

Long-term Fish and Associated Environmental  
Data Management at the  
Rutgers University Marine Field Station

S.M. Hagan, K.W. Able, D.A. Witting, A.M. Muzeni, and J. McLellan

Marine Field Station  
Institute of Marine and Coastal Sciences  
Rutgers University  
800 Great Bay Blvd.  
Tuckerton, NJ 08087

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## INTRODUCTION

Data, both long and short term, are increasingly needed to evaluate the effects of habitat alteration, climate change, fishing activities, etc., in the fauna of estuarine and inner shelf waters. This is especially important for coastal marine laboratories (Gorentz 1992) because of the growth of human populations in coastal areas. In response, large quantities of biological data on estuarine and ocean fauna (primarily fishes and crabs) and associated physical data, have been collected since 1988 in a systematic fashion by personnel at the Rutgers University Marine Field Station (RUMFS), in southern New Jersey. These data have been collected in research conducted in a variety of surveys primarily within the Jacques Cousteau National Estuarine Research Reserve at Mullica River - Great Bay and within the Delaware Bay Estuary. General description of the objectives and methods for current surveys are available (<http://marine.rutgers.edu/rumfs/>). To maintain a high level of organization of these data allowing for its long-term use, a data-entry program, called TUCKFILE, is utilized. The purpose of this report is to provide supporting documentation for data entry, data correction and accessing data in TUCKFILE.

Although each survey program collects its own unique data, their basic elements are similar. These similarities are utilized in organizing TUCKFILE. TUCKFILE houses almost all of the data on fish and selected invertebrates, including abundance and length measurements and associated environmental data, collected by RUMFS personnel since 1988 (Table 1). In Appendix A, we present meta-data of surveys included within TUCKFILE. It is highly recommended that you review this Appendix before entering or accessing any data.

## ORGANIZATION OF TUCKFILE

TUCKFILE is a object-based relational data-entry program written in Corel Paradox<sup>®</sup> Version 8.0, but it can work in more advanced versions. All biological and related physical data are entered simultaneously in the program and are separated into four files (TUCKENV, TUCKTOW, TUCKABUN, TUCKLENG) that are linked through referential integrity (Fig. 1). These four files are “nested” within each other. TUCKENV are environmental data associated with a sampling event for a given survey, date, and location. For example, during otter trawl sampling environmental data are taken once at a location, but 3 or 4 trawls may be conducted at that location. TUCKTOW are data unique for a given tow at a specific location. For example, using the same example as above, each otter trawl tow will have its own line of data including time start, time end, tow length, macroalgal quantities, etc. TUCKABUN are data unique to a species collected within a particular tow including number and weight of each species. TUCKLENG are data unique to an individual for each species collected in a specific tow including length of each individual.

Although each file stands alone, each of these four data sets includes variables that are duplicated so that they can be merged together (Fig. 1). TUCKENV and TUCKTOW are linked with the variables “Survey”, “Date”, “Location” and “Time”. TUCKTOW, TUCKABUN, and TUCKLENG are linked by “Tow”. TUCKABUN and TUCKLENG are linked by tow number,

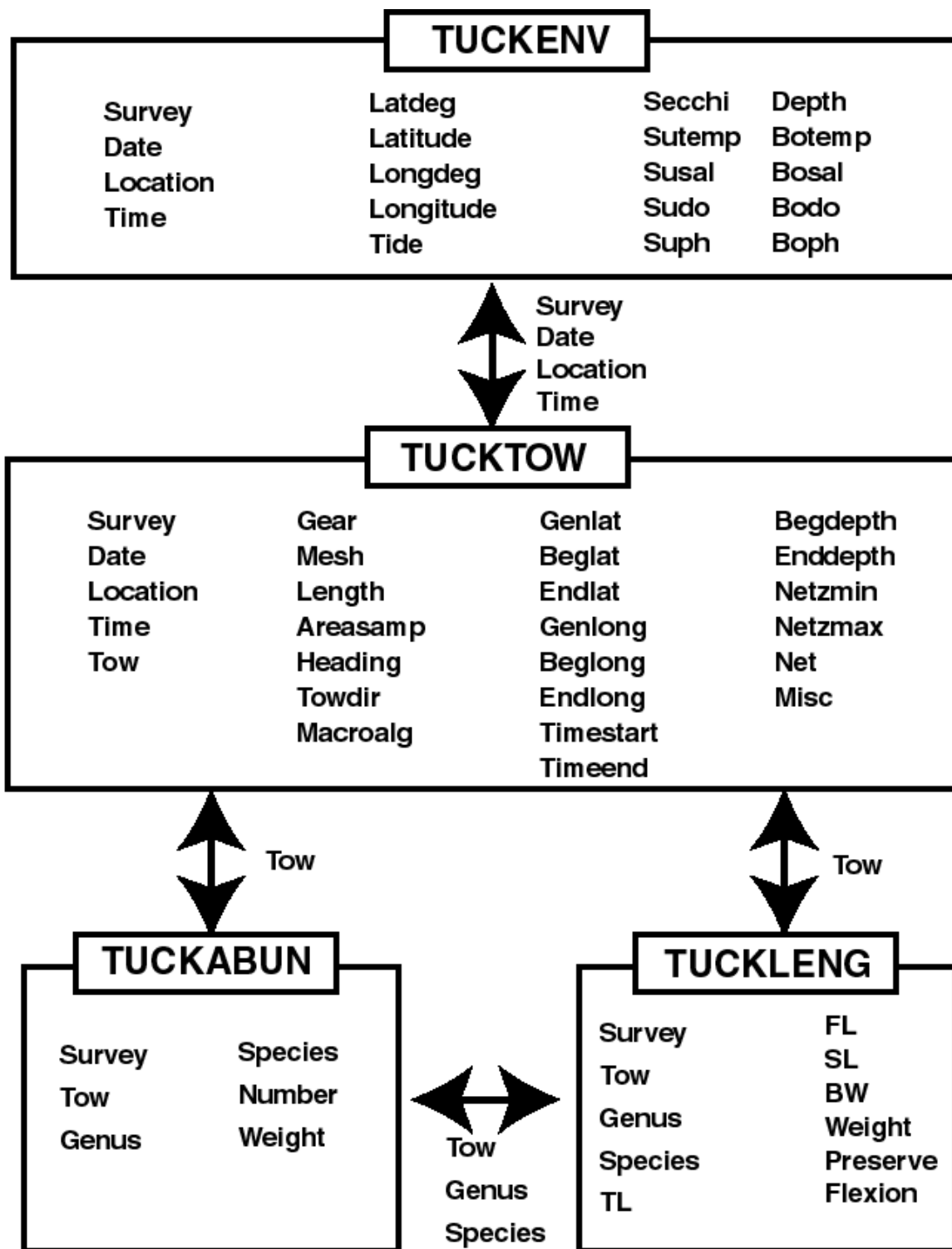


Figure 1. Schematic of TUCKFILE organization. There are four files (TUCKENV, TUCKTOW, TUCKABUN, TUCKLENG). Within each box, there is a list of the variables included in each respective TUCKFILE file. Arrows indicate linkages between files due to the listed overlapping variables.

genus, and species. The referential integrity, the above-mentioned links, within the data-entry program limit any major errors while data are entered.

## DATA ENTRY

### Initial set-up

The first step in entering data into TUCKFILE is to assign a computer. It is important to note that each computer can only be a port to enter one survey data set at a time. This is because raw, unchecked, and uncorrected data remain on that computer until the data are corrected and downloaded to the master TUCKFILE (see below). Once data are downloaded and cleared from the computer in which data were entered, the computer can then be reassigned as a port to enter data collected in another survey.

To enter data into TUCKFILE, two programs must be installed on the computer: 1) Corel Paradox<sup>®</sup> Version 8.0 or higher and 2) the data-entry program and associated files (Table 2) located in C:\NEW TUCKFILE. Also, computer must have DELLSERVER mapped as "T:\".

### *Setting up Corel Paradox<sup>®</sup>*

The first step in setting up Paradox<sup>®</sup> is to install it and create the local configuration for network use (only in Version 8.0). This can be accomplished by the following:

1. Run the "BDE Configuration Utility" by choosing "Corel Paradox 8 | Tools | Database engine 4.0".
2. Choose the "Drivers | Native | Paradox" on file tree.
3. Change "Net Drive" to "T:\"

The final step in setting up Paradox<sup>®</sup> is to set up the "Aliases" so that the TUCKFILE program knows where to look for specific files. When Paradox<sup>®</sup> is installed or if it ever needs to be reinstalled on a computer, these aliases need to be created. Creation of aliases can be accomplished by the following:

1. Open Paradox<sup>®</sup>.
2. In the toolbar menu, select "Tools" then "Alias Manager..."
3. In pop-up box, select "New".
4. In "Database alias" type "LONGTERM".
5. Leave "Driver type" as "STANDARD".
6. In "Path" type "T:\TUCKFILE\_MASTER\LONGTERM".
7. Push "OK".
8. In box that pops up, "Okay to save data alias....", push "YES".
9. Need to repeat steps 2-8, seven more times. During each time, you must change what is typed at step 4 and step 6 to the following:
  - 1<sup>ST</sup> TIME: step 4 "master", step 6 "T:\tuckfile\_master"
  - 2<sup>ND</sup> TIME: step 4 "pseg", step 6 "T:\tuckfile\_master\pseg"

- 3<sup>RD</sup> TIME: step 4 “shorttermad”, step 6 “T:\tuckfile\_master\shortterm a-d”  
 4<sup>TH</sup> TIME: step 4 “shorttermek”, step 6 “T:\tuckfile\_master\shortterm e-k”  
 5<sup>TH</sup> TIME: step 4 “shorttermlr”, step 6 “T:\tuckfile\_master\shortterm l-r”  
 6<sup>TH</sup> TIME: step 4 “shorttermsz”, step 6 “T:\tuckfile\_master\shortterm s-z”  
 7<sup>TH</sup> TIME: step 4 “tuckfile”, step 6 “C:\new tuckfile”

10. At this point all the necessary aliases for entering data in to TUCKFILE have been created.

### *Other necessary files*

In the directory C:\NEW TUCKFILE, there are files containing the forms for data entry and files associated with data and referential integrity (Table 2). A shortcut can be created to C:\NEW TUCKFILE\Tuckfile.fsl for each computer in which data are to be entered. In addition to the files located in C:\NEW TUCKFILE\, the computer in which data are being entered must be networked to DellServer because the data entry program accesses some files from the server during entry. These files include: T:\TUCKFILE\_MASTER\ Source.db (contains list of possible surveys and associated locations), Towlist.db (keeps record of last tow number used within each survey and year) and Tuckspec.db (list of species currently entered in TUCKFILE).

### **Entering Data Step-by-step**

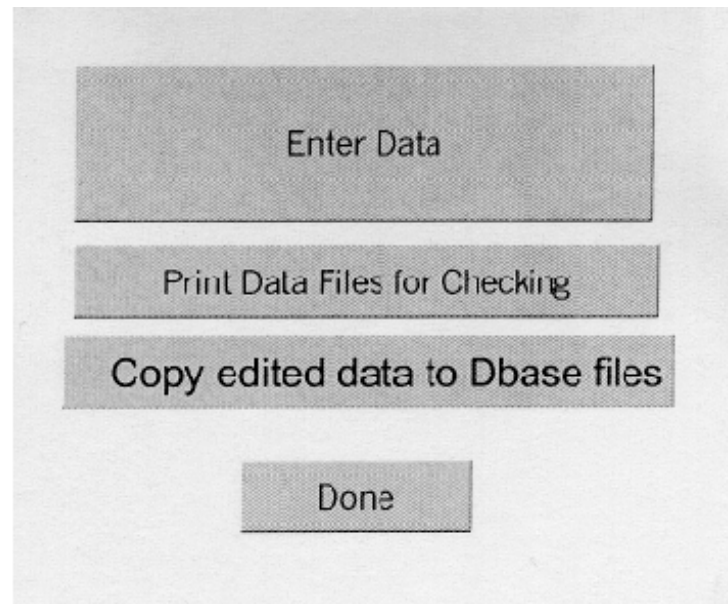
Before sitting down at a computer it is suggested that you read through all raw data sheets to make sure all information is recorded in appropriate locations on data sheets and all values are calculated, such as subtracting beginning meter count from ending count to get difference for each tow. To facilitate data proofing, it is recommended that data are organized and entered in the following manner: chronological by date, then alphabetized by location, and then numerical by time. TUCKFILE will orient data in this manner in TUCKENV regardless of how you enter it. If you organize it before entering then data sheets will be organized in proper order for proofing data.

Entering data with the TUCKFILE program is fairly easy if you take your time. Below is a step-by-step explanation of how to enter data. If you have any questions, do not hesitate to ask someone.

11. Open TUCKFILE with icon on computer’s desktop on which you are assigned.
12. Select “Enter data” (Fig. 2).

In “Location Information” box (Fig. 3)...

13. Select “New Location” - this clears all fields.
14. Double click on box next to “Survey”. A drop down menu containing all surveys entered in TUCKFILE appears. Select survey you are entering. If it does not exist, select “New Survey” and type survey name into box.
15. Enter “Date” in date box (eg. MM/DD/YYYY).



The image shows a simple graphical user interface for the TUCKFILE form. It consists of four rectangular buttons arranged vertically. The top button is labeled "Enter Data". The second button is labeled "Print Data Files for Checking". The third button is labeled "Copy edited data to Dbase files". The bottom button is labeled "Done". All buttons have a light gray background and a thin black border.

Figure 2. Initial TUCKFILE form. Using the button on this form opens other forms, including forms to "Enter data" (Fig. 3), "Print data files for checking" (Fig. 7) and "Copy edited data to dBase files" (i.e. downloading).

The screenshot displays the TUCKFILE form interface with several components:

- Location Information Box (pop-up):** Contains fields for Latitude (Degrees and Minutes) and Longitude (Degrees and Minutes), with a "Done" button.
- Main Form:**
  - Location Information:** Includes "New Location" and "Lat/Long" buttons. Fields include SURVEY, DATE, LOCATION, TIME, SECCHI, Tide, and DEPTH.
  - Environmental Data:** A table for Surface and Bottom measurements:
 

	Surface	Bottom
Temperature	<input type="text"/>	<input type="text"/>
Salinity	<input type="text"/>	<input type="text"/>
Dissolved Oxygen	<input type="text"/>	<input type="text"/>
pH	<input type="text"/>	<input type="text"/>
  - Tow Information:** Includes "Number of tows (data entry only)" set to 0, and fields for TOW, Misc. Tow?, Gear, MESH, LENGTH, and MACROALG. An "ENTER SPECIES" button is present.
  - Tow Information Box (pop-up):** Contains fields for AREA SAMP, HEADING, TOWDIR, METERCT, and Meter Type. It includes buttons for "Enter time, depth and Lat/Long", "Enter Tucker Trawl Info", "New Tow", and "Done".
  - NETZMIN/NETZMAX/NET (pop-up):** Contains fields for NETZMIN, NETZMAX, and NET, with a "Done" button.

Dotted lines indicate the flow of pop-up windows: from the "Lat/Long" button to the "Location Information Box", from the "New Tow" button to the "Tow Information Box", and from the "Enter Tucker Trawl Info" button to the "NETZMIN/NETZMAX/NET" box.

Figure 3. TUCKFILE form accessed by using "Enter Data" button (Fig. 2). Dotted lines indicate windows that pop-up when button is pushed. Variables in "Location Information" box are part of TUCKENV and variables in "Tow Information" box are part of TUCKTOW (Table 2).

16. Double click on box next to “Location”. A drop-down menu containing all locations entered in TUCKFILE for that survey appears. Select location wanted. If location does not exist, select “New Location” and type location name into box.
17. Enter “Time” in time box (e.g. 0000-2359).

\*\*\*\***IMPORTANT**\*\*\*\*

**STEPS 4 - 7 must have values or data entry can not continue.**

18. All other values in “Location Information” box are optional. See Table 3 for description of variables.

Below “Location Information” box (Fig. 3)....

19. Enter number of tows associated with the environmental data entered at **Steps 4-8** at “Number of tows (data entry only)”.
  - a. This acts as a counter to allow entry of a specific number of tows under this particular data entry line. For example, if there are four otter trawl tows for a particular date, location, and time, then “4” would be entered at this step.
  - b. Every time you select “New Tow” (**Step 10**), this counter will count down. When it comes to “0”, it will alert the enterer that there are no tows left for this environmental line.
    - i. If you have more tows to enter for this environmental line, re-enter that number.
    - ii. Otherwise, select “New Location” (**Step 3**) and begin entering new environmental information.

In “Tow Information” box (Fig. 3)....

20. Select “New Tow” button which has TUCKFILE “create” a unique tow identification number for this tow. It takes the first four letters of the survey name, the last two numbers of the year, and adds one to last number entered for that survey and year. For example, the first tow enter for survey = “OTTER” during the year 2000 is tow number “OTTE-00-0001”. The second tow number in that same survey and year would be “OTTE-00-0002”. NOTE: Skipping tow numbers does not create problems. The number is just meant to be a unique identifier.
21. All other variables in the “Tow Information” box are optional. See Table 3 for a description of variables.
22. Do you have species collected in this tow?
  - a. If yes, then select “Enter species” button and continue to **Step 13**.
  - b. If no and you have more tows to enter for this date, location and time, go back to **Step 10**.
  - c. If no and you have no more tows to enter for this date, location, and time, go back to **Step 3**.
  - d. If you are done entering this session go to **Step 24**.
13. After selecting “Enter Species” button, a new window pops-up (Fig. 4).
14. Enter the first letter of the genus name in “Select species”.

The image displays the TUCKFILE form interface, which is divided into several sections:

- Location Information:** Includes fields for SURVEY (Somewhere), DATE (12/05/1963), LOCATION (Somewhere), and TIME (1200). It also has a 'New Location' button and a 'Lat/Long' section.
- Water Quality Data:** A table with columns for 'Surface' and 'Bottom' rows, containing fields for Temperature, Salinity, Dissolved Oxygen, and pH.
- Tow Information:** Contains fields for TOW (Some-63-0001), Misc. Tow?, Gear, MESH, LENGTH, and MACROALG. It also has an 'ENTER SPECIES' button.
- Abundance box:** A pop-up window accessed from the 'ENTER SPECIES' button. It includes a 'Done' button, a 'LENGTHS' dropdown, an 'Another?' button, a 'Select species' dropdown, and input fields for 'Number' and 'Weight'.
- Enter New Lengths:** A pop-up window accessed from the 'Abundance box'. It includes a 'Done' button, SURVEY (Somewhere), IND# (1.00), TOW (Some-63-0001), and a species name field containing *Fistularia tabacaria*. Below this are several pairs of input fields and labels: SL, TL, FL, BW, WEIGHT, Preservative, Flexion, and Sex.

Dotted lines indicate the flow of the user interface: from the 'ENTER SPECIES' button to the 'Abundance box', and from the 'Abundance box' to the 'Enter New Lengths' window.

Figure 4. TUCKFILE form highlighting the "Enter Species" button. This is accessed from "Tow Information" box (Fig. 3). Dotted lines indicate windows that pop-up when button is pushed. Variables in "Abundance" box are part of TUCKABUN and variables in "Enter New Lengths" box are part of TUCKLENG (Table 2).

15. A drop-down window appears listing all genera beginning with the letter entered. Select genus name. Another drop-down window appears listing all species names associated with selected genus. Select species name. If genus name is not listed, double check spelling (see Robins et al. 1991). If spelling is correct then it will need to be typed in and added to list by using the following.
  - a. Select “New Genus” and a new window will pop-up (Fig. 5). Type in new genus and species. Be sure to spell it correctly. Capitalize first letter in genus name, all others are lower case.
  - b. Select “Done” button to return to abundance box.
16. Enter Number and /or weight (g) for selected species.
17. Do you have Lengths to enter for selected species?
  - a. If yes, then select “Lengths” button and continue to **Step 18**.
  - b. If no and you have more species to enter for this tow then select “Another” button and go back to **Step 14**.
  - c. If no and you have no more species to enter for this tow then select “Done” button and go back to **Step 12**.
18. After selecting “Lengths” button, length window pops up (Fig. 4).
  - a. The top section lists the survey, tow number, and species name.
  - b. “IND #” is a counter to keep track of how many lengths were entered in case you become distracted while entering.
  - c. Buttons running down right side of box allow the data entry person to temporarily “turn off” boxes which will not be used during their session. Simply click on buttons you do not want to appear and re-click on them to have them reappear.
19. Enter individual data for appropriate variables. See Table 3 for description of how to enter values.
20. Hit the “enter” key on keyboard to clear screen and enter more lengths.
21. After last length, hit the “enter” key on keyboard TWICE.
22. Red box pops-up “Finish Entering?”.
  - a. If done entering lengths for this species, select “yes” which will return you to the abundance box (Fig. 4) and continue to **Step 23**.
  - b. If not, select “no” and continue entering lengths.
23. Do you have any more species to enter?
  - a. If yes, then select “Another” button and go back to **Step 14**.
  - b. If not, then select “Done” button and go back to **Step 12**.
24. If you have come to a stopping point and want to end this session, then select “done” at the bottom the “Tow Information” box (Fig. 3). Select “done” again on opening window to exit TUCKFILE (Fig. 2).

### Variable formats

Table 3 lists the format and definition of each variable entered in TUCKFILE. In rare instances, some surveys did not enter data for variables as defined. Be sure to see TUCKFILE metadata (Appendix A) before entering or accessing any data.

The image shows a complex data entry form for TUCKFILE. It is divided into several sections:

- Location Information:** Includes fields for SURVEY (Somewhere), DATE (12/05/1983), LOCATION (Somewhere), TIME (1205), SECCHI, Tide (dropdown), and DEPTH.
- Temperature:** Fields for Surface and Bottom.
- Number of tows (data entry only):** A field with the value 0.
- Tow Information:** Includes TOW (Some-63-0002), Misc. Tow? (0), Gear (dropdown), MESH, LENGTH, MACROALG, AREA SAMP, HEADING, TOWDIR, METERCT, Meter Type (dropdown), and buttons for "Enter time, depth and Lat/Long", "Enter Tucker Trawl Info", "New Tow", and "Done".
- ENTER SPECIES:** A button at the bottom left.

A pop-up window is overlaid on the form, containing the following text and fields:

**This is a new entry into the species list so be SURE that you spell it correctly!!!!**

Genus:

species:

Done

Below the pop-up window, there is another section with buttons for "Done", "LENGTHS", "Another?", "Select species" (dropdown), "Number" (input), and "Weight" (input). An arrow points from the "ENTER SPECIES" button in the main form to the pop-up window.

Pop-up window to enter a new species

Figure 5. TUCKFILE entry form highlighting how to enter a new genus/species combination into TUCKFILE. This is accessed by selecting "New genus" from species drop-down menu while entering abundance information. See "Entering Data Step-by step" in text for details.

## PROOFING AND CORRECTING ENTERED DATA

Once all of the survey data is entered, it is time to proof data for errors. This is an important step in the data-entry process. It is recommended to proof data, make corrections electronically, and proof data a second time before data are downloaded (see below) to the Master TUCKFILE database on DellServer.

### Printing data

In order to proof the data that were entered, you'll need to print it out. TUCKFILE has standard reports formatted to make this process easy.

1. Open TUCKFILE form shortcut on desktop.
2. Set printer to print landscape.
  - a. Select "File" in the Paradox<sup>®</sup> menu list.
  - b. Select "Print...".
  - c. Select "Properties" button.
  - d. Select "Basics" tab.
  - e. Change Orientation to "Landscape".
  - f. Select "OK" and then "Close".
3. On TUCKFILE form (Fig. 2), select button "Print data files for checking"
4. In window that pops up (Fig. 6), there are buttons to print out each of the data files (TUCKENV, TUCKTOW, TUCKABUN, TUCKLENG) created by TUCKFILE. Due to page size restrictions, TUCKENV and TUCKTOW are each separated into 2 print options.
  - a. "TUCKENV - water quality" prints all variables in TUCKENV except those associated with Latitude and Longitude (see Table 3).
  - b. "TUCKENV - lat/long fields" includes variables associated with Latitude and Longitude (see Table 3), Survey, date. Location, and time.
  - c. "TUCKTOW - common fields" includes variables commonly used in data entry including the variables: tow, date, location, time, time start (TIMESTAR), time end (TIMEEND), gear, mesh, length, area sampled (AREASAMP), meter count (METERCT), meter type (METERTP), beginning depth (BEGDEPTH), ending depth (ENDDEPTH), miscellaneous (MISC).
  - d. "TUCKTOW - all other fields" includes any variables not listed in **Step 4c** (see Table 3) plus tow number.
  - e. "TUCKABUN - all fields" prints all TUCKABUN variables (see Table 3).
  - f. "TUCKLENG - all fields" prints all TUCKLENG variables (see Table 3).
5. Select "Done" to close the Print window (Fig. 6).
6. Select "Done" to close TUCKFILE window (Fig. 2).

The image shows a graphical user interface for printing Tuckfile component data sets. At the top, a large title box reads "Print Tuckfile Component Data Sets for Checking". Below this, there are several buttons arranged in a grid. The first row contains "TuckEnv - water quality" and "TuckEnv - lat/long fields". The second row contains "TuckTow - common fields" and "TuckTow - all other fields". The third row contains a single button "TuckAbun - all fields". The fourth row contains a single button "TuckLeng - all fields". At the bottom center, there is a "Done" button.

Figure 6. TUCKFILE entry form to print data for proofing. This is accessed from the initial TUCKFILE form (Fig. 2). See "Proofing and Correcting Entered data" in text for details.

## Proofing

After printing the data, you can now proof the data against the raw data sheets. This is best completed by two people, one reading aloud off the raw data sheets and the other following along with the printout. It is recommended to check all of the environmental data (TUCKENV), then tow data (TUCKTOW), then abundance data (TUCKABUN), and then finally the length data (TUCKLENG). Due to the inherent linkages between these data sets, errors can flow down through each.

TUCKFILE organizes the raw data that are entered into the program. Therefore some data may not be in the exact order as entered from the data sheets. TUCKENV is in chronological order by date, alphabetical order by location, and numerical order by time. TUCKTOW is in order of tow number (i.e. the order that tows were entered). TUCKABUN is in order of tow number and then alphabetized by genus and species. TUCKLENG is in order of tow number, then alphabetized by genus and species, and lengths are in the order they were entered.

## Electronic corrections

Almost all of the electronic correction of data should be done within the TUCKFILE forms. The forms are programmed to make some corrections easier without more errors occurring. It is rare that corrections should be done within the tables.

### *Editing TUCKENV*

1. **To correct value in environmental record...** (e.g. entered wrong salinity value)
  - a. Have cursor in the large "Location" box on the data entry form.
  - b. Use the "page up" and "page down" arrows to get to the "Survey", "Date", "Location", and "Time" combination that has a value that needs to be edited.
  - c. Select wrong value and type correct value.
  - d. Note: Changes to "Survey" cascade through to TUCKTOW, TUCKABUN, and TUCKLENG. Changes to "Date", "Location", and "Time" cascade through to then respective variables in TUCKTOW. Changes to "Survey" and the year value in "Date" cascade into creation of the "Tow" number. For example, if the data were entered SURVEY = "ICHPLAN" and date= "12/05/1963", the tow number made is "ICHP-63-#####". If date was revised to SURVEY= "OTTER" and date = "12/05/2003", then the tow number is changed to "OTTE-03-#####". The ##### gets reassigned to the next number available in the survey/year combination.
2. **If an environmental line needs to be added....**
  - a. Select "New Location" button (Fig. 3).
  - b. Follow the directions at **Step 4** through **Step 8** under "**Entering Data Step-by-step**" (see above) If tow, abundance, and length information were also not

- entered, continue through to **Step 23**.
3. **If an environmental line needs to be deleted....**
    - a. All associated data needs to be deleted first including tows, abundance and lengths (TUCKFILE will give an error stating “Master record has details. Can not delete or modify” to alert you that there are associated records).
    - b. Follow **Steps 1a - 1b** under this heading.
    - c. Double click on the tow number and a window pops up (Fig. 7).
    - d. Use the “page up” and “page down” arrows to determine which species are entered for that tow.
    - e. Select “Delete Species” for each of the species (NOTE: Deletion of species in TUCKABUN will also delete length lines associated with that species in TUCKLENG).
    - f. A box appears confirming the selection.
      - i. Select “Yes” if you want to delete the species from the tow.
      - ii. Select “No” if you do not want to delete it.
    - g. **Steps 3d - 3f** will have to be repeated for all species entered in this tow.
    - h. Then have cursor in large “Tow Information” box and hit the “Ctrl” and “Delete” button at the same time on the key board. This deletes tow record.
    - i. **Steps 3b - 3h** under this heading will have to be repeated for each tow associated with the environmental line that needs to be deleted.
    - j. Once all tows, abundance, and length lines associated with the environmental line are deleted, move cursor to “Location Information” box and hit the “Ctrl” and “Delete” button at the same time on the key board. This deletes this environmental record.

### *Editing TUCKTOW*

1. **To correct value in entered tow record** (e.g. entered wrong gear)...
  - a. Have cursor in the large “Location” box on the data entry form.
  - b. Use the “page up” and “page down” arrows to get to the “Survey”, “Date”, “Location”, and “Time” combination that has something that needs to be edited.
  - c. Then move cursor to large “Tow” box.
  - d. Use the “page up” and “page down” arrows to locate the tow that needs to be edited.
  - e. Select wrong value and type correct value.
2. **If a tow line needs to be added....**
  - a. Follow Steps 1a - 1b under this heading to get to the “Survey”, “Date”, “Location”, and “Time” combination that has something that a tow needs to be added.
  - b. Follow the directions at **Steps 10 - 11** under “**Entering Data Step-by-step**” (see above). If abundance and length information were also not entered, continue through to **Step 23**.
3. **If a tow record needs to be deleted....**
  - a. All associated data needs to be deleted first including abundance and lengths (TUCKFILE will give an error stating “Master record has details. Can not delete or modify” to alert you there are associated records).

Location Information

New Location

SURVEY: Somewhere

DATE: 12/05/1963

LOCATION: Somewhere

TIME: 1200

Lat/Long

SECCHI:

Tide:

DEPTH:

	Surface	Bottom
Temperature	<input type="text"/>	<input type="text"/>
Salinity	<input type="text"/>	<input type="text"/>
Dissolved Oxygen	<input type="text"/>	<input type="text"/>
pH	<input type="text"/>	<input type="text"/>

Number of tows (data entry only)

Tow Information:

TOW: Some-63-0001

Misc. Tow?

Gear:

MESH:

LENGTH:

MACROALG:

ENTER SPECIES

LENGTHS Done

*Fistularia*

*tabacaria*

NUMBER:

WEIGHT:

TOW: Some-63-0001

Change species name

Delete species

Window for making most corrections to TUCKABUN and TUCKLENG

Figure 7. TUCKFILE entry form highlighting how to make most electronic corrections in TUCKABUN and TUCKLENG. This pop-up window is accessed by double clicking on the tow number. See "Proofing and Correcting Entered data" in text for details.

- b. Follow **Steps 1a - 1b** under this heading to highlight record in question.
  - c. Follow directions from **Steps 3c through 3h** under the heading “Electronically editing - Editing TUCKENV”.
4. **If a tow record was entered under the wrong environmental line** (e.g. with the wrong “Survey, date, location, or time” information)....
- a. If line with correct “Survey, date, location, or time” information already exists in TUCKENV, then ...
    - i. Open TUCKTOW table through “Project viewer” in Paradox<sup>®</sup>.
    - ii. Hit F9 key to put screen in edit mode.
    - iii. Carefully enter the correct “Survey, date, location and time” for tow that needs to be edited.
    - iv. Close table and changes are automatically saved.
  - b. If line with correct “Survey, date, location, or time” information **does not** exist in TUCKENV, then do...
    - i. Select “New Location” button on forms.
    - ii. Enter new environmental information.
    - iii. Close forms by selecting “Done”.
    - iv. After returning to TUCKFILE beginning screen (Fig. 2), follow **Steps 4a i- 4a iv** under this heading.

### *Editing TUCKABUN*

1. **If the abundance or weight value needs to be changed** (e.g. A “2” was enter when actually “12” individuals were collected)....
  - a. Follow **Steps 1a - 1d** under the heading “Electronically editing - Editing TUCKTOW”.
  - b. Double click on the tow number and a window pops up (Fig. 7).
  - c. Use the “page up” and “page down” arrows to locate the species that needs to be edited.
  - d. Select wrong value and type correct value.
  - e. Select “Done” when completed.
2. **If a genus and species was entered but the names need to be changed** (e.g. “*Fundulus* sp.” was entered and it was later identified as “*Gobiosoma bosc*”) then....
  - a. Follow **Steps 1a - 1c** under this heading to get to the tow and species in question.
  - b. Select “Change Species” and a window appears.
  - c. In new window, type first letter of newly identified species name.
  - d. Follow the directions at **Step 15** under “**Entering Data Step-by-step**” (see above).
  - e. NOTE: These changes cascade through to TUCKLENG.
3. **If an abundance line needs to be added** then...
  - a. Follow **Steps 1a - 1d** under the heading “Electronically editing - Editing TUCKTOW”.

- b. Select “Enter species” button (Fig. 4).
  - c. Follow the directions at **Step 13** through **Step 16** under heading “**Entering Data Step-by-step**” (see above). If lengths for this species were also not entered, continue through to **Step 23**.
4. **If an abundance line needs to be deleted** then...
- a. Follow **Steps 1a - 1d** under the heading “Electronically editing - Editing TUCKTOW”.
  - b. Follow **Steps 3c - 3f** under the heading “Electronically editing - Editing TUCKENV”.

### *Editing TUCKLENG*

1. **If the length value needs to be changed** (e.g. Length was entered as “2” when actually it was “20”)....
  - a. Follow **Steps 1a - 1d** under the heading “Electronically editing - Editing TUCKTOW” to locate tow in which length value needs to be corrected.
  - b. Double click on the tow number and a window pops up (Fig. 7).
  - c. Use the “page up” and “page down” arrows to locate the species that needs to be edited.
  - d. Select “Lengths” button.
  - e. Use the “page up” and “page down” arrows to locate the length line that needs to be edited.
  - f. Select wrong value and type correct value.
  - g. Select “Done” when completed.
  - h. Select “Done” in abundance box.
2. **If a genus and species was entered but the names need to be changed** (e.g. “*Fundulus* sp.” was entered and it was later identified as “*Gobiosoma bosc*”) then follow **Steps 2a - 2g** under the heading “Electronically editing - Editing TUCKABUN”(see above).
3. **If a specific length for a species needs to be deleted...**
  - a. Follow **Steps 1a - 1e** under this heading.
  - b. Hit the “Ctrl” and “Delete” buttons at the same time on the keyboard. This deletes the highlighted length record.
  - c. Select “Done” when completed.
  - d. Select “Done” in abundance box.
4. **If all lengths for a species need to be deleted**, follow **Steps 4a - 4b** under the heading “Electronically editing - Editing TUCKABUN”(see above).
5. **If lengths need to be added for a species not yet entered for a specific tow in TUCKABUN**, follow **Steps 3a - 3c** under the heading “Electronically editing - Editing TUCKABUN”(see above).
6. **If lengths need to be added for a species currently entered for a specific tow in TUCKABUN....**
  - a. Follow **Steps 3a - 3b** under the heading “Electronically editing - Editing TUCKABUN” (see above).

- i. Select species that is currently entered.
- ii. Enter new abundance value. There will be a list of questions posed to you. Depending on how you respond. The previously entered abundance value remain the same or be altered.
- b. Window pops up: “Do you want to see existing Record?” Select “Yes”.
- c. Shows existing record. Select “Okay”.
- d. “Do you want to add the new entry to the existing abundance record?”
  - i. Select “Yes” if you want newly entered abundance value to be added to the previously entered value (e.g. previously you entered n=2 for *Gobiosoma bosc* but you newly entered n=3 because the value should actually be n=5 with additional lengths).
  - ii. Select “No” if you want previously entered value to remain the same.
- e. “Do you want to replace value in existing record?”
  - i. Select “Yes” if you want newly entered abundance value to replace the previously entered value (e.g. previously you entered n=2 for *Gobiosoma bosc* but you newly entered n=3 because the value should actually be n=3 with additional lengths).
  - ii. Select “No” if you want previously entered value to remain the same.
- f. “You have already entered ## lengths, would you like to enter anymore?”
  - i. Select “Yes” if you want to enter new lengths. Brings you to the length screen. Follow **Steps 18 through 22** under heading “Entering Data Step-by-step” (see above).
  - ii. Select “No” if you do not have any lengths to enter.

## DOWNLOAD

### Long-Term Data Storage

After data are corrected electronically in C:\NEW TUCKFILE on the computer on which data entry occurred, data are then ready to be merged with the master TUCKFILE database on DellServer (T:\TUCKFILE\_MASTER\). The master database is broken into six directories (LONGTERM, PSEG, SHORTTERM A-D, SHORTTERM E-K, SHORTTERM L-R, SHORTTERM S-Z). Each of these directories contains four data files (TUCKENV.dbf, TUCKTOW.dbf, TUCKABUN.dbf, TUCKLENG.dbf).

**LONGTERM** includes all data collected in long-term surveys (Table 1), including bridge sampling (survey=”ICHPLAN”), otter trawling in Mullica River, Great Bay, and Little Egg Harbor (survey=”OTTER”), and boat basin killitrapping (survey=”KILLI”).

**PSEG** includes data collected by otter trawl and weir during the fish utilization monitoring project funded by Public Service Enterprise Group.

**SHORTTERM A-D** includes data from short-term surveys which begin with the letters A- D. See Table 1 for complete list of surveys included.

**SHORTTERM E-K** includes data from short-term surveys which begin with the letters E-K. See Table 1 for complete list of surveys included.

**SHORTTERM L-R** includes data from short-term surveys which begin with the letters L-R. See Table 1 for complete list of surveys included.

**SHORTTERM S-Z** includes data from short-term surveys which begin with the letters S-Z. See Table 1 for complete list of surveys included.

**NOTE:**       **Data are still able to be corrected in master files after they are downloaded. However, since the four Paradox<sup>®</sup> data files lose all safeguards (i.e. referential integrity) once they are converted into dBase formatted files (.DBF), it is highly recommended to do all major editing in TUCKFILE program before data are downloaded. Corrections in master files should be reserved for minor revisions located after “Data verification” procedures are done (see below).**

### *Data Back-up*

All data files including master files (T:/TUCKFILE\_MASTER) and files on each entry port (C:/NEW TUCKFILE) are backed up on tape twice a week. There are two backup routines/schedules run, one of which includes the master files, the other includes all of the entry port files. At any given time there is approximately 2-3 months of current backup tapes available at RUMFS in the event of a necessary restoration of files. To ensure against catastrophe the two most current tapes (i.e. one with the master files and one with the entry port files) are kept at the home of the person in charge of the backup routine (currently A.M. Muzeni) and are switched out regularly. Additionally, for each year a quarterly set of tapes (the first two from January, April, July and October) are archived off the premises at the RUMFS dormitory. This backup routine started in 2000 and it is anticipated that only a 5 year set of tapes will be kept archived at the RUMFS dormitory.

### **How to Download**

1. Back-up of C:\NEW TUCKFILE should occur before data are downloaded. This can be done with normal Windows functions (ie. copy and paste in “My Computer”).
2. Open TUCKFILE using shortcut icon.
3. Select “Copy edited data to dBase” (Fig. 2)
4. Window pops up: “Are you sure? Did you back-up the data? See Manual”
5. Select “YES” (see above)
6. Window pops up: “Possible values: ”PSEG, SHORTTERM A-D, SHORTTERM E-K,

- SHORTTERM L-R, SHORTTERM S-Z, LONGTERM”
7. Select correct destination file (see above)
  8. Window pops up: “Is this (what you selected at **Step 6** under this heading) data?”
  9. If true, select “YES”, otherwise select “NO” start again at **Step 2** (under this heading).
  10. Files are automatically downloaded from C:\NEW TUCKFILE\ to T:\TUCKFILE\_MASTER\. Data are merged to the files in the directory chosen in **Step 6** (under this heading) and can be accessed as discussed below.
  11. When completed, Window pops up: “You have now downloaded the data”
  12. Select “OK”
  13. Window pops up: “Now that you have downloaded data, are you ready to clear the Paradox<sup>®</sup> files?”
  14. Select “YES” if you want to clear files located on C:\NEW TUCKFILE or select “NO” if you do not want this to occur. (If you select “YES”, the only way you can retrieve the Paradox<sup>®</sup> version of the data with the referential integrity intact is from the back-up. If you select “NO”, before you can continue entering data again, you will manually have to clear files using Paradox<sup>®</sup> functions.)
  15. Select “Done” (Fig. 2) to close TUCKFILE

To ensure that files were downloaded correctly, open T:\TUCKFILE\_MASTER\ and the directory to which the files were appended. Your downloaded data is located at the end of each of the four data files (TUCKENV.dbf, TUCKTOW.dbf, TUCKABUN.dbf, TUCKLENG.dbf). If it appears that not all of the data are there, there is a formatting issue in which entered values exceed size of the variable. See Table 3 for data-entry variable formats.

## ACCESSING DATA

All TUCKFILE data can be accessed in two ways: 1) copy and paste surveys of interest into a spreadsheet such as Microsoft Excel, or 2) writing programs using SAS. The latter is the suggested method of data access and will be discussed in detail in this section including sample programs for common routines.

The first step in accessing data is obtaining permission to use it. This can be done by contacting Kenneth W. Able at RUMFS (609-296-5260 ext. 230 or [able@imcs.rutgers.edu](mailto:able@imcs.rutgers.edu)).

### Access and View Files

TUCKFILE\_MASTER files can be accessed through SAS programming. To facilitate this, permanent ACCESS and VIEW files have been created and saved in each T:\TUCKFILE\_MASTER\ subdirectory (LONGTERM, SHORTTERM A-D, SHORTTERM E-K, SHORTTERM L-R, SHORTTERM S-Z, PSEG) for the four data files (TUCKENV,

TUCKTOW, TUCKABUN, TUCKLENG) contained within each. See Appendix B-1 for details to create SAS ACCESS and VIEW files. The access and view files are permanent, real-time links, so when corrections are made to the TUCKFILE\_MASTER files, they will be reflected by re-running any program. An autoexec.sas file (Appendix B-2) located at C:\Program Files\SAS Institute\SAS\V8\ is loaded on each computer in which SAS is installed. This file locates the subdirectories in which the access and view files reside.

To access the TUCKFILE\_MASTER data via SAS, just enter the libnames listed in Table 4. For example, the following program can access the PSEG - TUCKTOW data:

```
DATA TOW;
SET TUCKPSEG.TUCKTOW;
RUN;
```

If the TUCKFILE\_MASTER files are altered, i.e. variables are added / deleted or variable formats are changed, such as character length changed from 10 to 12 spaces, the access and view files need to be updated. This can be accomplished by running a program in SAS (see Appendix B-1).

### **Verification of data through SAS and editing TUCKFILE\_MASTER files**

Data entry, proofing, and correction through the TUCKFILE program nearly eliminates any serious data errors. However, minor errors can still be missed and it is highly recommended to run some data verification programs (see example at Appendix B-3) before utilizing the data. If errors are found, data need to be corrected in master files. However, since the four Paradox<sup>®</sup> data files lose all safeguards (i.e. referential integrity) once they are downloaded and converted into dBase formatted files (.DBF), it is imperative to understand the TUCKFILE organization before making any corrections.

**NOTE:** To make corrections to TUCKFILE\_MASTER DBF files, it must be done using Paradox. Spreadsheet programs such as Microsoft Excel are not capable of handling the volume of records found in these files. The “F9” key needs to be pushed to be in an editing mode. To insert lines, use “Insert” key. (Any inserted lines go to the bottom of the file.) To delete lines, have cursor on record and hit “Ctrl” and “Delete” keys at the same time. This marks a record for deletion, however, the file needs to be “packed” for record to be completely deleted and before changes will be seen in SAS.

To pack a dBase file in Paradox<sup>®</sup> (i.e. remove any records marked for deletion).

1. Open file in question in Paradox<sup>®</sup>.
2. Select “Format” from the menu.
3. Select “Restructure Table”.
4. In window that pops up, select “Pack table” (at bottom near save button)

5. Select “Save”

### **Typical data summary SAS programs**

Since all surveys in TUCKFILE have data entered in a similar format, it is possible to have base SAS programs that can output typical data summaries. These include effort table (Appendix B-4); species composition table (Appendix B-5); catch per unit effort figures, by groupings (Appendix B-6) and by species (Appendix B-7); length frequency distributions (Appendix B-8); length conversions (Appendix B-9); and flowmeter conversions (Appendix B-10). All of these base programs are available electronically (T:\TUCKFILE\_MASTER\SAS PROGRAMS). See individual appendices for file names.

In addition to these programs, a table (SCINAMES) is included which is very useful in data manipulation (Appendix B-11). This table was created from various sources including species currently entered into TUCKFILE, Able (1992), and Able and Fahay (1998). It can be merged in SAS by genus and species with either TUCKABUN or TUCKLENG to facilitate with spell checks on genus/species names (Appendix B-3); with ordering species phylogenetically (Appendix B-5), including order, family and common names; with grouping species by type (i.e. “Fish” or “Crab”; Appendix B-6); and with converting fish lengths (for select species) to a common denominator (i.e. change all lengths to total length, TL; Appendix B-9).

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**LITERATURE CITED**

Able, K.W. 1992. Checklist of New Jersey saltwater fishes. *Bulletin of New Jersey Academy of Science* 37(1): 1-11.

Able, K.W. and M.P. Fahay. 1998. *The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight*. Rutgers University Press, New Brunswick, New Jersey.

Robins, C.R., R.M. Bailey, C.E. Bond, J.R. Brooker, E.A. Lachner, R.N. Lea and W. B. Scott. 1991. *Common and scientific names of fishes from the United States and Canada*. American Fisheries Special Publication 20. Bethesda, Maryland.

Gorentz, J.B. 1992. *Data management at biological field stations and coastal marine laboratories*. Report of an invitational workshop April 22-26, 1990, W.K. Kellogg Biological Station, Michigan State University.

Table 1. List of surveys currently entered in TUCKFILE. See Appendix A-1 through A-24 for metadata about each survey. “RUMFS” is entered in principal investigators indicates that this project has had many investigators.

Tuckfile_master Subdirectory	Survey Name	Survey Description	Principal Investigators (besides K.W. Able)	Appendix Number	Duration of Survey (year)														
					88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
LONGTERM	ICHPLAN	ichthyoplankton	Witting	A-1		X	-	-	-	-	-	-	-	-	-	-	-	-	-
	KILLI	killitrap	RUMFS	A-2				X	-	-	-	-	-	-	-	-	-	-	-
	OTTER	otter trawl	Szedlmayer Martino	A-3	X	-	X						X	-	-	-	-	-	-
PSEG	PSEG	fish utilization	Grothues	A-4								X	-	-	-	-	-	-	
SHORTTERM A-D	ARMYCORPS	ACE ichthyoplankton	Muzeni	A-5								X	-	-	-	X			
	BEACHSUR	estuarine beach	Harowski Neuman	A-6							X	X							
	BEAMSUR	1m beam trawl	RUMFS	A-7					X	-	-	-	X						
	BFGILL	gill netting for piscivorous predators	Fox	A-8														X	-
	BIRDFISH	marsh pool and creek faunal survey	Hagan	A-9									X	X					
	BLUEFISH	inshore and offshore plankton and beach	Rowe	A-10												X	-	X	

Table 1. (Continued)

Tuckfile_master Subdirectory	Survey Name	Survey Description	Principal Investigators (besides K.W. Able)	Appendix Number	Duration of Survey (year)														
					88	89	90	91	92	93	94	95	96	97	98	99	00	01	02
	DIAZABLE	Essential Fish Habitat- offshore benthic	Diaz	A-11													X	-	X
SHORTTERM E-K	EXPTRAP	experimental trapping	RUMFS	A-12					X	-	-	-	-	-	-	-	-	-	X
	GEARCOMP	deep and shallow water gear comparison	RUMFS	A-13				X											
	HABTRAP	habitat trays	Bell	A-14										X	X				
	HOGISLND	<u>Spartina</u> and <u>Phragmites</u> - marsh surface/edge	Hagan	A-15										X	X			X	X
SHORTTERM L-R	LEODATA	offshore benthic sampling	McBride	A-16				X	-	-	X								
	LIGHTRAP	quatrefoil trapping in marsh pools	Hoppe	A-17					X										
	PITTRAP	<u>Spartina</u> and <u>Phragmites</u> - marsh surface	Hagan	A-18													X	X	
	POPNET	Estuarine pelagic fauna	Hagan	A-19								X	X						
	RECAPFUN	recapture effort for coded wire tag <u>Fundulus</u> in Schooner Creek	Vivian	A-20													X	X	



Table 2. List of files located in C:\NEW TUCKFILE. Files are separated by purpose including those associated with data and referential integrity and those associated with creating forms and tables for data entry. \* is the Corel Paradox<sup>®</sup> form to which a shortcut icon can be made to place on the computer entry terminal's desktop for easy access.

Files Associated with data and referential integrity	Files Associated with creating program forms and reports
Pdoxwork.ini	Add.fsl
Tuckabun.fam	Change.fsl
Tuckenv.fam	Latlong.fsl
Tuckleng.fam	Print.fsl
Tucktow.fam	Species.fsl
Tuckabun.db	TUCKFILE.fsl*
Tuckenv.db	Tucktow.fsl
Tuckleng.db	abun.rsl
Tucktow.db	env1.rsl
Tuckabun.px	env2.rsl
Tuckenv.px	leng.rsl
Tuckleng.px	tow1.rsl
Tucktow.px	tow2.rsl
Tuckabun.tv	
Tuckenv.tv	
Tuckleng.tv	
Tucktow.tv	
Tuckabun.val	
Tuckenv.val	
Tucktow.val	
Tuckleng.val	
Tuckabun.X01	
Tuckleng.XG0	
Tucktow.XG0	
Tuckabun.Y01	
Tuckleng.YG0	
Tucktow.YG0	

Table 3. General description of variables found in TUCKFILE dataset. Included is type of variable (C = character, D = date, N = numeric), data file location, total character spaces and number of decimal places (if appropriate), and definition of variable.

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
TUCKENV					
	SURVEY	C	9	-	double click to select from drop down list or add new (see Table 1)
	DATE	D	-	-	MM/DD/YYYY
	LOCATION	C	15	-	double click to select from drop down list or add new (see Appendix A for details by survey)
	TIME	N	4	0	time sampling began at location. All times are on a 24 hour clock, format is HHMM. (Acceptable values: 0000-2359)
	SUDO	N	8	3	surface dissolved oxygen, mg/L
	BODO	N	8	3	bottom dissolved oxygen, mg/L
	SUSAL	N	8	3	surface salinity, ppt
	BOSAL	N	8	3	bottom salinity, ppt
	SUTEMP	N	8	3	surface water temperature, °C
	BOTEMP	N	8	3	bottom water temperature, °C

Table 3. (Continued)

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
	TIDE	C	4	-	tide stage choices: HI, LOW, EBB, FLD, EBB1 (1 <sup>st</sup> half of ebb tide), EBB2 (2 <sup>nd</sup> half of ebb tide), FLD1 (1 <sup>st</sup> half of flood tide), FLD2 (2 <sup>nd</sup> half of flood tide)
	DEPTH	N	5	2	water depth, m
	LATDEG	N	8	3	latitude (degrees) of location
	LATITUDE	N	8	3	latitude (decimal minutes) of location
	LONGDEG	N	8	3	longitude (degrees) of location
	LONGITUD	N	8	3	longitude (decimal minutes) of location
	SECCHI	N	5	2	water clarity measured by Secchi disk, m
	SUPH	N	8	2	surface pH
	BOPH	N	8	2	bottom pH
TUCKTOW					
	TOW	C	13	-	created by TUCKFILE: first four letters of survey, last two numbers of year, and consecutive numbering (0001-9999)
	SURVEY	C	9	-	same as in TUCKENV (see above)
	DATE	D	-	-	same as in TUCKENV (see above)
	LOCATION	C	15	-	same as in TUCKENV (see above)
	TIME	N	4	0	same as in TUCKENV (see above)

Table 3. (Continued)

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
	TIMESTART	N	4	0	time tow began (military time: 0000-2359)
	TIMEEND	N	4	0	time tow ended (military time: 0000-2359)
	GEAR	C	8	-	gear choices: (see Appendix A for details by survey)
	MESH	N	3	0	mesh of gear codes (see Appendix A for details by survey)
	LENGTH	N	6	1	length of gear codes (see Appendix A for details by survey)
	AREASAMP	N	10	2	area sampled in time or space (see Appendix A for details by survey)
	HEADING	N	3	0	boat heading in degrees
	TOWDIR	C	8	-	tow direction of hand-pulled nets (see Appendix A for details by survey)
	MACROALG	N	6	2	amount of macroalgae, L
	METERCT	N	10	2	flowmeter or meter wheel, number of revolutions (see Appendix A for details by survey and conversion factors)
	METERTP	C	5	-	type of meter used (see Appendix A for details by survey)
	GENLAT	N	8	3	latitude (degrees) of tow
	BEGLAT	N	8	3	beginning latitude (decimal minutes) of tow
	ENDLAT	N	8	3	ending latitude (decimal minutes) of tow
	GENLONG	N	8	3	longitude (degrees) of tow

Table 3. (Continued)

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
	BEGLONG	N	8	3	beginning longitude (decimal minutes) of tow
	ENDLONG	N	8	3	ending longitude (decimal minutes) of tow
	NETZMIN	N	8	3	tucker trawl minimum depth (m) (see Appendix A-23 for details)
	NETZMAX	N	8	3	tucker trawl maximum depth (m) (see Appendix A-23 for details)
	BEGDEPTH	N	8	3	beginning depth (m) of tow
	ENDDEPTH	N	8	3	ending depth (m) of tow
	NET	C	3	-	net placement (see Appendix A for details by survey)
	MISC	N	1	0	coded variable indicating tows not following protocol (see Appendix A for details by survey)
<hr/>					
TUCKABUN					
	TOW	C	13	-	same as in TUCKTOW (see above)
	GENUS	C	25	-	Select from drop-down list or add new. As noted (may also be family) or unidentified.
	SPECIES	C	25	-	Select from drop-down list or add new. All unknowns or partial id's should be denoted by "sp."
	SURVEY	C	9	-	same as in TUCKENV (see above)
	NUMBER	N	9	0	total number of individuals by species

Table 3. (Continued)

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
	WEIGHT	N	10	2	total weight (g) by species
TUCKLENG					
	TOW	C	13	-	same as in TUCKTOW (see above)
	GENUS	C	25	-	same as in TUCKABUN (see above)
	SPECIES	C	25	-	same as in TUCKABUN (see above)
	IND	N	12	6	unique number identifying individuals entered, assigned by TUCKFILE during data entry
	SURVEY	C	9	-	same as in TUCKENV (see above)
	FL	N	8	1	fork length (mm)
	SL	N	8	1	standard length (mm)
	TL	N	8	1	total length (mm)
	BW	N	8	1	carapace/body width (mm)
	WEIGHT	N	8	2	individual weight (g)
	PRESERVE	C	4	-	preservative choices: FORM = formalin, ETOH = ethanol, FROZ = frozen, LIVE = kept live (see Appendix A for details of use by survey)
	FLEXION	C	4	-	flexion stage choices: FLEX = flexion, PREF = preflexion, POST = post-flexion (see Appendix A for details of use by survey)

Table 3. (Continued)

Data File	Variables	Type	Total character spaces	Number of decimal places	Definition (unless otherwise noted in metadata)
	SEX	C	2	-	sex choices: M = male, F = female, U = unknown (see Appendix A for details of use by survey)

Table 4. SAS libnames to be used for each data set while accessing them via SAS. TUCKFILE\_MASTER subdirectory indicates which subdirectory the data are located. See Table 1 and Appendix A for location of each survey. See Appendix B-1 for details for creating files. See SAS programs in Appendix B for examples of use of libnames.

TUCKFILE_MASTER Subdirectory	TUCKFILE DATA SET			
	Environmental data (TUCKENV)	Tow data (TUCKTOW)	Abundance data (TUCKABUN)	Length data (TUCKLENG)
LONGTERM	tucklong.tuckenv	tucklong.tucktow	tucklong.tuckabun	tucklong.tuckleng
PSEG	tuckpseg.tuckenv	tuckpseg.tucktow	tuckpseg.tuckabun	tuckpseg.tuckleng
SHORTTERM A-D	tuckshad.tuckenv	tuckshad.tucktow	tuckshad.tuckabun	tuckshad.tuckleng
SHORTTERM E-K	tuckshek.tuckenv	tuckshek.tucktow	tuckshek.tuckabun	tuckshek.tuckleng
SHORTTERM L-R	tuckshlr.tuckenv	tuckshlr.tucktow	tuckshlr.tuckabun	tuckshlr.tuckleng
SHORTTERM S-Z	tuckshsz.tuckenv	tuckshsz.tucktow	tuckshsz.tuckabun	tuckshsz.tuckleng