        STATUS="OUT"
5810        DO 801 JSP=1,NML
5820        DO 801 ISP=1,99          !
5830        IF(SPIN(ISP).EQ.0) GO TO 801
5840        IF(SP(JSP).EQ.SPIN(ISP)) STATUS="IN"
5850 801    CONTINUE
5860        IF(STATUS.EQ."OUT") GO TO 799
5870C **CALCULATES CONSUMER CONTAMINANT MEAN AND STD DEVIATION**
5880 7      DO 820 I=1,NML
5890        Q(I)=Q(I)*QF(SP(I))+.5
5900        FR(I)=FR(I)*FF(SP(I))
5910        MN=MN+12.*FR(I)*Q(I)*PARAM(SP(I),4)/365.
5920        SD=SD+12.*FR(I)*Q(I)**2*PARAM(SP(I),5)/365.**2
5930 820    CONTINUE
5940        SD=SQRT(SD)
5950C **ASSIGNS SEX INDICES FOR GROUP AND WEIGHT ASSIGNMENTS**
5960        IF(SX.EQ."M") GO TO 826
5970        IF(SX.EQ."F") GO TO 827
5980        IF(SX.EQ." ") GO TO 828
5990 826    IMA=1
6000        ISX=1
6010        GO TO 829
6020 827    IFE=1
6030        ISX=2
6040        GO TO 829
6050 828    INR=1
6060        ISX=3
6070C **ASSIGNS AGE INDICES FOR WEIGHT ASSIGNMENT**
6080 829    JAGE=5
6090        IF(AGE.EQ.0) JAGE=1
6100        IF(AGE.GE.1.AND.AGE.LE.5) JAGE=2
6110        IF(AGE.GE.6.AND.AGE.LE.11) JAGE=3
6120        IF(AGE.GE.12.AND.AGE.LE.17) JAGE=4
6130        IF(AGE.GE.18.AND.AGE.LE.54) JAGE=5
6140        IF(AGE.GE.55.AND.AGE.LE.74) JAGE=6
6150        IF(AGE.GE.75.AND.AGE.LE.98) JAGE=7
6160        IF(AGE.EQ.99) JAGE=5
6170C **CALCULATES PERSONAL ALLOWED DAILY INTAKE**
6180        ADIF=ADI*ADIWT(JAGE,ISX)/70.
6190        DO 830 IG=1,NGR
6200C **ACCEPTS OR ELIMINATES CONSUMER FROM OUTPUT GROUP ACCORDING
6210C    TO SEX, AGE, AND NONEATER STATUS**
6220        IF((IMA.EQ.1.AND.GR(IG,1).EQ.1).OR.(IFE.EQ.1.AND.GR(IG,2).EQ.
6230       &1).OR.(INR.EQ.1.AND.GR(IG,3).EQ.1)) GO TO 835
6240        GO TO 830
6250 835    IF(AGE.EQ.99.AND.GR(IG,6).NE.1) GO TO 830
6260        IF(AGE.NE.99.AND.AGE.LT.GR(IG,4).OR.AGE.GT.GR(IG,5))
6270       &GO TO 830
6280        IF(GR(IG,7).NE.1.AND.NEAT.EQ.1) GO TO 830
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      GR(IG,8)=GR(IG,8)+1
C **CALCULATES UPPER LIMIT OF APPROPRIATE CONFIDENCE INTERVAL**
      DO 840 IRK=1,6
      ULEV=MN+LEV(IRK)*SD
      IF(ULEV.GE.ADIP) RSK(IG,IRK)=RSK(IG,IRK)+1
      IF(ULEV.LT.ADIP.OR.RISK.NE.RSLV(IRK).OR.IG.NE.1) GO TO 840
      IF(IRISKE.NE.1) GO TO 840
      IF(AGE.NE.99) GO TO 839
C ****** OUTPUT OF THOSE WHO ARE AT RISK ************************
      WRITE(20,841) ID,ST,SX,MN,ADIP,ULEV,(ABNAME(SP(K)),Q(K)
     &,FR(K),K=1,NML)
841   FORMAT(1X,A7,2X,A2,3X,A1,8X,F6.2,2X,F6.2,2X,F6.2,5X,
     &3(A5,3X,I5,5X,F4.1,6X),/,51X,3(A5,3X,I5,5X,F4.1,6X),/,51X,
     &3(A5,3X,I5,5X,F4.1,6X),/,51X,3(A5,3X,I5,5X,F4.1,6X))
      GO TO 840
839   WRITE(20,842) ID,ST,SX,AGE,MN,ADIP,ULEV,(ABNAME(SP(K)),Q(K),FR(K),
     &K=1,NML)
842   FORMAT(1X,A7,2X,A2,3X,A1,3X,I3,2X,F6.2,2X,F6.2,2X,F6.2,5X,3(A5,
     &3X,I5,5X,F4.1,6X),/,51X,3(A5,3X,I5,5X,F4.1,6X),/,51X,3(A5,3X,I5,
     &5X,F4.1,6X),/,51X,3(A5,3X,I5,5X,F4.1,6X))
840   CONTINUE
830   CONTINUE
      GO TO 799
845   WRITE(20,650) TITLE
      WRITE(20,855)
855   FORMAT(60X,"GROUP  RISK",/,60X,"*****  ****",///)
      DO 900 IG=1,NGR
      DO 890 IRK=1,6
      S1=" "
      S2=" "
      S3="  "
      S4="OUT"
      S5="OUT"
      IF(GR(IG,1).EQ.1)S1="M"
      IF(GR(IG,2).EQ.1)S2="F"
      IF(GR(IG,3).EQ.1)S3="NR"
      IF(GR(IG,6).EQ.1)S4="IN"
      IF(GR(IG,7).EQ.1)S5="IN"
C **CALCULATES % POPULATION PER GROUP AT RISK AND NOT AT RISK**
      NNR(IRK)=GR(IG,8)-RSK(IG,IRK)
      XNNR(IRK)=NNR(IRK)
      TOTAL(IRK)=GR(IG,8)
      PNR(IRK)=(XNNR(IRK)/TOTAL(IRK))*100.
      PAR(IRK)=100.-PNR(IRK)
890   CONTINUE
C ****** GROUP RISK OUTPUT ***************************************
      WRITE(20,856)
856   FORMAT(20X,"SEX INCLUDED",4X,"LOWEST AGE",4X,"HIGHEST AGE",4X,
     &"AGE NOT REC",2X "NONEATERS",2X,"ADI (MCG/70KG)",4X,"TOTAL NO.",/)
      WRITE(20,857) S1,S2,S3,GR(IG,4),GR(IG,5),S4,S5,ADI,GR(IG,8)
857   FORMAT(23X,A1,1X,A1,1X,A2,11X,I3,11X,I3,12X,A3,9X,A3,8X
     &,F5.2,10X,I6,//)
      WRITE(20,858)
858   FORMAT(30X,"CONFIDENCE  (BELOW ADI)",35X,"RISK  (ABOVE ADI)")
      WRITE(20,859)
859   FORMAT(25X,"_____________________________________________",13X,
     &"_____________________________________________",/)
      WRITE(20,860)
860   FORMAT(27X,"50%",4X,"70%",4X,"90%",4X,"95%",4X,"99%",3X,"99.9%",
     &17X,"50%",4X,"30%",4X,"10%",4X," 5%",4X," 1%",4X ".1%",/)
      WRITE(20,861) (PNR(I),I=1,6),(PAR(J),J=1,6)
861   FORMAT(2X,"% POPULATION",10X,6(1X,F6.2),14X,6(1X,F6.2),///////)
900   CONTINUE
```

```
      STOP
      END
      SUBROUTINE MONTH(IO,ISPE,NAME,MO)
C****** ASSIGNS MONTH NAMES ******
      DIMENSION NAME(99,7),MO(99,7),MON(6)
      CHARACTER *3 MON
      DO 100 I=2,7
      MON(I-1)="   "
      IF(MO(IO,I).EQ.1)MON(I-1)="JAN"
      IF(MO(IO,I).EQ.2)MON(I-1)="FEB"
      IF(MO(IO,I).EQ.3)MON(I-1)="MAR"
      IF(MO(IO,I).EQ.4)MON(I-1)="APR"
      IF(MO(IO,I).EQ.5)MON(I-1)="MAY"
      IF(MO(IO,I).EQ.6)MON(I-1)="JUN"
      IF(MO(IO,I).EQ.7)MON(I-1)="JUL"
      IF(MO(IO,I).EQ.8)MON(I-1)="AUG"
      IF(MO(IO,I).EQ.9)MON(I-1)="SEP"
      IF(MO(IO,I).EQ.10)MON(I-1)="OCT"
      IF(MO(IO,I).EQ.11)MON(I-1)="NOV"
      IF(MO(IO,I).EQ.12)MON(I-1)="DEC"
100   CONTINUE
      IF(ISPE.NE.1) GO TO 1
      WRITE(20,101) (NAME(IO,K),K=1,7),MON
101   FORMAT(1X,7A4,2X,"MONTHS ELIMINATED",2X,6(2X,1A3))
1     RETURN
      END
      SUBROUTINE LOCA(LIN,IO,L)
C****** ASSIGNS LOCATION NAMES ******
      DIMENSION LIN(99,7),L(99,8)
      CHARACTER *1 L
      CHARACTER *3 LIN
      DO 100 I=2,8
      LIN(IO,I-1)="   "
      IF(L(IO,I).EQ."A")LIN(IO,I-1)="ATL"
      IF(L(IO,I).EQ."C")LIN(IO,I-1)="CAL"
      IF(L(IO,I).EQ."F")LIN(IO,I-1)="FRE"
      IF(L(IO,I).EQ."G")LIN(IO,I-1)="GUL"
      IF(L(IO,I).EQ."H")LIN(IO,I-1)="HAW"
      IF(L(IO,I).EQ."K")LIN(IO,I-1)="ALA"
      IF(L(IO,I).EQ."N")LIN(IO,I-1)="NAT"
      IF(L(IO,I).EQ."P")LIN(IO,I-1)="PAC"
      IF(L(IO,I).EQ."S")LIN(IO,I-1)="SAT"
      IF(L(IO,I).EQ."W")LIN(IO,I-1)="PNW"
100    CONTINUE
      RETURN
      END
      SUBROUTINE MIXES(MIX)
C****** ASSIGNS DEFAULT SUBSTITUTIONS ******
      DIMENSION MIX(99,99)
      REAL MIX
      MIX(93,4)=29.
      MIX(93,5)=71.
      MIX(96,32)=85.
      MIX(96,33)=15.
      MIX(97,35)=22.07
      MIX(97,37)=10.93
      MIX(97,69)=18.62
      MIX(97,70)=31.98
      MIX(97,71)=16.4
      MIX(98,53)=70.
      MIX(98,54)=30.
      MIX(99,63)=47.44
      MIX(99,64)=52.56
```

```
7550       MIX(1,63)=7.55
7560       MIX(1,64)=8.36
7570       MIX(1,65)=4.49
7580       MIX(1,4)=7.95
7590       MIX(1,15)=7.95
7600       MIX(1,24)=7.95
7610       MIX(1,43)=7.95
7620       MIX(1,22)=13.6
7630       MIX(1,47)=11.4
7640       MIX(1,51)=4.5
7650       MIX(1,39)=2.3
7660       MIX(1,30)=2.3
7670       MIX(1,14)=2.3
7680       MIX(68,51)=63.
7690       MIX(68,14)=12.
7700       MIX(68,32)=7.65
7710       MIX(68,33)=1.35
7720       MIX(68,39)=7.8
7730       MIX(68,17)=5.8
7740       MIX(68,34)=1.6
7750       MIX(68,16)=.6
7760       MIX(68,2)=.2
7770       RETURN
7780       END
7790       SUBROUTINE MERCURY(MIX,P,ADI)
7800C ****** ASSIGNS SUBSTITUTIONS AND OTHER VALUES IF MERCURY IS USED ******
7810       DIMENSION MIX(99,99),P(99,12)
7820       REAL MIX
7830       CALL MIXES(MIX)
7840       MIX(9,11)=100.
7850       MIX(73,8)=84.
7860       MIX(73,72)=16.
7870       MIX(1,40)=11.4
7880       MIX(59,76)=100.
7890       MIX(95,26)=42.90
7900       MIX(95,27)=31.27
7910       MIX(95,28)=25.50
7920       MIX(95,29)=.33
7930       P(26,6)=45360.
7940       P(26,7)=99.89
7950       P(27,6)=45360.
7960       P(27,7)=96.12
7970       P(28,6)=45360.
7980       P(28,7)=96.23
7990       P(29,6)=27216.
8000       P(29,7)=89.04
8010       DO 100 I=1,99
8020       P(I,2)=5.0
8030 100   CONTINUE
8040       ADI=30.
8050       RETURN
8060       END
8070       SUBROUTINE CADMIUM(MIX,P,ADI)
8080C ****** ASSIGNS SUBSTITUTIONS AND OTHER VALUES IF CADMIUM IS USED ******
8090       DIMENSION MIX(99,99),P(99,12)
8100       REAL MIX
8110       CALL MIXES(MIX)
8120       ADI=72.
8130       MIX(1,61)=11.4
8140       MIX(7,61)=100.
8150       MIX(9,61)=100.
8160       MIX(11,61)=100.
8170       MIX(18,61)=100.
```

```
8180       MIX(40,61)=100.
8190       MIX(42,61)=100.
8200       MIX(58,61)=100.
8210       MIX(59,50)=100.
8220       MIX(66,61)=100.
8230       MIX(95,27)=21.28
8240       MIX(95,28)=21.28
8250       MIX(95,29)=57.44
8260       DO 100 I=1,99
8270       P(I,2)=20.
8280 100   CONTINUE
8290       RETURN
8300       END
8310       SUBROUTINE ARSENIC(MIX,P,ADI)
8320C ****** ASSIGNS SUBSTITUTIONS AND OTHER VALUES IF ARSENIC IS USED ******
8330       DIMENSION MIX(99,99),P(99,12)
8340       REAL MIX
8350       CALL MIXES(MIX)
8360       ADI=500.
8370       MIX(7,61)=100.
8380       MIX(9,61)=100.
8390       MIX(11,61)=100.
8400       MIX(18,61)=100.
8410       MIX(40,61)=100.
8420       MIX(42,61)=100.
8430       MIX(58,61)=100.
8440       MIX(59,50)=100.
8450       MIX(66,61)=100.
8460       MIX(95,27)=21.28
8470       MIX(95,28)=21.28
8480       MIX(95,29)=57.44
8490       MIX(1,61)=11.4
8500       DO 100 I=1,99
8510       P(I,2)=100.
8520 100   CONTINUE
8530       RETURN
8540       END
```

FILE DESCRIPTION

Examples of the average weight, species data, and consumption data files are given below.

AVERAGE WEIGHT FILE IN GRAMS (file #8)

Example Record:	02	1091	902	905
	Species Code	Ave. Wt. for Hg	Ave. Wt. for Cd	Ave. Wt. for As

SPECIES DATA FILE (file #51 and #52)

Example Record:	D2	C	8	1092	160
	Species Code	Location	Month	Weight (F6.0)	Contaminant Level (F6.3)

CONSUMPTION DATA FILE (file #11)

Example Record:	100961	PA	F	54	22	119	2099	31	4024	88	10
	Personal ID	State	Sex	Age	A		B			C	
					meals						

MEAL A:	22	119	20
	Species Code	Quantity (I5)	Frequency (F3.1)

ADDING NEW DATA

Adding a New Contaminant File

Whenever a new contaminant is added to the consumer-risk simulation model the following is suggested:

1. The representative probability distribution function (PDF) should be determined to be unique and lognormal or normal for each species and/or subspecies. If the PDF is not lognormal or normal a subroutine should be written to calculate the consumer's average daily intake using the new PDF.
2. If the new contaminant does not behave similarly to Mercury and Cadmium concerning its potential effects on human health, a new modelling design should be considered.
3. The true market situation should be modelled as realistically as possible. This can be done by writing a new contaminant's subroutine using weight, location, months, and substitution assignments. Also, one should include the accepted action level and ADI in this subroutine.
4. Assign the appropriate mixture of species consumed according to what consumers eat. Perhaps, some consumers will report eating a species that is not represented in the new contaminant data file. If this is the case, select a similar species for which there are data and substitute it for the species without data.

Adding New Consumption Data

A comprehensive new consumption survey would contain new information that could be utilized by the consumer risk model. Additionally, two pieces of information that should be included in a new survey are the weight of each participant and the portion of each seafood consumed. Complete and accurate information in a new survey would eliminate the "Not Recorded" sex and age categories.

APPENDIX A

SPECIES CODES

Species Number	Species Name	Abbreviated Name
1	Not Reported	NOTRP
2	Abalone	ABALO
3	Anchovies	ANCHO
4	Bass, Sea	SEABS
5	Bass, Striped	STRBS
6	Bluefish	BLUEF
7	Bluegills	BLUEG
8	Bonito (Below 3197 grams)	BONBE
9	Buffalofish	BUFFA
10	Butterfish	BUTTE
11	Carp	CARP
12	Catfish (Freshwater)	CATFF
13	Catfish (Marine)	CATFM
14	Clams	CLAMS
15	Cod	COD
16	Crab, King	CRABK
17	Crab, other than King	CRABO
18	Crappie	CRAPP
19	Croaker	CROAK
20	Dolphin	DOLPH
21	Drums	DRUMS
22	Flounders	FLOUN

APPENDIX A. CONTINUED.

Species Number	Species Name	Abbreviated Name
23	Groupers	GROUP
24	Haddock	HADDO
25	Hake	HAKE
26	Halibut 4	HALI4
27	Halibut 3	HALI3
28	Halibut 2N	HAL2N
29	Halibut 2S	HAL2S
30	Herring	HERRI
31	Kingfish	KINGF
32	Lobster, Northern (Inshore)	LOBNI
33	Lobster, Northern (Offshore)	LOBNO
34	Lobster, Spiny	LOBSP
35	Mackerel, Atlantic	MACKA
36	Mackerel, Jack	MACKJ
37	Mackerel, King (gulf)	MACKK
38	Mullet	MULLE
39	Oysters	OYSTE
40	Perch (Freshwater)	PERCF
41	Perch (Marine)	PERCM
42	Pike	PIKE
43	Pollock	POLLO
44	Pompano	POMPA
45	Rockfish	ROCKF
46	Sablefish	SABLE

APPENDIX A. CONTINUED.

Species Number	Species Name	Abbreviated Name
47	Salmon	SALMO
48	Scallops	SCALL
49	Scup	SCUP
50	Sharks	SHARK
51	Shrimp	SHRIM
52	Smelt	SMELT
53	Snapper, Red	SNAPR
54	Snapper, Other	SNAPO
55	Snook	SNOOK
56	Spot	SPOT
57	Squid and Octopi	SQOCT
58	Sunfish	SUNFI
59	Swordfish	SWORD
60	Tilefish	TILEF
61	Trout (Freshwater)	TROUF
62	Trout (Marine)	TROUM
63	Tuna, Light Skipjack	TUNLS
64	Tuna, Light Yellowfin	TUNLY
65	Tuna, White	TUNAW
66	Whitefish	WHITE
67	Other Finfish	FINFO
68	Other Shellfish	SHELO
69	Mackerel, King (Other)	MACKO
70	Mackerel, Spanish (Gulf)	MACSG

APPENDIX A. CONTINUED.

Species Number	Species Name	Abbreviated Name
71	Mackerel, Spanish (Other)	MACSO
72	Bonito (Above 3197 grams)	BONIA
73	Bonito, All	BONIT
74	Swordfish 1971	SWO71
75	Swordfish 1975	SWO75
76	Swordfish All	SWOAL
77	New Data	DATA
78	New Data	DATA
79	New Data	DATA
80	New Data	DATA
81	Moments 1	MOMEN
82	Moments 2	MOMEN
83	Moments	MOMEN
84	Moments	MOMEN
85	Moments	MOMEN
86	Moments	MOMEN
87	Moments	MOMEN
88	Moments	MOMEN
89	Moments	MOMEN
90	Moments	MOMEN
91	Name	NAME
92	Name	NAME
93	Bass	BASS
94	Name	NAME

APPENDIX A. CONTINUED.

Species Number	Species Name	Abbreviated Name
95	Halibut	HALIB
96	Lobster, Northern	LOBSN
97	Mackerel, Other than Jack	MACJO
98	Snapper	SNAPP
99	Tuna, Light	TUNAL

APPENDIX B.

LOCATION CODES

Location of Catch Site	Code
California	C
Pacific Northwest	W
Alaska	K
Hawaii	H
Pacific	P
Freshwater	F
Gulf of Mexico	G
North Atlantic	N
South Atlantic	S
Atlantic	A

APPENDIX C

STATE CODES

State	Code	State	Code
Alabama	AL	Montana	MT
Alaska	AK	Nebraska	NE
Arizona	AZ	Nevada	NV
Arkansas	AR	New Hampshire	NH
California	CA	New Jersey	NJ
Colorado	CO	New Mexico	NM
Connecticut	CT	New York	NY
Delaware	DE	North Carolina	NC
District of Columbia	DC	North Dakota	ND
Florida	FL	Ohio	OH
Georgia	GA	Oklahoma	OK
Hawaii	HW	Oregon	OR
Idaho	ID	Pennsylvania	PA
Illinois	IL	Rhode Island	RI
Indiana	IN	South Carolina	SC
Iowa	IA	South Dakota	SD
Kansas	KS	Tennessee	TN
Kentucky	KY	Texas	TX
Louisiana	LA	Utah	UT
Maine	ME	Vermont	VT
Maryland	MD	Virginia	VA
Massachusetts	MA	Washington	WA
Michigan	MI	West Virginia	WV
Minnesota	MN	Wisconsin	WI
Mississippi	MS	Wyoming	WY
Missouri	MO		

APPENDIX D

Cadmium Data Summary

Each record of the cadmium data file contains information by species name, when it was caught (month), where it was caught (location), weight of the fish, and the level of cadmium in edible flesh in ppm. However, some of the above information was not always recorded. Therefore, some minor data adjustments were made to provide as much information as possible. For instance, unweighed fish were assigned the average weight of all fish of that species on the file. Because individual smelt (Osmeridae) were not weighed, an arbitrary weight of 1 gm was assigned to all samples. Replicated contaminant measurements were represented by using their average value. Nondetectable cadmium values were replaced by random entries from a triangular distribution between zero and the nondetection limit in order to eliminate bias (Hg Report, 1978).

Each species or subspecies category in the model is represented by a unique lognormal probability distribution function for the contaminant and must, therefore, be kept separated when calculating a combined species weighted mean and standard deviation. However, consumers usually could not differentiate between two subcategories from the same species (i.e. lobster, northern inshore; and lobster, northern offshore. Therefore, a mixture of such subcategories had to be built into the model to accommodate broad market categories. Figure 10 illustrates the mixtures (or substitutions) used. These proportions or perentages were determined from the average weight and total pounds that were caught commercially during the consumption survey as indicated in Fishery Statistics of the United States, 1973 or from industry data.

Contaminant Values Used Where Species Identification was Missing

When the name of the species eaten at a meal was not reported, an average cadmium value calculated for a mix of species was used (See Hg Report, 1978 for

details, p.5). The "other shellfish" and "other finfish" species categories were similarly determined from proportionate consumption information derived from the consumption survey (Hg Report, 1978).

Table 5 summarizes the cadmium data file. When the user wishes to implement some of the available options that allow him to segregate the data he should refer to this table in order to run the model without errors. (i.e. if the user requests to look only at a species of fish from a certain location but that location was not sampled, an error will occur.)

Figure 10. List of Substitution Values Used in Cadmium Modelling.

NOT REPORTED

7.95	% BASS, SEA
2.30	% CALMS
7.95	% COD
13.60	% FLOUNDERS
7.95	% HADDOCK
2.30	% HERRING
2.30	% OYSTERS
7.95	% POLLOCK
11.40	% SALMON
4.50	% SHRIMP
11.40	% TROUT (FRESHWATER)
7.55	% TUNA, LIGHT SKIPJACK
8.36	% TUNA, LIGHT YELLOWFISH
4.49	% TUNA, WHITE

BLUEGILLS

100.00	% TROUT (FRESHWATER)

BUFFALOFISH

100.00	% TROUT (FRESHWATER)

CARP

100.00	% TROUT (FRESHWATER)

CRAPPIE

100.00	% TROUT (FRESHWATER)

PERCH (FRESHWATER)

100.00	% TROUT (FRESHWATER)

PIKE

100.00	% TROUT (FRESHWATER)

SUNFISH

100.00	% TROUT (FRESHWATER)

SWORDFISH

100.00	% SHARKS

WHITEFISH

100.00	% TROUT (FRESHWATER)

OTHER SHELLFISH

0.20	% ABALONE
12.00	% CLAMS
0.60	% CRAB, KING
5.80	% CRAB, OTHER THAN KING
7.65	% LOBSTER, NORTHERN (INSHORE)
1.35	% LOBSTER, NORTHERN (OFFSHORE)
1.60	% LOBSTER, SPINY
7.80	% OYSTERS
63.00	% SHRIMP

BASS

29.00	% BASS, SEA
71.00	% BASS, STRIPED

HALIBUT

21.28	% HALIBUT 3
21.28	% HALIBUT 2N
57.44	% HALIBUT 2S

LOBSTER, NORTHERN

85.00	% LOBSTER, NORTHERN (INSHORE)
15.00	% LOBSTER, NORTHERN (OFFSHORE)

MACKEREL, OTHER THAN JACK

22.07	% MACKEREL, ATLANTIC
10.93	% MACKEREL, KING (GULF)
18.62	% MACKEREL, KING (OTHER)
31.98	% MACKEREL, SPANISH (GULF)
16.40	% MACKEREL, SPANISH (OTHER)

SNAPPER

70.00	% SNAPPER, RED
30.00	% SNAPPER, OTHER

TUNA, LIGHT

47.44	% TUNA, LIGHT SKIPJACK
52.56	% TUNA, LIGHT YELLOWFISH

Table 5. Summary of Cadmium Data Values in Cadmium File.

Species	Number Samples	Average Weight (gm)	Contaminant Range (ppm)	Mean	Months Sampled	Locations Sampled*
Abalone	20	902	.02-3.50	1.17	Aug, Sep	C
Anchovies	80	23	.03- .57	.28	Jan, Apr, May, Aug, Nov	C,G
Bass, Sea	55	35	.00- .21	.06	Jun, Aug-Nov	N,S
Bass, Striped	117	4,491	.01- .24	.06	Apr-Jun, Sep, Oct	C,N,W
Bluefish	74	1,148	.00- .15	.05	Apr-Nov	G,N,S
Bonito	40	13,659	.01- .41	.11	Apr-Jun, Sep	C
Butterfish	91	81	.02- .19	.08	Mar-May, Aug-Nov	N
Catfish (Fresh)	35	1,480	.00- .15	.06	Mar, Jul, Sep, Oct	F,G,N
Catfish (Marine)	81	754	.01- .26	.06	May-Nov	G
Clams	586	165	.01-1.66	.24	Feb-Dec	K,N,S,W
Cod	134	1,849	.00- .21	.05	Feb-Nov	N
Crab, King	49		.01- .38	.17	Jan, Feb, May, Jun, Dec	K
Crab, Other	261	321	.01-3.00	.16	Jan, Mar-Jun, Aug-Dec	C,G,K,N,S,W
Croaker	92	332	.00- .31	.07	Mar, May, Jun, Aug-Dec	G,N,S
Dolphin	63	7,254	.00- .21	.06	Feb, May, Jul-Nov	G,H,S
Drums	139	1,787	.00- .21	.06	Jan, Apr-Dec	G,N,S
Flounders	1002	640	.00- .74	.06	Jan, Mar-Dec	C,G,N,S,W
Groupers	125	6,309	.00- .13	.05	Feb, Jun, Sep, Nov, Dec	G,S
Haddock	89	1,277	.00- .28	.05	Apr-Nov	N
Hake	365	526	.00- .63	.05	Jan, Mar-Nov	C,N.W
Halibut 3	10	87,111	.01- .18	.06	None	K
Halibut 2N	10	8,947	.03- .09	.06	Apr	K
Halibut 2S	27	12,415	.00- .20	.06	Apr, Jul, Sep, Oct	W

Table 5. Continued

Species	Number Samples	Average Weight (gm)	Contaminant Range (ppm)	Mean	Months Sampled	Locations Sampled*
Herring	251	471	.01- .48	.08	Apr-Nov	K,N,W
Kingfish	20	116	.02- .11	.06	Mar, May, Jun, Sep	G,N
Lobster (North.I)	132	1,072	.03-14.88	1.17	Jan, Mar-Dec	N
Lobster (north.O)	57	1,503	.04- .70	.18	Apr, May, Sep-Nov	N
Lobster, Spiny	54	522	.00- .48	.10	Mar, Oct, Nov	C.G.S
Mackerel, Atl.	112	393	.03- .42	.08	Feb, Apr, May, Sep, Oct	C,N
Mackerel, Jack	14	2,200	.01- .15	.08	Apr, Aug	C
Mackerel, King(G)	87	3,485	.01- .13	.05	May-Nov	G
Mackerel, King(O)	20	4,368	.02- .17	.08	Aug, Nov	S
Mackerel, Sp(G)	65	832	.00- .17	.05	Jan, Apr-Sep, Dec	G
Mackerel, Sp(O)	43	538	.00- .69	.08	Jul-Nov	S
Mullet	194	567	.00- .48	.06	Jun-Dec	G,H,S
Oysters	404	158	.01-15.90	1.63	Jan-Dec	C,G,N,S,W
Perch (Marine)	207	533	.00- .43	.07	Mar-May, Jul-Nov	C,N,S,W
Pollock	133	1,893	.00- .29	.06	Mar-Nov	K,N,W
Pompano	60	584	.01- .31	.07	Jan, May, Jul-Oct, Dec	G,S
Rackfish	121	2,686	.00- .35	.05	Apr, Jul-Oct	C,W
Sablefish	103	2,510	.01- .34	.05	Apr, Jun-Sep, Nov	C,K,W
Salmon	332	4,539	.00- .29	.06	May-Nov	C,K,W
Scallops	137	124	.04- 9.75	.79	Mar, Apr, Jun-Oct, Dec	K,N,S
Scup	74	172	.01- .24	.06	May, Sep-Nov	N,S
Sharks	320	11,629	.00- 3.47	.09	Jun, Mar-Dec	G,N,S,W
Shrimp	348	12	.00- .94	.09	Apr-Dec	C,G,K,N,S,W

Table 5. Continued

Species	Number Samples	Average Weight (gm)	Contaminant Range (ppm)	Mean	Months Sampled	Locations Sampled*
Smelt	33	N.A.	.01- .78	.13	Feb, Jul, Sep, Oct	W
Snapper, Red	49	4,238	.00- .14	.05	Apr, Jun, Jul, Sep, Nov	G,S
Snapper, Other	212	1,711	.00- .22	.07	Feb, Mar, May-Dec	C,G,H,P,S
Snook	12	3,797	.03- .13	.06	Mar, Jun, Sep	G
Spot	54	103	.00- .15	.06	May, Jun, Aug-Nov	N,S
Squid & Octopi	315	365	.03- 1.81	.37	Apr, May, Jul-Nov	C,H,N
Tilefish	60	5,184	.03- .09	.06	May, Oct	G
Trout (Fresh)	8	3,099	.04- .07	.05	Feb	W
Trout (Marine)	190	687	.00- .22	.06	Mar-Dec	G,N,S
Tuna, Lt.Skip.	70	3,413	.00- .26	.08	Apr, May, Jul, Sep	C,H,P
Tuna, Lt.Yell.	90	22,250	.00- .41	.08	Mar-Jul	C,H
Tuna, White	40	4,740	.01- .33	.07	Jun, Aug, Sep	C,W
Other Finfish	115	3,979	.01- .18	.07	Mar-May, Aug-Nov	C,N,W

N.A. - not available
* - See Appendix B for Location Codes

APENDIX E

Mercury Data Summary

This section has been reproduced from the Hg Report prepared in 1978. The mercury file contains the same type of information as does the cadmium and data adjustments were similar. Again, each species or subspecies category is represented by a unique lognormal probability distribution for that contaminant. The reader should see Table 1 in the Hg report to obtain a summary of the mercury data by species although similar information is given here in Table 6.

MERCURY DATA BASE

(Reproduced from 1978 Hg Report)

Source of Data

The results from the analysis of a total of 18,904 fish samples, representing all major commercial and recreational species of the U.S. collected during 1971-73, for total mercury are used in this program. The majority of the data was provided by NMFS (17,000 samples). Other contributors were: the Michigan Department of Natural Resources, the New York State Department of Conservation for data on freshwater species, and Fisheries and Environment Canada for swordfish data.

Unweighed Fish

In order to determine the distribution of mercury in the total pounds of fish flesh available to consumers for any one species, actual weights for each sample were used as a weighting factor.

For samples where the species weight was not given, the average weight of the weighed fish in each species was found. This weight was then used as the weight for all samples which had no weight reported.

Replicated Analyses

Replicated analyses were performed on most of the samples. For these samples, the average mercury content of the replicated analyses was used as the mercury content for that sample.

Values Below the Nondetection Level

Mercury values of 00 were not used in the model. The nondetection level was used for each species. Some species had nondetection levels set at 0.02 ppm, while others had 0.01 ppm because of differing physical composition such as oil content. In order not to bias the data up or down, the nondetected values were replaced by random entries from a triangular distribution between zero and the nondetection limit.

Mercury Levels Based on Proportions

Several species are landed in more than one area and in varying weight classes. Therefore, to provide a more accurate representation of what was in the marketplace during the consumption survey, the range of mercury levels for bass, bonito, halibut, lobster, mackerel, snapper, and tuna was determined using proportions based on the average weight and the total pounds commercially caught at specific sites as indicated in Fishery Statistics of the United States, 1973 or from industry data.

Mercury Levels Used in Study

One hundred thirty five seafood items were reported by participants in the Consumption Survey. These were reduced to the 69 seafood categories used in the program by combining categories that included either the same species of fish, or species in similar scientific families. For example, the category "Flounder" inludes 9 species of flounder and 6 species of sole. The data on mercury levels for each of the species were then weighted in terms of their percent contribution to the total "flounder" catch. Other categories were similarly weighted where appropriate. Following is a summary (see Table 6) of the mercury data for each of the seafood categories, or "species", used in the computer model. It should be noted that the data reflect mercury levels as found in the resource, not the marketplace. Included is the number of samples analyzed for each species, the number of samples

whose weight was not reported, the average weight of the fish sampled, the weighted average mercury content, the maximum mercury content found, when the fish were caught (by month), and location of catch (when reported).

Mercury Values Used Where Species Identification Was Missing

When the name of the species eaten at a meal was not reported (5,117 out of 58,826 meals), an average mercury value calculated for a mix of species was used. The mix of species was developed by NMFS using the following criteria:

(a) Consideration of the various product forms in those cases where they were indicated.

(b) Consideration of those fish and shellfish species which could be marketed in the above product forms.

(c) The relative consumption of the above fish and shellfish species as reported in the consumption survey.

Mercury Values Used for the Category "Other Shellfish"

The consumption survey reported an "Other Shellfish" category in 29 of 58,826 meal records. In these cases, a weighted mercury level was used which reflected the proportionate consumption of all shellfish which were reported in the survey.

Mercury Values Used for Buffalofish

Mercury values for the freshwater species buffalofish were not available. Therefore, mercury values for a simular species, carp, were substituted.

Table 6. Summary of Mercury Data in Edible Tissue on Mercury File.

Species	Number Samples	Average Weight (gms)	Contaminant Maximum	Contaminant Mean	Months Sampled	Locations Sampled
Abalone	30	1,092	.12	.018	Apr, Aug, Sep	C
Anchovies	80	23	.21	.039	Jan, Apr, May, Aug, Nov	C,G
Bass, Sea	53	346	.575	.157	Jun, Aug-Nov	N,S
Bass, Striped	231	4,378	2.0	.752	Apr-Jun, Aug-Oct	C,N,W
Bluefish	94	1.005	1.255	.378	Apr-Nov	G,N,S
Bluegills	49	202	1.01	.259	None	None
Bonito (Below 3197)	239	2,206	.47	.302	May-Jul, Sep	C
Bonito (Above 3197)	196	4,407	.74	.382	Jul, Sep, Oct	C
Butterfish	91	81	.190	.021	Mar-May, Aug-Nov	N
Carp	52	4,891	.54	.181	None	None
Catfish (Fresh)	35	1,480	.38	.146	Mar, Jul, Sep, Oct	F,G,N
Catfish (Marine)	81	754	1.2	.475	May-Nov	G
Clams	584	258	.26	.049	Feb-Dec	N,W,S
Cod	134	1.847	.59	.125	Feb-Nov	N
Crab, King	93	2,724	.24	.07	Jan, Feb, May, Jun, Sep, Oct, Dec	None
Crab, Other	314	704	.61	.14	Mar-Jun, Aug-Dec	C,G,N,W,S
Crappie	212	289	1.39	.262	None	None

Table 6. Continued.

Species	Number Samples	Average Weight (gm)	Contaminant Maximum	Contaminant Mean	Months Sampled	Locations Sampled
Croaker	217	232	.81	.124	Mar, May, Jun, Aug-Dec	G,N,S
Dolphin	73	7,170	.53	.144	Jan, Feb, Apr, May, Jul-Nov	A,G,H,S
Drums	137	1,769	.80	.15	Jan, Apr-Dec	G,N,S
Flounders	1,179	606	.88	.096	Jan-Dec	C,G,N,W,S
Groupers	928	6,197	2.45	.595	Feb, Apr-Jul, Sep-Dec	G,S
Haddock	88	1,277	.368	.109	Apr-Nov	N
Hake	426	550	1.1	.10	Jan-Nov	C,N,W
Halibut 4	152	32,966	1.00	.187	None	None
Halibut 3	771	43,961	1.28	.284	None	None
Halibut 2N	243	28,048	1.48	.44	Apr	None
Halibut 2S	108	17,163	1.43	.534	Apr, Jul, Sep, Oct	W
Herring	272	428	.26	.023	Apr-Nov	N,W
Kingfish	19	125	.33	.078	Feb, Mar, May, Jun, Sep	G,N
Lobster, North(I)	770	718	1.603	.339	Jan, Mar-Dec	N
Lobster, North(O)	1199	1,429	2.31	.509	Jan, Feb, Apr, May, Sep-Nov	N
Lobster, Spiny	65	435	.370	.113	Jan, Mar, Oct, Nov	C,G,S

Table 6. Continued.

Species	Number Samples	Average Weight (gm)	Contaminant Maximum	Contaminant Mean	Months Sampled	Locations Sampled
Mackerel, Atlantic	111	391	.19	.048	Apr, May, Sep, Oct	C, N
Mackerel, Jack	29	959	.51	.267	Apr, Aug	C
Mackerel, King (G)	478	3,932	2.73	.823	Mar-Dec	G
Mackerel, King (O)	357	6,799	2.9	1.128	Feb, Apr, May, Aug-Dec	S
Mackerel, Spanish (G)	627	968	2.47	.542	Jan, Mar-Dec	G
Mackerel, Spanish (O)	369	613	1.605	.325	Mar, May, Jul-Nov	S
Mullet	191	566	.28	.016	Jun-Dec	G,H,S
Oysters	260	104	.45	.027	Mar, Apr, Jun-Dec	C,G,N,W,S
Perch (Fresh	147	338	.88	.29	None	None
Perch (Marine)	268	542	.59	.133	Mar-May, Jul-Nov	C,N,W,S
Pike	87	2,273	1.71	.61	None	None
Pollock	227	1,781	.95	.141	Feb-Nov	N,W
Pompano	61	568	.42	.104	Jan, May, Jul-Oct, Dec	G,S
Rockfish	451	1,613	.93	.348	Feb-Apr, Jun-Oct	C,W
Sablefish	102	2,510	.70	.261	Apr, Jun-Sep, Nov	C,W
Salmon	806	4,077	.21	.048	Jan, May-Nov	C,W
Scallops	138	132	.22	.058	Mar, Apr, Jun-Dec	N,S

Table 6. Continued

Species	Number Samples	Average Weight (gm)	Contaminant Maximum	Contaminant Mean	Months Sampled	Locations Sampled
Scup	73	172	.52	.108	May, Sep-Nov	N,S
Sharks	588	8,320	4.528	1.244	Jan-Dec	A,G,N,W,S
Shrimp	353	15	.33	.046	Feb, Apr-Dec	C,G,N,W,S
Smelt	53	None	.058	.016	Feb, Mar, Jul, Sep, Oct	W
Snapper, Red	759	2,822	2.17	.454	Apr-Dec	G,S
Snapper, Other	327	1,486	1.84	.362	Feb, Mar, May-Dec	A,C,G,H,P,S
Snook	12	3,797	1.64	.701	Mar, Jun, Sep	G
Spot	60	114	.18	.041	May, Jun, Aug-Nov	N,S
Squid & Octopi	339	356	.40	.031	Apr, May, Jul-Nov	C,H,N
Sunfish	174	179	1.2	.312	None	None
Swordfish	115	47,639	2.72	1.268	None	None
Tilefish	61	5,281	3.73	1.607	May, Oct	G
Trout (Fresh)	528	4,432	1.22	.417	Feb, Jul-Sep	W
Trout (Marine)	201	676	1.19	.242	Mar-Dec	G,N,S
Tuna, Light Skip	70	3,412	.385	.144	Apr, May, Jul, Sep	C,H,P
Tuna, Light Yellow	115	29,051	.87	.271	Jan, May-Jul	A,C,H,N,S
Tuna, White	76	9,532	.904	.35	May-Sep	C,H,W

Table 6. Continued.

Species	Number Samples	Average Weight (gm)	Contaminant Maximum	Contaminant Mean	Months Sampled	Locations Sampled
Whitefish	86	2,242	.23	.054	Aug, Sep	None
Other Finfish	180	5,537	1.02	.287	May-May, Aug-Dec	C,N,W

APPENDIX F

Consumption Data Summary

The data found in the consumption file were collected by NPD Research, Inc., Chicago, Illionis during 1973-1974. There were 25,947 consumers of which 24,652 recorded eating seafood. The consumers represented all major demographic characteristics.

Each family had a diary in which each seafood meal was recorded by family member. Each family kept a diary for a one month period and half of the panelists kept the diary for one year (September 1973 -August 1974). Age, sex, and geographic location were recorded for most panelists. The age and sex were sometimes missing so a sex of "not recorded" and an age of 99 were developed to account for those panelists. One hundred incomplete records were corrected by an ad hoc committee formed from EPA, USDA, Tuna Research Foundation, NPI, and NMFS by referring back to the original 100 diaries. A very important piece of information that was missing from every person's diary was their body weight. That information was needed to calculate a person's personal allowed daily intake. The table that follows summarizes the average weight for seven sex/age groups used by the program (Hg Report, 1978).

TABLE 7. Average Body Weights

Age Groups (yrs)	Males (kg)	Females (kg)
0-1	7	7
1-5	15	15
6-11	31	31
12-17	56	52
18-54	72	59
55+	74	64

USDA Handbook #11, Table 143, p. 279.

Each seafood meal record from the NPD survey, contained the species, total amount of seafood available (product form), identification of which family members had eaten, and number of servings eaten by each person. However, the actual serving size was not recorded. Since the serving size was needed to determine the actual consumption of seafood, NMFS employed the following table to estimate that information (Hg Report, 1978).

TABLE 8. Average Serving Size (gms) for Seafood [1/]

Age Groups (yrs)	Males (gms)	Females (gms)
0-1	20	20
1-5	66	66
6-11	95	95
12-17	131	100
18-54	158	125
55-75	159	130
75+	180	139

[1/] USDA Handbook #11, Table 10, p.40-41.

Table 9 summarizes the diet of the panelists. The list identifies species eaten in declining order of abundance. The reader should review the Hg report to obtain more details concerning the consumption survey.

Table 9. Seafood Categories and Number of Panelists Using Products.

SUMMARY OF CONSUMPTION DATA

TUNA, LIGHT	16817
SHRIMP	5808
NOT REPORTED	5117
FLOUNDERS	3327
PERCH (MARINE)	2519
SALMON	2454
CLAMS	2242
OTHER FINFISH	1503
COD	1492
POLLOCK	1466
HADDOCK	1441
HERRING	1251
OYSTERS	1239
CRAB, OTHER THAN KING	1168
TROUT (FRESHWATER)	970
CATFISH (FRESHWATER)	876
BASS	826
LOBSTER, NORTHERN	675
MACKEREL, OTHER THAN JACK	616
HALIBUT	574
SCALLOPS	526
WHITEFISH	492
SNAPPER	490
HAKE	392
PIKE	390
LOBSTER, SPINY	350
SMELT	328
PERCH (FRESHWATER	268
BLUEGILLS	265
BLUEFISH	236
CRAPPIE	228
TROUT (MARINE)	220
BONITO	148
CRAB, KING	130
MULLET	97
SPOT	91
CROAKER	76
ANCHOVIES	75
ROCKFISH	75
CATFISH (MARINE)	70
GROUPERS	68
CARP	64
BUFFALOFISH	60
SUNFISH	60
DRUMS	58
SCUP	55
OTHER SHELLFISH	54

Table 9. Continued.

ABALONE	48
SQUID AND OCTOPI	45
SWORDFISH	41
BUTTERFISH	39
DOLPHIN	34
TUNA, WHITE	22
MACKEREL, JACK	13
SNOOK	13
TILEFISH	11
POMPANO	10
KINGFISH	8
SABLEFISH	7
SHARKS	3

APPENDIX G

TWO SAMPLE RUNS

Two sample runs have been illustrated completely. The user responses or entries are underlined. Everything else printed comes from the computer. Comments are found throughout the listing.

```
     6-   17  02/19/80 08:41:31
106 41071
STATION 6-   CONNECTED ON NPS LINE 36


USOPM TIME SHARING  02/19/80 AT  8.682  CHANNEL 0652

USER ID -66DC70CNA
PASSWORD--
[redacted]

[redacted]
*CRUN START

FRN 66DC70CNA/OBJ/PROMPT #66DC70CNA/FILE/ANSWER "30"


          CONTAMINANT/CONSUMER RISK SIMULATION MODEL

     THIS  IS A PRELIMINARY PROGRAM FOR THE
CONTAMINANT/CONSUMER RISK SIMULATION MODEL.

      HAVE THE USER GUIDE IN FRONT OF YOU FOR
REFERENCE.  FOR EXAMPLE THE SPECIES CODES ARE FOUND
IN THE USER GUIDE.

      THE PROGRAM WILL ASK YOU IF YOU WANT TO CHANGE
A CERTAIN VARIABLE.  IF YOU DON'T A DEFAULT VALUE IS
AUTOMATICALLY CHOSEN FOR THAT PARTICULAR VARIABLE.  THE
PROGRAM LISTS THAT VALUE AS DOES THE USER GUIDE.

      ANSWER EVERY QUESTION.  ENTER Y FOR YES AND N
FOR NO.

**********************
ENTER THE TITLE OF YOUR RUN.

THIS WILL BE PRINTED AT THE TOP OF MOST PAGES OF YOUR
OUTPUT.  PLEASE RESTRICT YOUR TITLE TO ONE LINE.
$**$COPY OFF
TEST RUN FOR USER'S GUIDE

*****************************************************
              INPUT FORMULATION
*****************************************************

**************************

WHICH CONTAMINANT ARE YOU INTERESTED IN?
MERCURY = 1.  CADMIUM = 2.  ARSENIC = 3.
2

*********************

DO YOU WISH TO CHANGE THE ACTION LEVEL?  (DEFAULT VALUES ARE 5.0 PPM
FOR MERCURY, 20.0 PPM FOR CADMIUM AND 100.0  PPM FOR ARSENIC.)
Y
HOW MANY SPECIES IS A NEW VALUE TO BE APPLIED?  (FROM ONE  TO 99)
99
DO YOU WANT THE SAME VALUE APPLIED TO EVERY SPECIE?
```

Y
ENTER THE NEW VALUE.
5.0

****
DO YOU WISH TO CHANGE THE LEVEL OF ENFORCEMENT? (DEFAULT
VALUE IS 100 %)
N

****
DO YOU WISH TO ELIMINATE CERTAIN MONTHS OF CATCH FOR SPECIFIC SPECIES?
(DEFAULT IS NO MONTHS ELIMINATED.)
Y
HOW MANY SPECIES?
2
ENTER THE SPECIES NUMBER AND THE NUMBER OF MONTHS TO
BE ELIMINATED. (UP TO 6 MONTHS.)
14,3
ENTER THE SPECIFIC MONTHS (ONE PER LINE) USING THEIR STANDARD NUMBER. I
.E. JANUARY = 1, FEBRUARY = 2.
2
11
8
ENTER THE SPECIES NUMBER AND THE NUMBER OF MONTHS TO
BE ELIMINATED. (UP TO 6 MONTHS.)
16
2
ENTER THE SPECIFIC MONTHS (ONE PER LINE) USING THEIR STANDARD NUMBER. I
.E. JANUARY = 1, FEBRUARY = 2.
1
6

****
DO YOU WISH TO LIMIT LOCATIONS OF CATCH FOR SPECIFIC
SPECIES? (DEFAULT IS ALL LOCATIONS INCLUDED.)
Y
HOW MANY SPECIES ARE INVOLVED?
1
ENTER THE SPECIES NUMBER AND THE NUMBER OF LOCATIONS THE SPECIE
WILL BE DIVIDED INTO. (UP TO 7.)
48,2
ENTER SPECIFIC LOCATION AND CORRESPONDING PERCENT VALUE. SEE USER
GUIDE FOR LOCATION CODES AND AN ENTRY EXAMPLE.
N,65
S,35

****
DO YOU WISH TO DIVIDE ANY SPECIE BY WEIGHT?
(FOR DEFAULT VALUES SEE USER GUIDE)
Y
HOW MANY SPECIES?
1
ENTER SPECIES CODE, THE SPECIFIC WEIGHT IN GRAMS, AND
THE PERCENTAGE BELOW THE ENTERED WEIGHT. (IN THAT ORDER.)
3,15.0,35

****
DO YOU WISH TO LIMIT THE SPECIES EATEN BY CONSUMERS?
(DEFAULT IS ALL SPECIES INCLUDED.)
N

****
DO YOU WISH TO EXCLUDE CERTAIN SPECIES EATEN BY CONSUMERS?

(DEFAULT IS NO SPECIES EXCLUDED.)
N

****
DO YOU WISH TO SUBSTITUTE A NEW CONTAMINANT MEAN AND STANDARD DEVIATON FOR A SPECIFIC SPECIES? (DEFAULT IS NO SUBSTITUTIONS.)
N

****
DO YOU WISH TO SUBSTITUTE ONE OR MORE SPECIES FOR ANOTHER? (SEE USER GUIDE FOR DEFAULT VALUES.)
N

****

DO YOU WISH A NEW ADI? (DEFAULT VALUES ARE 72.0MCG/70KG FOR CADMIUM, 30.0MCG/70KG FOR MERCURY, AND 500.0MCG/70 KG FOR ARSENIC)
ANSWER WITH FOLLOWING FORMAT: Y,NEW VALUE OR N,0
N,0

****
DO YOU WISH TO ONLY INCLUDE CERTAIN CONSUMER STATES?
(DEFAULT IS ALL STATES INCLUDED.)
N

****
DO YOU WISH TO EXCLUDE CERTAIN CONSUMER STATES?
(DEFAULT IS NO STATES EXCLUDED.)
N

****
DO YOU WISH TO CHANGE THE QUANTITY FACTOR FOR ANY SPECIE?
(DEFAULT IS QUANTITY FACTORS AS IS.)
N

****
DO YOU WISH TO CHANGE THE FREQUENCY FACTOR FOR ANY SPECIE?
(DEFAULT IS FREQUENCY FACTORS AS IS.)
N

****
OUTPUT DESIGN
****
NOW WE MUST DESIGN YOUR DESIRED OUTPUT.
AS YOU KNOW THERE ARE SPECIES DATA OUTPUT AND CONSUMER RISK OUTPUT.

THE SPECIES OUTPUT CONSISTS OF A TABLE OF INFORMATION
CONCERNING THE NUMBERS OF FISH PER SPECIE THAT WERE USED
BY THE MODEL AND A LIST OF ALL SUBSTITUTIONS.

****
DO YOU WISH TO DELETE ANY OF THIS OUTPUT?
N

ONE PART OF THE CONSUMER RISK OUTPUT IS A LIST OF
THOSE CONSUMERS WHO ARE AT A CERTAIN RISK.

****
DO YOU WISH TO KEEP THIS PART OF THE OUTPUT?
Y
ENTER THE RISK VALUE FOR THIS OUTPUT.

.05

NOW WE MUST DEFINE THE ACTUAL OUTPUT GROUPS THAT
YOU WISH TO EXAMINE. FOR THE DEFAULT GROUPS SEE THE
USER GUIDE.

****
DO YOU WISH TO ADD ANY OUTPUT GROUPS?
IF SO, ENTER Y AND THEN THE NUMBER OF GROUPS YOU WISH TO
ADD. IF NOT, ENTER N AND THEN 0 (ZERO).
N,0

****

THIS RUN IS ENTITLED
TEST RUN FOR USER'S GUIDE

TO COMPLETE THIS RUN OF THE MODEL
              ENTER: CRUN FINISH

*CRUN FINISH

*CARDIN
*REMOVE CLEARFILES
*RUN 66DC70CNA/JCL/MAINPROG
  SNUMB # 6556C
*JSTS 6556C
6556C -01   WAIT-ALOC
*RYE

CP DISCONNECTS

NPS DISCONNECTS

```
     2-    2    02/19/80 10:04:13
106 40460
STATION 2-    CONNECTED ON NPS LINE 32


     2-    3    02/19/80 10:04:15
106 40460
STATION 2-    CONNECTED ON NPS LINE 32


     2-    4    02/19/80 10:04:16
106 40460
STATION 2-    CONNECTED ON NPS LINE 32


USOPM TIME SHARING  02/19/80 AT 10.064  CHANNEL 0252

USER ID -66DC70CNA
PASSWORD--
[illegible]

[illegible]
*JSTS 6556C
6556C OUTPUT WAITING     ID=6-.
*CRUN PRINT

*CONVERT 66DC70CNA/FILE/OUTPUT=*
*EDIT
-RS:/$/;S:/ /
-DONE
*LIST
```

THE TITLE OF THIS RUN IS TEST RUN FOR USER'S GUIDE

TODAY'S DATE IS 02/19/80. THE TIME IS 9.829.

SPECIES DATA ON CADMIUM

TEST RUN FOR USER'S GUIDE

NAME	# ON FILE	# PER WT&/OR LOC	ACTION LEVEL VALUE	# ABOVE	% ABOVE	REJECTED EL	#	%	CONTAMINANT TOTAL	RANGE	MEAN/SD	LOCATION NAME	%
ABALONE	20.	20.	5.00	0.	0.	100.	0.	0.	20.	0.02 3.50	1.17/ 1.21		100.00
ANCHO BELOW 15. GRAMS AT 35.00 %	80.	50.	5.00	0.	0.	100.	0.	0.	50.	0.03 0.23	0.14/ 0.04		100.00
ANCHO ABOVE 15. GRAMS AT 65.00 %	80.	10.	5.00	0.	0.	100.	0.	0.	10.	0.11 0.57	0.36/ 0.11		100.00
BASS, SEA	55.	55.	5.00	0.	0.	100.	0.	0.	55.	0.00 0.21	0.06/ 0.03		100.00
BASS, STRIPED	117.	117.	5.00	0.	0.	100.	0.	0.	117.	0.01 0.24	0.06/ 0.03		100.00
BLUEFISH	74.	74.	5.00	0.	0.	100.	0.	0.	74.	0.00 0.15	0.05/ 0.03		100.00
BONITO	40.	40.	5.00	0.	0.	100.	0.	0.	40.	0.01 0.41	0.11/ 0.04		100.00
BUTTERFISH	91.	91.	5.00	0.	0.	100.	0.	0.	91.	0.02 0.19	0.08/ 0.03		100.00
CATFISH (FRESHWATER)	35.	35.	5.00	0.	0.	100.	0.	0.	35.	0.00 0.15	0.06/ 0.03		100.00
CATFISH (MARINE)	81.	81.	5.00	0.	0.	100.	0.	0.	81.	0.01 0.26	0.06/ 0.04		100.00
CLAMS MONTHS ELIMINATED		FEB	NOV	AUG									
CLAMS	586.	538.	5.00	0.	0.	100.	0.	0.	538.	0.02 1.66	0.25/ 0.18		100.00
COD	134.	134.	5.00	0.	0.	100.	0.	0.	134.	0.00 0.21	0.05/ 0.03		100.00
CRAB,KING MONTHS ELIMINATED		JAN	JUN										
CRAB,KING	49.	30.	5.00	0.	0.	100.	0.	0.	30.	0.01 0.38	0.16/ 0.07		100.00
CRAB, OTHER THAN KING	261.	261.	5.00	0.	0.	100.	0.	0.	261.	0.01 3.00	0.16/ 0.19		100.00
CROAKER	92.	92.	5.00	0.	0.	100.	0.	0.	92.	0.00 0.31	0.07/ 0.04		100.00
DOLPHIN	63.	63.	5.00	0.	0.	100.	0.	0.	63.	0.00 0.21	0.06/ 0.03		100.00
DRUMS	139.	139.	5.00	0.	0.	100.	0.	0.	139.	0.00 0.21	0.06/ 0.03		100.00
FLOUNDERS	1002.	1002.	5.00	0.	0.	100.	0.	0.	1002.	0.00 0.74	0.06/ 0.04		100.00
GROUPERS	125.	125.	5.00	0.	0.	100.	0.	0.	125.	0.00 0.13	0.05/ 0.02		100.00
HADDOCK	89.	89.	5.00	0.	0.	100.	0.	0.	89.	0.00 0.28	0.05/ 0.03		100.00
HAKE	365.	365.	5.00	0.	0.	100.	0.	0.	365.	0.00 0.63	0.05/ 0.04		100.00
HALIBUT 3	10.	10.	5.00	0.	0.	100.	0.	0.	10.	0.01 0.18	0.06/ 0.05		100.00
HALIBUT 2N	10.	10.	5.00	0.	0.	100.	0.	0.	10.	0.03 0.09	0.06/ 0.02		100.00
HALIBUT 2S	27.	27.	5.00	0.	0.	100.	0.	0.	27.	0.00 0.20	0.06/ 0.05		100.00
HERRING	251.	251.	5.00	0.	0.	100.	0.	0.	251.	0.01 0.48	0.08/ 0.05		100.00
KINGFISH	20.	20.	5.00	0.	0.	100.	0.	0.	20.	0.02 0.11	0.06/ 0.02		100.00
LOBSTER, NORTHERN (INSHORE)	132.	132.	5.00	2.	1.52	100.	2.	1.52	130.	0.03 0.57	0.16/ 0.12		100.00
LOBSTER, NORTHERN (OFFSHORE)	57.	57.	5.00	0.	0.	100.	0.	0.	57.	0.04 0.70	0.18/ 0.10		100.00
LOBSTER, SPINY	54.	54.	5.00	0.	0.	100.	0.	0.	54.	0.00 0.48	0.10/ 0.08		100.00
MACKEREL, ATLANTIC	112.	112.	5.00	0.	0.	100.	0.	0.	112.	0.03 0.42	0.08/ 0.05		100.00
MACKEREL, JACK	14.	14.	5.00	0.	0.	100.	0.	0.	14.	0.01 0.15	0.08/ 0.04		100.00
MACKEREL, KING (GULF)	87.	87.	5.00	0.	0.	100.	0.	0.	87.	0.01 0.13	0.05/ 0.03		100.00
MACKEREL, KING (OTHER)	20.	20.	5.00	0.	0.	100.	0.	0.	20.	0.02 0.17	0.08/ 0.04		100.00
MACKEREL, SPANISH (GULF)	65.	65.	5.00	0.	0.	100.	0.	0.	65.	0.00 0.17	0.05/ 0.03		100.00
MACKEREL, SPANISH (OTHER)	43.	43.	5.00	0.	0.	100.	0.	0.	43.	0.00 0.69	0.08/ 0.13		100.00
MULLET	194.	194.	5.00	0.	0.	100.	0.	0.	194.	0.00 0.48	0.06/ 0.04		100.00
OYSTERS	404.	404.	5.00	24.	5.94	100.	24.	5.94	380.	0.01 4.75	1.19/ 1.06		100.00
PERCH (MARINE)	207.	207.	5.00	0.	0.	100.	0.	0.	207.	0.00 0.43	0.07/ 0.05		100.00
POLLOCK	133.	133.	5.00	0.	0.	100.	0.	0.	133.	0.00 0.29	0.06/ 0.03		100.00
POMPANO	60.	60.	5.00	0.	0.	100.	0.	0.	60.	0.01 0.31	0.07/ 0.04		100.00
ROCKFISH	121.	121.	5.00	0.	0.	100.	0.	0.	121.	0.00 0.35	0.05/ 0.05		100.00
SABLEFISH	103.	103.	5.00	0.	0.	100.	0.	0.	103.	0.01 0.34	0.05/ 0.05		100.00
SALMON	332.	332.	5.00	0.	0.	100.	0.	0.	332.	0.00 0.29	0.06/ 0.04		100.00
SCALLOPS	137.	70.	5.00	1.	1.43	100.	1.	1.43	69.	0.04 0.61	0.11/ 0.07	NAT	65.00
SCALLOPS	137.	62.	5.00	0.	0.	100.	0.	0.	62.	0.06 3.86	1.51/ 1.17	SAT	35.00
SCUP	74.	74.	5.00	0.	0.	100.	0.	0.	74.	0.01 0.24	0.06/ 0.04		100.00
SHARKS	320.	320.	5.00	0.	0.	100.	0.	0.	320.	0.00 3.47	0.09/ 0.20		100.00
SHRIMP	348.	348.	5.00	0.	0.	100.	0.	0.	348.	0.00 0.94	0.09/ 0.07		100.00
SMELT	33.	33.	5.00	0.	0.	100.	0.	0.	33.	0.01 0.78	0.13/ 0.15		100.00
SNAPPER, RED	49.	49.	5.00	0.	0.	100.	0.	0.	49.	0.00 0.14	0.05/ 0.04		100.00
SNAPPER, OTHER	212.	212.	5.00	0.	0.	100.	0.	0.	212.	0.00 0.22	0.07/ 0.03		100.00
SNOOK	12.	12.	5.00	0.	0.	100.	0.	0.	12.	0.03 0.13	0.06/ 0.03		100.00
SPOT	54.	54.	5.00	0.	0.	100.	0.	0.	54.	0.00 0.15	0.06/ 0.03		100.00
SQUID AND OCTOPI	315.	315.	5.00	0.	0.	100.	0.	0.	315.	0.03 1.81	0.37/ 0.50		100.00

TILEFISH	60.	60.	5.00	0.	0.	100.	0.	0.	60.	0.03	0.09	0.06/	0.01	100.00
TROUT (FRESHWATER)	8.	8.	5.00	0.	0.	100.	0.	0.	8.	0.04	0.07	0.05/	0.01	100.00
TROUT (MARINE)	190.	190.	5.00	0.	0.	100.	0.	0.	190.	0.00	0.22	0.06/	0.04	100.00
TUNA, LIGHT SKIPJACK	70.	70.	5.00	0.	0.	100.	0.	0.	70.	0.00	0.26	0.08/	0.06	100.00
TUNA, LIGHT YELLOWFISH	90.	90.	5.00	0.	0.	100.	0.	0.	90.	0.00	0.41	0.08/	0.06	100.00
TUNA, WHITE	40.	40.	5.00	0.	0.	100.	0.	0.	40.	0.01	0.33	0.07/	0.06	100.00
OTHER FINFISH	115.	115.	5.00	0.	0.	100.	0.	0.	115.	0.01	0.18	0.07/	0.04	100.00

THIS SECTION LISTS THE SUBSTITUTIONS MADE BY SPECIES.

THE FOLLOWING OUTPUT ILLUSTRATES HOW A SPECIE WAS SUBSTITUTED FOR.

NOT REPORTED

7.95 %	BASS, SEA
2.30 %	CLAMS
7.95 %	COD
13.60 %	FLOUNDERS
7.95 %	HADDOCK
2.30 %	HERRING
2.30 %	OYSTERS
7.95 %	POLLOCK
11.40 %	SALMON
4.50 %	SHRIMP
11.40 %	TROUT (FRESHWATER)
7.55 %	TUNA, LIGHT SKIPJACK
8.36 %	TUNA, LIGHT YELLOWFISH
4.49 %	TUNA, WHITE

BLUEGILLS

100.00 %	TROUT (FRESHWATER)

BUFFALOFISH

100.00 %	TROUT (FRESHWATER)

CARP

100.00 %	TROUT (FRESHWATER)

CRAPPIE

100.00 %	TROUT (FRESHWATER)

PERCH (FRESHWATER)

100.00 %	TROUT (FRESHWATER)

PIKE

100.00 %	TROUT (FRESHWATER)

SUNFISH

100.00 %	TROUT (FRESHWATER)

SWORDFISH

100.00 %	SHARKS

WHITEFISH

100.00 %	TROUT (FRESHWATER)

OTHER SHELLFISH

0.20 %	ABALONE
12.00 %	CLAMS
0.60 %	CRAB,KING
5.80 %	CRAB, OTHER THAN KING
7.65 %	LOBSTER, NORTHERN (INSHORE)
1.35 %	LOBSTER, NORTHERN (OFFSHORE)
1.60 %	LOBSTER, SPINY
7.80 %	OYSTERS
63.00 %	SHRIMP

BASS

29.00 %	BASS, SEA
71.00 %	BASS, STRIPED

HALIBUT

21.28 %	HALIBUT 3
21.28 %	HALIBUT 2N
57.44 %	HALIBUT 2S

LOBSTER, NORTHERN

85.00 %	LOBSTER, NORTHERN (INSHORE)
15.00 %	LOBSTER, NORTHERN (OFFSHORE)

MACKEREL, OTHER THAN JACK

22.07 %	MACKEREL, ATLANTIC
10.93 %	MACKEREL, KING (GULF)
18.62 %	MACKEREL, KING (OTHER)
31.98 %	MACKEREL, SPANISH (GULF)
16.40 %	MACKEREL, SPANISH (OTHER)

SNAPPER

70.00 %	SNAPPER, RED
30.00 %	SNAPPER, OTHER

TUNA, LIGHT

47.44 %	TUNA, LIGHT SKIPJACK
52.56 %	TUNA, LIGHT YELLOWFISH

TEST RUN FOR USER'S GUIDE

THIS PAGE OF OUTPUT LISTS THOSE CONSUMERS AT A RISK OF 0.050

SEX INCLUDED	AGE ABOVE	AGE BELOW	AGE NOT RECORDED	NONEATERS	ADI (MCG/70KG)	RISK
M,F,NOT REC	0	100	IN	IN	72.00	0.050

ID	ST	SEX	AGE	DAILY INTAKE (MCG) AVE	ALLOWED	UPPER LIMIT	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH
2210671	OH	M	76	73.92	76.11	82.47	OYSTE	143	13.0	PERCM	126	2.0	SALMO	80	3.0
3029181	AZ	M	33	64.93	74.06	78.27	OYSTE	402	4.0	MACJO	90	4.0	NOTRP	51	3.5
							PERCM	122	1.0	TUNAL	111	1.0			
3887921	MO	F	37	79.05	60.69	89.24	OYSTE	204	9.0	TUNAL	101	9.0	SHRIM	145	3.0
							CLAMS	204	2.0						

TEST RUN FOR USER'S GUIDE

GROUP RISK
***** ****

SEX INCLUDED	LOWEST AGE	HIGHEST AGE	AGE NOT REC	NONEATERS	ADI (MCG/70KG)	TOTAL NO.
M F NR	0	100	IN	IN	72.00	25947

	CONFIDENCE (BELOW ADI)						RISK (ABOVE ADI)					
	50%	70%	90%	95%	99%	99.9%	50%	30%	10%	5%	1%	.1%
% POPULATION	100.00	99.99	99.99	99.99	99.99	99.98	0.00	0.01	0.01	0.01	0.01	0.02

SEX INCLUDED	LOWEST AGE	HIGHEST AGE	AGE NOT REC	NONEATERS	ADI (MCG/70KG)	TOTAL NO.
M F NR	0	100	IN	OUT	72.00	24652

	CONFIDENCE (BELOW ADI)						RISK (ABOVE ADI)					
	50%	70%	90%	95%	99%	99.9%	50%	30%	10%	5%	1%	.1%
% POPULATION	100.00	99.99	99.99	99.99	99.99	99.98	0.00	0.01	0.01	0.01	0.01	0.02

*BYE
**ON AT 10.064 - OFF AT 10.174 ON 02/19/80

CP DISCONNECTS

NPS DISCONNECTS

```
     2+    2   02/19/80 10:32:10
106 40460
STATION 2+    CONNECTED ON NPS LINE 20


     2+    3   02/19/80 10:32:11
106 40460
STATION 2+    CONNECTED ON NPS LINE 20


     2+    4   02/19/80 10:32:13
106 40460
STATION 2+    CONNECTED ON NPS LINE 20


     2+    5   02/19/80 10:32:14
106 40460
STATION 2+    CONNECTED ON NPS LINE 20


USOPM TIME SHARING  02/19/80 AT 10.531  CHANNEL 0260

USER ID -66DC70CNA
PASSWORD--
[illegible]

[illegible]
*CRUN START

FRN 66DC70CNA/OBJ/PROMPT #66DC70CNA/FILE/ANSWER "30"


          CONTAMINANT/CONSUMER RISK SIMULATION MODEL

     THIS  IS A PRELIMINARY PROGRAM FOR THE
CONTAMINANT/CONSUMER RISK SIMULATION MODEL.

      HAVE THE USER GUIDE IN FRONT OF YOU FOR
REFERENCE.  FOR EXAMPLE THE SPECIES CODES ARE FOUND
IN THE USER GUIDE.

      THE PROGRAM WILL ASK YOU IF YOU WANT TO CHANGE
A CERTAIN VARIABLE.  IF YOU DON'T A DEFAULT VALUE IS
AUTOMATICALLY CHOSEN FOR THAT PARTICULAR VARIABLE.  THE
PROGRAM LISTS THAT VALUE AS DOES THE USER GUIDE.

      ANSWER EVERY QUESTION.  ENTER Y FOR YES AND N
FOR NO.

**********
ENTER THE TITLE OF YOUR RUN.

THIS WILL BE PRINTED AT THE TOP OF MOST PAGES OF YOUR
OUTPUT.  PLEASE RESTRICT YOUR TITLE TO ONE LINE.
$**$COPY OFF
SECOND RUN FOR USER'S GUIDE
```

```
**************************************************
              INPUT FORMULATION
**************************************************

**************************

WHICH CONTAMINANT ARE YOU INTERESTED IN?
MERCURY = 1.  CADMIUM = 2.  ARSENIC = 3.
1

*********************

DO YOU WISH TO CHANGE THE ACTION LEVEL?  (DEFAULT VALUES ARE 5.0 PPM
FOR MERCURY, 20.0 PPM FOR CADMIUM AND 100.0  PPM FOR ARSENIC.)
Y
HOW MANY SPECIES IS A NEW VALUE TO BE APPLIED?  (FROM ONE  TO 99)
99
DO YOU WANT THE SAME VALUE APPLIED TO EVERY SPECIE?
Y
ENTER THE NEW VALUE.
0.5

*******************
DO YOU WISH TO CHANGE THE LEVEL OF ENFORCEMENT?  (DEFAULT
 VALUE IS   100 %)
Y
HOW MANY SPECIES IS A NEW VALUE TO BE APPLIED?  (FROM ONE  TO 99)
99
DO YOU WANT THE SAME VALUE APPLIED TO EVERY SPECIE?
Y
ENTER THE NEW VALUE.
50

*********************
DO YOU WISH TO ELIMINATE CERTAIN  MONTHS OF CATCH FOR SPECIFIC SPECIES?
  (DEFAULT IS NO MONTHS ELIMINATED.)
N

**********************
DO YOU WISH TO LIMIT LOCATIONS OF CATCH FOR SPECIFIC
 SPECIES?      (DEFAULT IS ALL LOCATIONS INCLUDED.)
N

**********************
DO YOU WISH TO DIVIDE ANY SPECIE BY WEIGHT?
(FOR DEFAULT VALUES SEE USER GUIDE)
N

*****************************
DO YOU WISH TO LIMIT THE SPECIES EATEN BY CONSUMERS?
 (DEFAULT IS ALL SPECIES INCLUDED.)
Y
HOW MANY?
4
ENTER SPECIFIC SPECIES CODE (ONE PER LINE).
48
39
16
17

*****************************
DO YOU WISH TO EXCLUDE CERTAIN SPECIES EATEN BY CONSUMERS?
     (DEFAULT IS NO SPECIES EXCLUDED.)
```

```
N

**************************
DO YOU WISH TO SUBSTITUTE A NEW CONTAMINANT MEAN AND  STANDARD DEVIATON
FOR A SPECIFIC SPECIES?  (DEFAULT IS NO SUBSTITUTIONS.)
Y
 HOW MANY SPECIES?
1
SPECIES CODE, NEW MEAN, NEW STANDARD DEVIATION
48,0.5,.01

**************************
DO YOU WISH TO SUBSTITUTE ONE OR MORE SPECIES FOR ANOTHER?  (SEE USER
GUIDE FOR DEFAULT VALUES.)
N

**********************

DO YOU WISH A NEW ADI?  (DEFAULT VALUES ARE 72.0MCG/70KG FOR  CADMIUM,
 30.0MCG/70KG FOR MERCURY, AND 500.0MCG/70 KG FOR ARSENIC)
ANSWER WITH FOLLOWING FORMAT: Y,NEW VALUE OR N,0
Y,25.0

**************************
DO YOU WISH TO ONLY INCLUDE CERTAIN CONSUMER STATES?
  (DEFAULT IS ALL STATES INCLUDED.)
Y
HOW MANY STATES?  (UP TO 25.)
10
ENTER SPECIFIC STATES USING THEIR APPROPRIATE
(POST OFFICE) TWO-LETTER ABBREVIATION. (ONE PER LINE)
AZ
OH
AK
CA
OR
KY
WA
ME
MD
SC

**************************
DO YOU WISH TO  EXCLUDE CERTAIN CONSUMER STATES?
 (DEFAULT IS NO STATES EXCLUDED.)
N

**************************
DO YOU WISH TO CHANGE THE QUANTITY FACTOR FOR ANY SPECIE?
  (DEFAULT IS QUANTITY FACTORS AS IS.)
Y
HOW MANY SPECIES?
1
ENTER SPECIES NUMBER AND ITS QUANTITY FACTOR
39,2

**************************
 DO YOU WISH TO CHANGE THE FREQUENCY FACTOR FOR ANY SPECIE?
   (DEFAULT IS FREQUENCY FACTORS AS IS.)
Y
HOW MANY SPECIES?
1
ENTER SPECIES NUMBER AND ITS FREQUENCY FACTOR.
```

48,2

```
**********************************************************
            OUTPUT        DESIGN
**********************************************************
NOW WE MUST DESIGN YOUR DESIRED OUTPUT.
AS YOU KNOW THERE ARE SPECIES DATA OUTPUT AND CONSUMER RISK OUTPUT.

THE SPECIES OUTPUT CONSISTS OF A TABLE OF INFORMATION
CONCERNING THE NUMBERS OF FISH PER SPECIE THAT WERE USED
BY THE MODEL AND A LIST OF ALL SUBSTITUTIONS.

**************************
DO YOU WISH TO DELETE ANY OF THIS OUTPUT?
N

ONE PART OF THE CONSUMER RISK OUTPUT IS A LIST OF
THOSE CONSUMERS WHO ARE AT A CERTAIN RISK.

**************************
DO YOU WISH TO KEEP THIS PART OF THE OUTPUT?
Y
ENTER THE RISK VALUE FOR THIS OUTPUT.
.01


NOW WE MUST DEFINE THE ACTUAL OUTPUT GROUPS THAT
YOU WISH TO EXAMINE.  FOR THE DEFAULT GROUPS SEE THE
USER GUIDE.

**************************
DO YOU WISH TO ADD ANY OUTPUT GROUPS?
IF SO, ENTER Y AND THEN THE NUMBER OF GROUPS YOU WISH TO
ADD.  IF NOT, ENTER N AND THEN 0 (ZERO).
Y,1


FOR EACH GROUP WE MUST PUT IN OR TAKE OUT CERTAIN
VARIABLES.  THESE VARIABLES (IN ORDER) ARE:
MALE, FEMALE, SEX NOT RECORDED, LOWEST AGE, UPPER AGE,
AGE NOT RECORDED, AND  NON-EATERS.

FOR EACH GROUP ENTER 1 FOR IN OR 0 FOR OUT FOR EACH
 VARIABLE.  FOR AGE VARIABLES ENTER THE APPROPRIATE
NUMBER.


ADDITIONAL GROUP NUMBER   1
**************************************************
MALE
1
FEMALE
1
SEX NOT RECORDED
1
LOWER AGE LIMIT
0
UPPER AGE LIMIT
13
AGE NOT RECORDED
0
```

```
NONEATERS
0
**************************************************

THIS RUN IS ENTITLED
SECOND RUN FOR USER'S GUIDE

TO COMPLETE THIS RUN OF THE MODEL
               ENTER;  CRUN FINISH

*CRUN FINISH

*CARDIN
*REMOVE CLEARFILES
*RUN 66DC70CNA/JCL/MAINPROG
  SNUMB # 6929C
*JSTS 6929C
6929C EXECUTING
*BYE

CP DISCONNECTS



NPS DISCONNECTS
```

```
     L-   29  02/19/80 19:06:08
106 40460
STATION L-   CONNECTED ON NPS LINE 45


USOPM TIME SHARING  02/19/80 AT 19.113  CHANNEL 4352

USER ID -66DC70CNA
PASSWORD--
[illegible]

[illegible]
*$IS 6929C
6929C OUTPUT WAITING     ID=2+.
*$RUN PRINT

*CONVERT 66DC70CNA/FILE/OUTPUT=*
*EDIT
-RS:/$/;5:/  /
 -DONE
 *LIST
```

THE TITLE OF THIS RUN IS SECOND RUN FOR USER'S GUIDE

TODAY'S DATE IS 02/19/80. THE TIME IS 15.882.

THIS RUN EXAMINES ONLY THOSE CONSUMERS WHO ATE SCALLOPS
OYSTERS
CRAB,KING
CRAB, OTHER THAN KING

THIS RUN EXAMINES ONLY THOSE CONSUMERS WHO LIVED IN AZ OH AK CA OR KY WA ME MD SC
THE CONSUMPTION OF OYSTERS WAS INCREASED BY 2.00 TIMES.

THE FREQUENCY OF CONSUMING SCALLOPS WAS INCREASED BY 2.00 TIMES.

SPECIES DATA ON MERCURY

SECOND RUN FOR USER'S GUIDE

NAME	# ON FILE	# PER WT&/OR LOC	ACTION LEVEL VALUE	# ABOVE	% ABOVE	EL	REJECTED #	REJECTED %	CONTAMINANT TOTAL	RANGE	MEAN/SD	LOCATION NAME	%
ABALONE	30.	30.	0.50	0.	0.	50.	0.	0.	30.	0.00	0.12 0.02/ 0.02		100.00
ANCHOVIES	80.	80.	0.50	0.	0.	50.	0.	0.	80.	0.01	0.21 0.04/ 0.04		100.00
BASS, SEA	53.	53.	0.50	1.	1.89	50.	0.	0.	53.	0.02	0.58 0.16/ 0.11		100.00
BASS, STRIPED	231.	231.	0.50	106.	45.89	50.	48.	20.78	183.	0.01	1.90 0.66/ 0.41		100.00
BLUEFISH	94.	94.	0.50	13.	13.83	50.	6.	6.38	88.	0.01	0.95 0.31/ 0.19		100.00
BLUEGILLS	49.	49.	0.50	4.	8.16	50.	3.	6.12	46.	0.02	0.80 0.23/ 0.14		100.00
BONITO (BELOW 3197 GMS)	239.	239.	0.50	0.	0.	50.	0.	0.	239.	0.00	0.47 0.30/ 0.07		100.00
BONITO (ABOVE 3197 GMS)	196.	196.	0.50	13.	6.63	50.	7.	3.57	189.	0.21	0.74 0.37/ 0.07		100.00
BUTTERFISH	91.	91.	0.50	0.	0.	50.	0.	0.	91.	0.00	0.19 0.02/ 0.03		100.00
CARP	52.	52.	0.50	1.	1.92	50.	1.	1.92	51.	0.01	0.49 0.17/ 0.12		100.00
CATFISH (FRESHWATER)	35.	35.	0.50	0.	0.	50.	0.	0.	35.	0.01	0.38 0.15/ 0.11		100.00
CATFISH (MARINE)	81.	81.	0.50	24.	29.63	50.	9.	11.11	72.	0.10	1.20 0.44/ 0.22		100.00
CLAMS	584.	584.	0.50	0.	0.	50.	0.	0.	584.	0.00	0.26 0.05/ 0.04		100.00
COD	134.	134.	0.50	2.	1.49	50.	1.	0.75	133.	0.00	0.58 0.12/ 0.09		100.00
CRAB,KING	93.	93.	0.50	0.	0.	50.	0.	0.	93.	0.00	0.24 0.07/ 0.04		100.00
CRAB, OTHER THAN KING	314.	314.	0.50	1.	0.32	50.	1.	0.32	313.	0.01	0.50 0.14/ 0.10		100.00
CRAPPIE	212.	212.	0.50	15.	7.08	50.	5.	2.36	207.	0.01	0.70 0.25/ 0.16		100.00
CROAKER	217.	217.	0.50	6.	2.76	50.	4.	1.84	213.	0.00	0.54 0.12/ 0.11		100.00
DOLPHIN	73.	73.	0.50	2.	2.74	50.	1.	1.37	72.	0.00	0.53 0.14/ 0.12		100.00
DRUMS	137.	137.	0.50	4.	2.92	50.	3.	2.19	134.	0.00	0.67 0.12/ 0.09		100.00
FLOUNDERS	1179.	1179.	0.50	3.	0.25	50.	3.	0.25	1176.	0.00	0.50 0.09/ 0.09		100.00
GROUPERS	928.	928.	0.50	368.	39.66	50.	186.	20.04	742.	0.02	1.93 0.50/ 0.27		100.00
HADDOCK	88.	88.	0.50	0.	0.	50.	0.	0.	88.	0.00	0.37 0.11/ 0.07		100.00
HAKE	426.	426.	0.50	1.	0.23	50.	1.	0.23	425.	0.	0.47 0.10/ 0.07		100.00
HALI4 BELOW 45360. GRAMS AT 99.89 %	152.	111.	0.50	4.	3.60	50.	3.	2.70	108.	0.02	0.59 0.12/ 0.09		100.00
HALI4 ABOVE 45360. GRAMS AT 0.11 %	152.	41.	0.50	3.	7.32	50.	3.	7.32	38.	0.08	0.42 0.20/ 0.09		100.00
HALI3 BELOW 45360. GRAMS AT 96.12 %	771.	453.	0.50	0.	0.	50.	0.	0.	453.	0.01	0.50 0.14/ 0.08		100.00
HALI3 ABOVE 45360. GRAMS AT 3.88 %	771.	318.	0.50	35.	11.01	50.	20.	6.29	298.	0.03	1.28 0.32/ 0.16		100.00
HAL2N BELOW 45360. GRAMS AT 96.23 %	243.	191.	0.50	27.	14.14	50.	8.	4.19	183.	0.01	1.23 0.29/ 0.28		100.00
HAL2N ABOVE 45360. GRAMS AT 3.77 %	243.	52.	0.50	24.	46.15	50.	12.	23.08	40.	0.09	1.46 0.48/ 0.35		100.00
HAL2S BELOW 27216. GRAMS AT 89.04 %	108.	81.	0.50	17.	20.99	50.	12.	14.81	69.	0.01	0.98 0.34/ 0.19		100.00
HAL2S ABOVE 27216. GRAMS AT 10.96 %	108.	19.	0.50	15.	78.95	50.	5.	26.32	14.	0.42	1.43 0.78/ 0.29		100.00
HERRING	272.	272.	0.50	0.	0.	50.	0.	0.	272.	0.00	0.26 0.02/ 0.04		100.00
KINGFISH	19.	19.	0.50	0.	0.	50.	0.	0.	19.	0.00	0.33 0.08/ 0.09		100.00
LOBSTER, NORTHERN (INSHORE)	770.	770.	0.50	121.	15.71	50.	68.	8.83	702.	0.04	1.60 0.29/ 0.20		100.00
LOBSTER, NORTHERN (OFFSHORE)	1199.	1199.	0.50	375.	31.28	50.	187.	15.60	1012.	0.03	1.90 0.42/ 0.28		100.00
LOBSTER, SPINY	65.	65.	0.50	0.	0.	50.	0.	0.	65.	0.01	0.37 0.11/ 0.09		100.00
MACKEREL, ATLANTIC	111.	111.	0.50	0.	0.	50.	0.	0.	111.	0.00	0.19 0.05/ 0.04		100.00
MACKEREL, JACK	29.	29.	0.50	1.	3.45	50.	1.	3.45	28.	0.01	0.45 0.25/ 0.13		100.00
MACKEREL, KING (GULF)	478.	478.	0.50	206.	43.10	50.	98.	20.50	380.	0.02	2.73 0.76/ 0.60		100.00
MACKEREL, KING (OTHER)	357.	357.	0.50	247.	69.19	50.	119.	33.33	238.	0.06	2.68 0.97/ 0.59		100.00
MACKEREL, SPANISH (GULF)	627.	627.	0.50	185.	29.51	50.	101.	16.11	526.	0.03	2.47 0.46/ 0.31		100.00
MACKEREL, SPANISH (OTHER)	369.	369.	0.50	34.	9.21	50.	16.	4.34	353.	0.00	1.61 0.29/ 0.25		100.00
MULLET	191.	191.	0.50	0.	0.	50.	0.	0.	191.	0.00	0.28 0.02/ 0.03		100.00
OYSTERS	260.	260.	0.50	0.	0.	50.	0.	0.	260.	0.00	0.45 0.03/ 0.04		100.00
PERCH (FRESHWATER)	147.	147.	0.50	19.	12.93	50.	8.	5.44	139.	0.01	0.88 0.26/ 0.18		100.00
PERCH (MARINE)	268.	268.	0.50	1.	0.37	50.	0.	0.	268.	0.00	0.59 0.13/ 0.12		100.00
PIKE	87.	87.	0.50	37.	42.53	50.	14.	16.09	73.	0.04	1.38 0.54/ 0.39		100.00
POLLOCK	227.	227.	0.50	6.	2.64	50.	4.	1.76	223.	0.00	0.95 0.11/ 0.13		100.00
POMPANO	61.	61.	0.50	0.	0.	50.	0.	0.	61.	0.00	0.42 0.10/ 0.09		100.00
ROCKFISH	451.	451.	0.50	69.	15.30	50.	32.	7.10	419.	0.02	0.89 0.30/ 0.21		100.00
SABLEFISH	102.	102.	0.50	11.	10.78	50.	6.	5.88	96.	0.00	0.70 0.24/ 0.18		100.00
SALMON	806.	806.	0.50	0.	0.	50.	0.	0.	806.	0.00	0.21 0.05/ 0.04		100.00
SCALLOPS	138.	138.	0.50	0.	0.	50.	0.	0.	138.	0.00	0.22 0.06/ 0.05		100.00
SCUP	73.	73.	0.50	1.	1.37	50.	0.	0.	73.	0.00	0.52 0.11/ 0.10		100.00
SHARKS	588.	588.	0.50	323.	54.93	50.	162.	27.55	426.	0.02	3.80 0.99/ 0.90		100.00

SHRIMP	353.	353.	0.50	0.	0.	50.	0.	0.	353.	0.00	0.33	0.05/	0.05	100.00
SMELT	53.	53.	0.50	0.	0.	50.	0.	0.	53.	0.00	0.06	0.02/	0.01	100.00
SNAPPER, RED	759.	759.	0.50	130.	17.13	50.	57.	7.51	702.	0.00	2.17	0.40/	0.30	100.00
SNAPPER, OTHER	327.	327.	0.50	56.	17.13	50.	28.	8.56	299.	0.02	1.56	0.30/	0.23	100.00
SNOOK	12.	12.	0.50	6.	50.00	50.	5.	41.67	7.	0.25	0.61	0.36/	0.13	100.00
SPOT	60.	60.	0.50	0.	0.	50.	0.	0.	60.	0.00	0.18	0.04/	0.04	100.00
SQUID AND OCTOPI	339.	339.	0.50	0.	0.	50.	0.	0.	339.	0.00	0.40	0.03/	0.04	100.00
SUNFISH	174.	174.	0.50	20.	11.49	50.	12.	6.90	162.	0.00	1.00	0.28/	0.16	100.00
SWORDFISH 1971	115.	115.	0.50	102.	88.70	50.	51.	44.35	64.	0.05	2.72	1.34/	0.52	100.00
SWORDFISH 1975	266.	266.	0.50	225.	84.59	50.	110.	41.35	156.	0.09	3.47	1.02/	0.60	100.00
SWORDFISH ALL	381.	381.	0.50	327.	85.83	50.	177.	46.46	204.	0.05	3.47	1.10/	0.57	100.00
TILEFISH	60.	60.	0.50	60.	100.00	50.	30.	50.00	30.	0.68	2.96	1.59/	0.63	100.00
TROUT (FRESHWATER)	528.	528.	0.50	121.	22.92	50.	72.	13.64	456.	0.00	1.08	0.35/	0.20	100.00
TROUT (MARINE)	201.	201.	0.50	22.	10.95	50.	7.	3.48	194.	0.00	0.91	0.21/	0.19	100.00
TUNA, LIGHT SKIPJACK	70.	70.	0.50	0.	0.	50.	0.	0.	70.	0.00	0.39	0.14/	0.09	100.00
TUNA, LIGHT YELLOWFISH	115.	115.	0.50	6.	5.22	50.	4.	3.48	111.	0.00	0.86	0.26/	0.15	100.00
TUNA, WHITE	76.	76.	0.50	5.	6.58	50.	1.	1.32	75.	0.04	0.90	0.34/	0.19	100.00
WHITEFISH	86.	86.	0.50	0.	0.	50.	0.	0.	86.	0.00	0.23	0.05/	0.05	100.00
OTHER FINFISH	180.	180.	0.50	8.	4.44	50.	6.	3.33	174.	0.00	0.72	0.23/	0.14	100.00

THIS SECTION LISTS THE SUBSTITUTIONS MADE BY SPECIES.

SCALLOPS A MEAN OF 0.500 AND A STANDARD DEVIATION OF 0.010 HAS BEEN SUBSTITUTED FOR THIS SPECIES

THE FOLLOWING OUTPUT ILLUSTRATES HOW A SPECIE WAS SUBSTITUTED FOR.

NOT REPORTED

7.95 %	BASS, SEA
2.30 %	CLAMS
7.95 %	COD
13.60 %	FLOUNDERS
7.95 %	HADDOCK
2.30 %	HERRING
2.30 %	OYSTERS
11.40 %	PERCH (FRESHWATER)
7.95 %	POLLOCK
11.40 %	SALMON
4.50 %	SHRIMP
7.55 %	TUNA, LIGHT SKIPJACK
8.36 %	TUNA, LIGHT YELLOWFISH
4.49 %	TUNA, WHITE

BUFFALOFISH

100.00 %	CARP

SWORDFISH

100.00 %	SWORDFISH ALL

OTHER SHELLFISH

0.20 %	ABALONE
12.00 %	CLAMS
0.60 %	CRAB,KING
5.80 %	CRAB, OTHER THAN KING
7.65 %	LOBSTER, NORTHERN (INSHORE)
1.35 %	LOBSTER, NORTHERN (OFFSHORE)
1.60 %	LOBSTER, SPINY
7.80 %	OYSTERS
63.00 %	SHRIMP

BONITO

84.00 %	BONITO (BELOW 3197 GMS)
16.00 %	BONITO (ABOVE 3197 GMS)

BASS

29.00 %	BASS, SEA
71.00 %	BASS, STRIPED

HALIBUT

42.90 %	HALIBUT 4

31.27 % HALIBUT 3
25.50 % HALIBUT 2N
0.33 % HALIBUT 2S

LOBSTER, NORTHERN

85.00 % LOBSTER, NORTHERN (INSHORE)
15.00 % LOBSTER, NORTHERN (OFFSHORE)

MACKEREL, OTHER THAN JACK

22.07 % MACKEREL, ATLANTIC
10.93 % MACKEREL, KING (GULF)
18.62 % MACKEREL, KING (OTHER)
31.98 % MACKEREL, SPANISH (GULF)
16.40 % MACKEREL, SPANISH (OTHER)

SNAPPER

70.00 % SNAPPER, RED
30.00 % SNAPPER, OTHER

TUNA, LIGHT

47.44 % TUNA, LIGHT SKIPJACK
52.56 % TUNA, LIGHT YELLOWFISH

SECOND RUN FOR USER'S GUIDE

THIS PAGE OF OUTPUT LISTS THOSE CONSUMERS AT A RISK OF 0.010

SEX INCLUDED	AGE ABOVE	AGE BELOW	AGE NOT RECORDED	NONEATERS	ADI (MCG/70KG)	RISK
M,F,NOT REC	0	100	IN	IN	25.00	0.010

ID	ST	SEX	AGE	DAILY INTAKE (MCG) AVE	ALLOWED	UPPER LIMIT	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH	FISH EATEN	GRAMS PER SERVING	SERVINGS PER MONTH
2042002	OH	F	45	35.02	21.07	37.35	TUNAL	127	21.0	FLOUN	236	10.0	SCALL	263	2.0
							FINFO	150	1.0	SHRIM	123	1.0			
2434301	OH	F	30	22.51	21.07	25.69	SHRIM	159	5.0	SNAPP	454	1.0	PERCM	397	1.0
							TUNAL	166	2.0	SCALL	318	2.0	FINFO	179	1.0
3092312	CA	F	53	22.92	21.07	26.56	HALIB	271	7.0	SHRIM	211	4.0	CRABO	152	5.0
							SWORD	150	1.0	LOBSN	150	1.0	TUNAL	49	1.0
3092313	CA	F		23.71	21.07	27.24	HALIB	237	8.0	SHRIM	232	3.0	TUNAL	156	4.0
							CRABO	237	2.0	SWORD	150	1.0			

SECOND RUN FOR USER'S GUIDE

GROUP RISK
***** ****

SEX INCLUDED	LOWEST AGE	HIGHEST AGE	AGE NOT REC	NONEATERS	ADI (MCG/70KG)	TOTAL NO.
M F NR	0	100	IN	IN	25.00	795

	CONFIDENCE (BELOW ADI)						RISK (ABOVE ADI)					
	50%	70%	90%	95%	99%	99.9%	50%	30%	10%	5%	1%	.1%
% POPULATION	99.50	99.50	99.50	99.50	99.50	99.50	0.50	0.50	0.50	0.50	0.50	0.50

SEX INCLUDED	LOWEST AGE	HIGHEST AGE	AGE NOT REC	NONEATERS	ADI (MCG/70KG)	TOTAL NO.
M F NR	0	100	IN	OUT	25.00	795

	CONFIDENCE (BELOW ADI)						RISK (ABOVE ADI)					
	50%	70%	90%	95%	99%	99.9%	50%	30%	10%	5%	1%	.1%
% POPULATION	99.50	99.50	99.50	99.50	99.50	99.50	0.50	0.50	0.50	0.50	0.50	0.50

SEX INCLUDED	LOWEST AGE	HIGHEST AGE	AGE NOT REC	NONEATERS	ADI (MCG/70KG)	TOTAL NO.
M F NR	0	13	OUT	OUT	25.00	93

	CONFIDENCE (BELOW ADI)						RISK (ABOVE ADI)					
	50%	70%	90%	95%	99%	99.9%	50%	30%	10%	5%	1%	.1%
% POPULATION	100.00	100.00	100.00	100.00	100.00	100.00	0.	0.	0.	0.	0.	0.

BYE
**ON AT 19.207 - OFF AT 19.223 ON 02/19/80

CP DISCONNECTS

NPS DISCONNECTS