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User's Guide for Steller's Eider Band-Recapture Database, Izembek National Wildlife Refuge

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USER'S GUIDE FOR STELLER'S EIDER BAND-RECAPTURE DATABASE, IZEMBEK NATIONAL WILDLIFE REFUGE

Abran Steele-Feldman¹ and Joel H Reynolds²

ABSTRACT

Steller's eiders (*Polysticta stelleri*) have been sampled at Izembek Lagoon since 1961 using band-recapture methods. A database was developed in 2005 to archive these and future encounters, to simplify annual reporting of sampling results and banding effort, and to create summary input files for survival analysis of the sampled population. This manual describes the database structure and design and lays out the steps required for standard data entry, editing, and summary. The database is built in Microsoft Access© and has a user-friendly interface so that no familiarity with databases is required to use it.

PLEASE READ THE MANUAL BEFORE USING THE DATABASE.

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| | |
|---|----|
| Security / User Access Levels | 2 |
| Access Level: User | 2 |
| Access Level: Manager..... | 2 |
| Access Level: Administrator..... | 2 |
| Changing Security Levels..... | 2 |
| Tables | 2 |
| All Bands | 2 |
| Newbands..... | 3 |
| Recaps..... | 3 |
| Temp-*..... | 3 |
| all birds..... | 3 |
| Locations..... | 3 |
| Foreign Birds | 4 |
| Problem Birds | 4 |
| Invalid Bands | 4 |
| Forms | 4 |
| Reports | 5 |
| Log-in | 6 |
| New bands and Re-bands | 6 |
| Recaptures | 8 |
| Doubly-banded birds..... | 8 |
| Band numbers missing from the database | 9 |
| Foreign Birds & Problem Birds | 9 |
| Unreadable band numbers..... | 9 |
| Invalid Bands | 9 |
| Log-in | 9 |
| Edit Temp-* Tables | 10 |
| Examine / Fix Sex Discrepancies | 11 |
| Update Permanent Tables | 11 |
| Edit Problem or Foreign Birds | 12 |
| Edit Invalid Bands | 12 |
| Edit Locations Table | 12 |
| Other Editing tasks involving the Permanent Tables | 12 |
| Eider-Survive Input File | 13 |
| Band Manager Input File | 14 |
| Generating Custom Reports and Queries | 14 |
| Integrity Checks | 15 |
| Adding a new bird directly as an Administrator | 15 |
| Incorrectly entered band number in the permanent tables | 15 |
| Correcting a bird accidentally associated with two bands (but not recorded as double-banded) | 16 |
| Archiving the database after updating | 16 |
| Appendix 1. Field and Code definitions | 18 |
| Locations Table | 18 |
| All Bands Table | 18 |

| | |
|--|----|
| Main Tables | 18 |
| Appendix 2- Internals of the Forms | 21 |
| Main Switchboard | 21 |
| Recap Entry Form | 21 |
| New Bands Entry Form | 21 |
| Edit Temp New Bands | 22 |
| Edit Temp Recaps | 22 |
| Sex ID Problems Form | 22 |
| Update Form | 23 |
| Create Eider-Survive Input File | 24 |

INTRODUCTION

Steller's eiders (*Polysticta stelleri*) at Izembek Lagoon have been studied using band-recapture methods since 1961 (Jones 1965). A new database was created in 2005 to provide a user-friendly archive of these observations, reduce recording errors, standardize data coding, and simplify data summary and analysis. The database automates production of standard summary reports and, most importantly, generates input files for the survival estimation software *Eider-Survive* (Reynolds and Feldman 2007). This manual first describes the database structure and steps required to maintain database integrity, then describes how to perform standard operations on the database, such as data entry, editing, and query or report generation.

The database contains all records of Steller's eiders banded or captured at Izembek or Nelson Lagoons near Izembek National Wildlife Refuge, Cold Bay, Alaska, since 1961. This includes records of rebandings, i.e., replacement of worn bands by new bands, captures of *foreign* banded birds i.e., birds banded elsewhere, and destroyed or invalid bands that were removed from use.

Valid survival estimates require valid input. Maintaining data integrity required certain database design and data entry process features detailed below; it also dictated the data review process undertaken in collating the historic data. The database was designed to be easy to use while ensuring data integrity. Proper use of the database will guarantee data integrity as well as greatly simplify the data acquisition phase of future analyses.

DATABASE STRUCTURE OVERVIEW

Steller's eiders are long-lived birds. A single bird may be banded multiple times through its life as older bands are removed and replaced. In order to automatically track recapture events of a given bird across multiple band numbers, the database assigns each bird a unique Bird ID the first time it is banded. No band number can be associated with more than one Bird ID, but a Bird ID may be associated with several different band numbers.

The database ensures different band numbers are correctly mapped to the appropriate Bird ID by storing the banding information and the recapture information in separate *tables*. Most users will not directly access these tables. Rather, users enter data using *forms*. The forms simplify data entry by automating default settings and minimize errors by automating error checking, thus maintaining database integrity. Once entered, data is accessed or summarized using *reports* or *queries*. The report functions are pre-defined and remain available permanently; new queries can be created through a special process (see Generating Custom Reports, page 14).

Newly entered data is stored in *temporary* tables until it has been proofed and validated. The validated data is then transferred to *permanent* tables that cannot be edited. Because the permanent tables cannot be edited, inadvertent mistakes could corrupt the entire database. This is prevented through use of three user access levels with different security levels. Each security level lets the user access and edit only the database objects, such as tables or queries, she needs for that level's allowable tasks, restricting access of permanent objects to the higher user levels only.

Security / User Access Levels

Opening the database prompts for a log-on specifying the desired access level and password. The three access level names are listed on a pull down menu. Each is described below. Passwords for the Manager and Administrator levels are available from the Izembek NWR lead Biologist or the Regional Refuge Biometrician.

Access Level: *User*

Password: *user*

Users are responsible mainly for data entry and cannot directly edit any of the data tables. They enter new data through forms which store the data in temporary tables until a *Manager* updates the database (see below). ***Users cannot edit data after they have entered it; they must use care when entering data to minimize later corrections.***

Users can run built in queries and reports that do not modify data; they cannot design their own queries.

Access Level: *Manager*

Password: *a*

Managers are responsible for validating entered data and then updating the database. They access special forms to view and edit data entered by *Users*. After editing the newly entered data, *Managers* update the database. This finalizes the data entry by transferring the data from the temporary tables into the permanent tables. ***Managers cannot directly modify the permanent tables, so must use care during data editing to prevent ANY entry errors.***

Access Level: *Administrator*

Password: *a*

Administrators can access and directly modify or edit all database tables. *Administrators* can also modify the design of the database objects, change permissions for other security levels, and add new objects to the database. ***Administrators must be extremely careful when modifying the design or the database setup; modifications can potentially break the internal code of the data entry, query, and report forms!***

Changing Security Levels

In order to log-in under a different security levels, completely close the database then reopen it.

Tables

There are three main permanent tables and several minor tables. The three main tables are discussed first. Tables not discussed in this manual are used internally by forms and should not be edited.

All Bands

The *All Bands* table associates each Band Number with a unique Bird ID. The Bird ID uniquely identifies an individual bird. Because no two bands will have the same number, each band number appears only once in the All Bands table. However, since birds can be re-banded, each Bird ID can be associated with more than one Band Number.

In addition to the Bird IDs and Band Numbers, this table also stores other band information, such as Band Type (a letter code) and Band Code, representing the nature of the banding event or the location of the band on the bird. Codes are defined in Appendix 1.

Newbands

The *newbands* table stores all new banding events. This includes all re-banding events occurring after 2004. Field names and codes are defined in Appendix 1

Recaps

The *recaps* table stores all recapture records, as well as all re-banding events occurring before 2005. Field names are identical to the *newbands* table.

*Temp-**

Temporary versions of each of the three preceding tables are created during data entry. The temporary version of the *newbands* table, for example, is called *Temp-newbands*. These tables are deleted when the *Manager* updates the database, transferring the new data into the corresponding permanent tables. Field names in the temporary tables match those of the corresponding permanent tables.

all birds

The *all birds* table is a merge of the *newbands* and *recaps* tables and contains every capture record in the database except those of foreign-banded birds: new bands, re-bands, and simple recaptures. Updating the database automatically updates the *all birds* table. Field names in the *all birds* table match the *newbands* table. After updating, most queries should use the *all birds* table.

Locations

The *Locations* table contains the flock location codes (i.e. GLAZENAP, BLAINEPT, etc) available for data entry. For data integrity, the data entry form only allows *Users* to select location codes from this list. Should sampling take place at other locations, a *Manager* must add the new location codes to this table **before the new data can be entered**. Geographical coordinates for locations should use datum WGS 84.

The table also lists each location's zone numbers, i.e., the 'area' numbers discussed in Flint et al. (2000). Zones are used in formatting the input file for running multi-state survival analyses using the program Eider-Survive (Reynolds and Steele-Feldman, 2007). If the *Manager* changes the *zone to use* field, then the next database update will change the zone numbers in the *all birds*, *newbands*, and *recaps* tables to reflect the new *zone to use* numbers. For example, to add an additional zone, say zone 3, the *Manager* simply changes the *zone to use* field to 3 for the appropriate location codes.

For completeness, the *historical zone* field lists the zone codes (1-7) used in Paul Flint's original database and referred to in Flint et al. (2000). These are not used by the database or summary reports and are only included for cross-reference to Flint et al. (2000).

Foreign Birds

The *Foreign Birds* table stores all the Izembek recaptures of birds originally banded elsewhere. This table is included simply for archiving convenience; the records are excluded from the summary reports that generate input for survival analysis.

Problem Birds

The *Problem Birds* table stores records that do not meet the database's integrity checks. Most of these records will be recaptures of birds whose initial banding events are missing from the database, often because the band number was incorrectly recorded in the field. Since Bird IDs are assigned when birds are initially banded, these birds will not have a unique Bird ID and thus must be placed in the *Problem Birds* table. This table also contains records from the old database that were somehow problematic. For example, a bird that was unknowingly double banded – i.e., a bander was careless in checking the legs of a bird and put a second band on a bird that already had a band from a previous year. All birds with conflicting sex records across multiple recapture events are identified by a gender error flag in the permanent tables rather than listed in the Problem Bird table.

Invalid Bands

The *Invalid Bands* table stores bands that have been removed from circulation because they were damaged or lost, etc. The data entry forms checks this table to prevent accidental entry of an invalid band number elsewhere in the database, raising an error warning if this is attempted.

Forms

Forms are used to control data entry, editing, and database updating. All operators can access the first three forms below, only *Managers* and *Administrators* can access the other forms. See the Data Entry and Editing Data sections below for use of each form.

| Form Name | Action |
|--------------------------------------|---|
| <i>New Bands/Re-bands Entry Form</i> | Enter new bands and re-bands |
| <i>Recaps Entry Form</i> | Enter recaptures |
| <i>Invalid Bands Entry Form</i> | Enter invalid bands |
| <i>Edit Temp-New Bands</i> | Edit data entered with the <i>New Bands Entry Form</i> |
| <i>Edit Temp-Recaps</i> | Edit data entered with the <i>Recaps Entry Form</i> |
| <i>Update Form</i> | Update the database and copy data from the temporary tables into the corresponding permanent tables |
| <i>Examine/Fix Sex Discrepancies</i> | Display an editable list of birds with sex identity conflicts |
| <i>Edit Invalid Bands</i> | Edit data in the Invalid Bands table |
| <i>Edit Locations</i> | Add new values or change zone codes in the <i>Locations</i> table |
| <i>Edit Foreign/Problem Birds</i> | Edit data in the <i>Foreign Birds</i> or <i>Problem Birds</i> tables |

Reports

Predefined reports create common data summaries or input files for other programs.

| Report Name | Action |
|--|--|
| <i>Create Eider-Survive Input File</i> | Create an input file for Eider-Survive ¹ , listing all capture histories, and their frequency of occurrence, for a range of years |
| <i>Create Band Manager Input File</i> | Export capture/banding records to a text file suitable for input to Band Manager ² . |
| <i>All Captures for Single Bird</i> | List all capture records for an individual bird; searchable by Bird ID. |
| <i>General Report for Range of Years</i> | General form for creating miscellaneous reports, such as total recaptures by sex and zone across a range of years. User selects source table, desired column variables (e.g., year), and up to three different row variables (e.g. sex, zone). Summaries can be limited to a range of years. |

INSTALLING THE DATABASE

The database is written in MS ACCESS 2003© and requires OFFICE Professional 2003©. It appears not to work with Office Professional 2000©. To install the database, simply copy it to the desired directory. Right-click on the database name in Explorer to edit the file properties in case they have been accidentally set to read-only.

OPENING /EXITING THE DATABASE INTERFACE

Start the database interface by double-clicking on the database icon. MS ACCESS© will query (i) whether to block 'unsafe expressions' – select 'No', then (ii) will query whether to really open the file – select 'Open'.

Opening the database prompts the operator for a log-on security level and password. For most users, entering a valid log-on opens the main switchboard (Figure 1). For *Administrators*, the main database window opens as well (Figure 2).

Most users will interact with the database exclusively through the main switchboard (Figure 1). The switchboard provides access to all forms, reports, and pre-defined queries. Interacting with the main database window (Figure 2) is only necessary for creating new queries or for *Administrators* that need to either modify the database design or manually edit data (this should **rarely** occur).

The switchboard has five main sections: Data Entry, Edit Data, Reports, View Tables, and Integrity Checks. Each section is discussed below. All operators can access all sections except Edit Data, which only *Managers* can access.

¹ Available at <http://www.stat.washington.edu/joel/> or by emailing joel_reynolds@fws.gov

² <http://www.pwrc.usgs.gov/BBL/resources/bandmgr/bandmgr.htm>

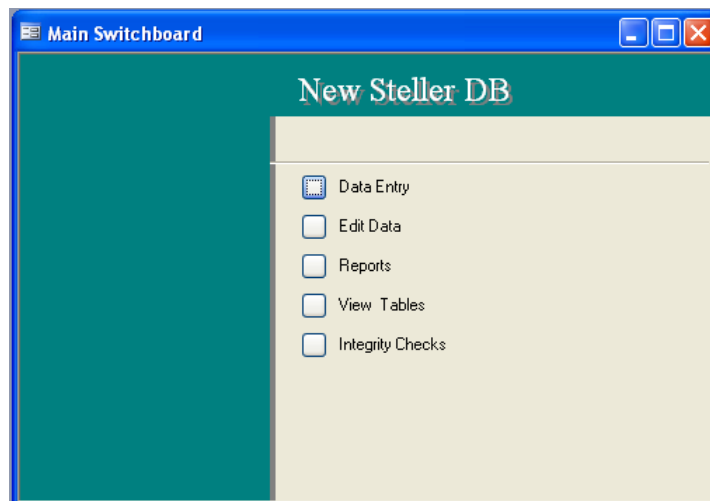


Figure 1. The main switchboard window used by all database users.

Exit the database by either (i) placing the mouse pointer over the 'X' in the upper right corner of the 'Microsoft access' window then clicking the left mouse button, or (ii) selecting 'Exit' under the 'File' menu on the 'Microsoft access' window.

COMMON TASKS: ENTERING DATA

The three data entry forms, *New Bands/Re-bands Entry Form*, *Recaps Entry Form*, and *Invalid Bands Entry Form* are accessible from the main switchboard under the Data Entry option (Figure 1).

The order of data entry is very important. **New bands and re-bands from a survey must be entered and edited, then the database updated, BEFORE ANY RECAPTURES ARE ENTERED. Editing and updating are done by the Manager** (Figure 3). If the *Temp-newbands* table exists, the *Recaps Entry Form* will not open. This sequencing is required to maintain data integrity and the error-checking features. The invalid bands can be entered at any point. Data entry should be self-explanatory otherwise, though all the minutiae are discussed below.

Log-in

To enter data, log-in as *User*.

New bands and Re-bands

New band events, as opposed to re-bands, only require six fields: date, trap location, sex, band type, band prefix, and band suffix. All other fields are optional. The band prefix and suffix are combined to create a single band number, hereafter referred to as the main band number. This band number **must not** already be present in the database; if it is, an error message will be displayed and the record will not be saved.

For re-band events, check the *Reband* box and enter the old band number into the appropriate box. The old band number is required in addition to the six required fields listed above. Note that the old band number **must** be present in the database, otherwise an error message will be displayed and the record will not be saved. It is strongly recommended that worn bands be etched to obtain the old band numbers **before** you start entry of re-band events;

otherwise, you will be forced to enter data as incomplete records that will need to be edited at a later date.

The database automatically sets default values for certain fields. To change the value, simply type into the entry box or select a different value from the pull down list (if there is one). **If data for a given field were not taken, leave the field blank.** Note that culmen and tarsus measurements are in mm with a precision of 1 decimal place, weight and primary have a precision of 0 decimal places. See Appendix 1 for complete list of assumed measurement units and precisions.

Sex identity problems can arise with re-bands and recaptures. If the sex entered with a re-band record differs from the sex entered on previous captures, an error message will be displayed. The user can then either cancel saving the record and modify the entered sex, or choose to continue saving the record. If the user chooses to continue, the record will be flagged with a *Sex Error Flag*. A *Manager* can later rectify such discrepancies using the *Examine/Fix Sex Discrepancies* form.

Pressing the save button initiates an integrity check on the entered data. An error message displays if invalid data are detected. Otherwise, the data is saved to the *Temp-newbands* and *Temp-All Bands* tables and the data entry form reappears. Since band numbers are generally entered sequentially, the band suffix number automatically increases by one and is highlighted, indicating successful data entry.

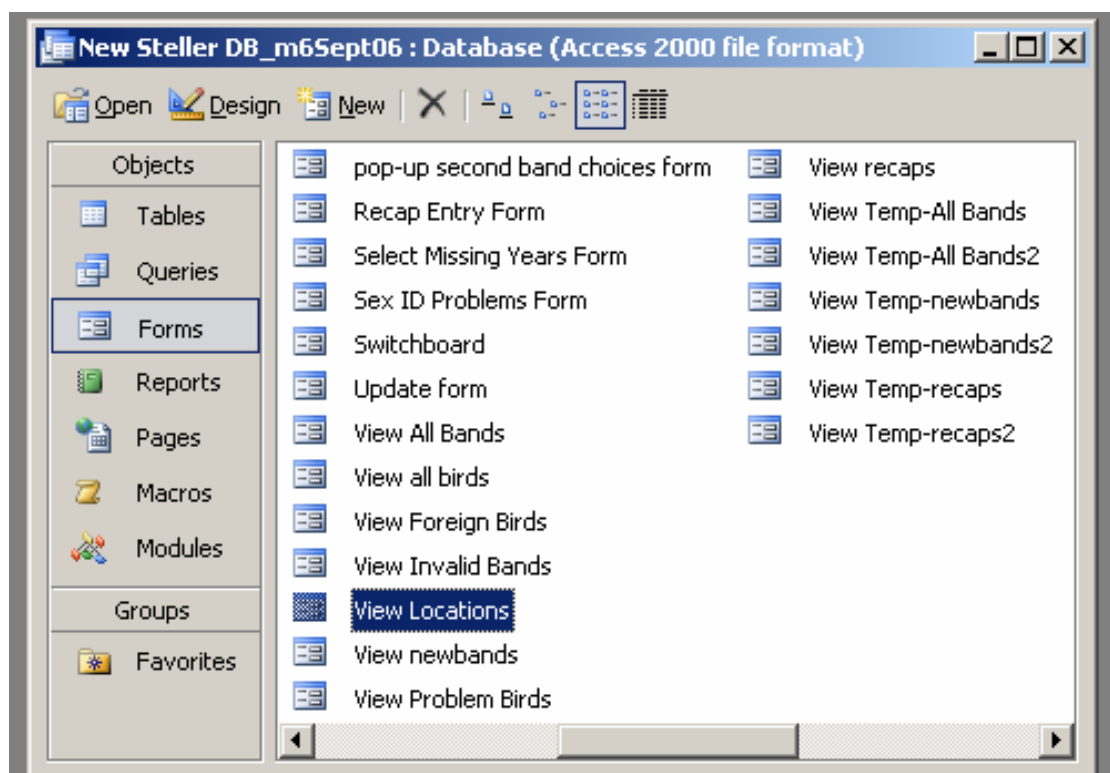


Figure 2. The main database window Accessible only by *Administrators*.

Recaptures

The *Recaps Data Entry* form is almost identical to the *New Bands Data Entry* form, with four required fields: date, location, sex, band prefix, and band suffix. The band prefix and suffix are combined to create the main band number.

The database automatically sets default values for certain fields. To change the value, simply type into the entry box or select a different value from the pull down list (if there is one). **If data for a given field were not taken, leave the field blank.** Note that culmen and tarsus measurements are in mm with a precision of 1 decimal place, weight and primary have a precision of 0 decimal places. See Appendix 1 for complete list of assumed measurement units and precisions.

Pressing the save button initiates an integrity check on the entered data. An error message displays if invalid data are detected. Otherwise, the data is saved to the *Temp-recaps* table and several of the form fields are cleared for the next record entry.

As with re-band events, the entered sex will be checked against all previously entered sexes. A discrepancy displays an error message and offers a choice between continuing or canceling the save. If the user chooses to continue, the record will be flagged with a *Sex Error Flag*. A *Manager* can later rectify such discrepancies using the *Examine/Fix Sex Discrepancies* form.

Three possible complications may arise with recaptures: doubly banded birds, missing band numbers, or unreadable band numbers.

Doubly-banded birds

Five hundred eiders were double banded in 1993 to test for band retention rates between two different types of bands; some of these birds are still recaptured. Sometimes a bird may not be recognized as having a band due to it being hidden by feathers or insufficient checking by the bander, and thus becomes double banded accidentally. To record a doubly banded bird, first enter the main band number then check the *Double Banded* box. If this box is clicked when you press Save, there must be a band number entered in the *Second Band Number* field.

Often the numbers on aluminum bands are unreadable or only partially readable. If so, press the *Unreadable* button, and a pop-up window will open containing all of the other band numbers associated with the main band number. Select the matching number from the list in the pop-up window. If the number is completely unreadable, or none of the listed choices seem appropriate, select the UNREADABLE option; this tells the database that a second band was present, but was unreadable at the time of capture. Pressing OK transfers selection to the *Second Band Number* field on the main form.

CAUTION: Entering the second band number by typing will initiate an integrity check when you press *Save*. If the main band number and the second band number are associated with different Bird IDs, you will be asked if the entered data are correct. Choosing yes will automatically declare the second band number invalid and it will be replaced with UNREADABLE. This is necessary to ensure that each band number is associated with one and only one Bird ID.

Note that it may happen that the main band number is not present in the database, whereas the second band number is. In this case you will be asked to swap the main band number and the second band number.

Band numbers missing from the database

There are only two situations where a main band number not already in the database may be entered in the recapture form: when the band number is from a *foreign* band, i.e. a bird not banded at Izembek Lagoon, or when the band number was entered into the database incorrectly during the initial banding event (and must be corrected later).

Foreign Birds & Problem Birds

If you know the band is from a foreign bird (not banded at Izembek), check the Foreign Bird box during data entry. As of 2007, only Izembek NWR uses size 7A bands on Steller's eiders; foreign bands are often readily recognized in the field as they are size 6 bands (last number of prefix is '6'). Entering a band number that is not already in the database will prompt the user as to whether the bird is a foreign bird. Selecting 'Yes' will add the capture record to the *Foreign Birds* table and assign a Bird ID of -2. Selecting 'No' will prompt the user as to whether to continue saving the record as a *Problem Bird*. Selecting 'Yes' will add the capture record to the *Problem Birds* table and assign a Bird ID of -1.

Unreadable band numbers

It is **strongly recommended** that worn bands be etched to obtain the old band numbers **before** you start entry of re-band events; otherwise, you will be forced to enter data as incomplete records that will need to be edited at a later date.

Invalid Bands

To enter an invalid band, such as a destroyed band, enter the date, band prefix and suffix, the event code, and any remarks. You can choose from an event code of 4 (band destroyed), 8 (band lost), or 9 (record lost). **Band numbers entered with this form are officially invalid, and an attempt to enter one of these numbers as a new band or recapture will raise an error flag.** If a lost record later turns up as a recapture, you will need to delete this record from the invalid band table, enter it as a newband with whatever information was available at the time, update the database, then enter it as a recapture.

COMMON TASKS: EDITING DATA

Log-in

To edit data or update the database, log-in as *Manager* or *Administrator*.

Selecting 'Edit Data' on the main switchboard opens the Edit Data switchboard and the operations detailed further below (Figure 3).

Edit Temp-* Tables

The two forms for editing temporary data, *Edit Temp New Bands* and *Edit Temp Recaps* are almost identical so the following discussion applies to both. **Close all data entry forms before opening either of these data editing forms.**

Opening an edit form displays a data editing window (Figure 4). Each row shows a different record and displays all of the fields that are stored internally.

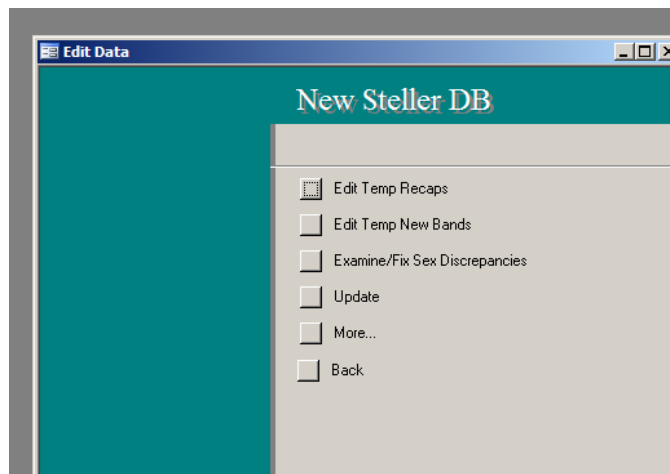


Figure 3. Edit Data switchboard showing editing options.

Most fields can be edited directly in the window by selecting the field and typing. Fields referencing band numbers, the band type, the Bird ID, or the sex cannot be edited directly. Edit those fields by double clicking on the row in the left hand margin of the form (Figure 4). This opens a new form, similar to the data entry forms, and enables editing of all fields. You can also delete records using this form by pressing the delete button.

Edit Temp-* Tables

The two forms for editing temporary data, *Edit Temp New Bands* and *Edit Temp Recaps* are almost identical so the following discussion applies to both. **Close all data entry forms before opening either of these data editing forms.**

Opening an edit form displays a data editing window (Figure 4). Each row shows a different record and displays all of the fields that are stored internally.

Most fields can be edited directly in the window by selecting the field and typing. Fields referencing band numbers, the band type, the Bird ID, or the sex cannot be edited directly. Edit

| Bird ID | Event Code | Pre | Left | Left Band Number |
|---------|------------|------|-------|------------------|
| 60861 | N | 1234 | 66666 | 123466666 |
| 60862 | N | 1234 | 77777 | 123477777 |
| 60863 | N | 1234 | 11111 | 123411111 |
| 60864 | N | 1234 | 98989 | 123498989 |
| 60865 | N | 1234 | 22235 | 123422235 |
| 60866 | N | 1234 | 56565 | 123456565 |
| 60867 | N | 1234 | 99999 | 123499999 |

Figure 4. A data editing form. Double clicking a row in the left hand margin (where the little arrow is) opens a form for editing the record in that row. Many fields can be edited directly by selecting the cell and typing.

those fields by double clicking on the row in the left hand margin of the form (Figure 4). This opens a new form, similar to the data entry forms, and enables editing of all fields. You can also delete records using this form by pressing the delete button.

Examine / Fix Sex Discrepancies

Administrators: This form will only work properly if launched from the main switchboard. Do not open it from the database window.

Selecting the Examine/Fix Sex Discrepancies item generates a table containing all of the birds with sex discrepancies; be patient, this process may take a while. Once the table is generated, a window opens displaying the problem birds. Four columns are displayed: Bird ID, F, M, and U. The number in each of the F, M, and U columns denotes the number of records in the database with the given sex (Female, Male, Unknown).

Resolve the discrepancies for an individual Bird ID by double clicking the left margin of the appropriate row. A pop-up window opens asking you to choose the correct sex for the selected Bird ID. Enter F, M, or U in the text box and press OK. **Every record in the database for that Bird ID will be updated with the sex you enter.** Additionally, the Sex Error Flag changes to false (no longer any errors). Finally, for records where the sex has been changed, the old sex will be entered into the Old Sex column of the record.

CAUTION: this process may change all of the permanent tables in the database, so be careful and certain that you are entering the proper sex. Check all original field records to make sure there are no data entry errors. Changes cannot be undone.

Update Permanent Tables

To update the data, simply open the *Update* form. **Before pressing the big button, be ABSOLUTELY CERTAIN that the data in the temporary tables is accurate: an update cannot be undone! If you have any doubts as to whether you are ready to update (still need to re-etch worn bands, etc.), make a second copy of the database. Update one copy but not the second copy, changing the database name to reflect which copy is which. If it turns out you were not ready for the update (you discovered uncorrected errors in the recent data entry), return to the copy you did not update, correct the errors, update that copy and destroy the erroneously updated versions. Any changes you made to the originally updated copy will not be present in the copy that was not updated and will have to be redone.**

Updating automatically invokes a series of actions on the tables:

- Append the *Temp-All Bands* table to the permanent *All Bands* table then delete the *Temp-All Bands* table (if it exists).
- Append the *Temp-newbands* table to the permanent *newbands* table then delete the *Temp-newbands* table (if it exists).
- Append the *Temp-recaps* table to the permanent *recaps* table then delete the *Temp-recaps* table (if it exists).
- Using the zone codes listed in the *Locations* table (the column *Zone To Use*), update the zone numbers for each capture in the *recaps* and *newbands* tables.
- Delete all records in the *all birds* table.

- Add all records from both the *recaps* and *newbands* tables to the *all birds* table.
- Add any second band numbers not already in the *All Bands* table.

Sometimes you may want to update even when there are no records in the temporary tables. For example, changing the zone numbers in the *Locations* table requires updating to assign the new zone numbers to the appropriate locations in the permanent tables.

Edit Problem or Foreign Birds

CAUTION: there are no temporary versions of these tables. Be careful when changing data as you are changing the permanent tables.

Edit data in the Problem Birds and Foreign Birds tables by clicking on the appropriate fields and changing the data. You cannot alter the Bird IDs: all problem birds entered after 2004 have an ID of -1, all foreign birds have an ID of -2.

You can delete records by right-clicking on the left margin of the row and selecting 'delete record'. Enter problem or foreign birds using the regular Data Entry form.

If a bird was incorrectly entered and subsequently assigned to the Problem Birds or Foreign Birds table, delete the record from the given table then use a Data Entry Form to correctly enter the record. However, remember that the Recap Entry Form will not allow you to enter a band number that does not already exist in the All Bands table.

Edit Invalid Bands

Use this form to edit the Invalid Bands table when a band was incorrectly classified as invalid or correctly classified as invalid but other fields were entered incorrectly. If the band was incorrectly declared invalid, simply delete the record by right clicking on the left margin of the row containing the record then re-enter the record (as a new band or whatever is appropriate). You can directly edit the data fields in this form.

Edit Locations Table

Only modify the locations table if you (i) decide to change the zone numbers used in creating the summary input files for survival analysis or (ii) need to add a new flock location code because of a change in sampling design. Location codes cannot be deleted as that would impact records already in the database.

Modify a zone number by clicking in the appropriate field and changing the number. Add a new location code by double clicking on the form's left margin, which then prompts for the new location code. Press okay, and the new location code will show up in the main window. Enter the zone number by clicking in the appropriate field.

If captures are made at a new location, the location code must be added before any data is entered. Only locations that appear in the Location table can be entered in the data entry forms.

Other Editing tasks involving the Permanent Tables

It is crucial that attention be spent to the proofing and editing of the temporary tables to minimize the need to edit the permanent tables. The permanent tables should only be edited in

rare occasions. When such a need does arise (and is not addressed by the situations above), figure out how to resolve the problem by editing either the *newbands* or *recaps* table and then updating *all birds*, after appropriate integrity checks (see page 19). Editing *all birds* directly may destroy the database integrity. Deleting a bird id requires editing all three tables: *newbands*, *recaps*, and *all bands*.

Only the *Administrator* can edit the permanent tables. Be sure to make a copy of the database before editing so that you can recover if you make a mistake. To edit a permanent table, use the main database window (Figure 2) to select the table you need to edit. Cells can be edited directly by clicking within them. Delete a row by right-clicking on the left margin of the row, as in Figure 4, and selecting the appropriate option.

COMMON TASKS: VIEWING TABLES

The View Tables option on the main switchboard allows direct perusal of all the database tables. This is the easiest and most straightforward method of examining the data. Records cannot be added, edited, or deleted through these forms, but they can be sorted and filtered using the toolbar buttons at the top of the main MS Access© database window. All tables can be printed from either the toolbar or the main file menu (after opening them for viewing) – for example, should you want to proof a hardcopy of the temp-* tables.

COMMON TASKS: GENERATING REPORTS AND QUERIES

The Reports option on the main switchboard opens up the Reports switchboard. Most reports are self explanatory and are not detailed here.

Eider-Survive Input File

This report creates an input file for fitting the multi-state mark recapture models in Flint et al. (2000) using the software interface Eider-Survive (Reynolds and Steele-Feldman 2007). Only captures from zones 1 and 2 (defined in the Location table) are summarized. Check the ‘create as a single state’ box to relabel the summaries from zones 1 and 2 as all coming from zone 1 (i.e., to generate the necessary summaries for fitting single-state mark recapture models).

Generating an Eider-Survive Input File requires entering a range of study years of interest. For example, for survival estimates from 1993 through 1997, enter 1993 in the Start Year field and 1997 in the End Year field. Every year in the specified range must contain some data or the file will not be created successfully (see paragraph below to avoid this). Select an input file by typing the file’s path or using the browse button. If the specified file does not exist, it will be created; if it does exist, it will be overwritten.

Pressing the *Run Query* button will ask if there are any years with zero capture effort in certain zones. For example, in 1999 no capture drives were made in zone 1 of Izembek Lagoon. If there are such years in the data, choose yes and specify all such years in the pop-up window. Specifying the years with no capture effort, or pressing no, creates the input file, which may take a brief time. A message is displayed when the input file is successfully created.

Band Manager Input File

The source data for the Band Manager input file may reside in several tables. If you are only entering new bands, only one table will need to be queried. However, if you are entering recaptures and/or invalid bands, several tables might need to be queried to obtain the necessary Band Manager information.

First, choose the source table containing the relevant data. Only new or invalid band numbers must be submitted and accounted for to the USGS Bird Banding Laboratory. Adding recaptures to the Band Manager database is optional. Next, specify the full path of the destination file, either by typing or using the browse button. If the specified file does not exist, it will be created; if it does exist, it will be overwritten.

For only a subset of the data on the table, enter the range of dates of interest using the format MM/DD/YYYY. Leave the starting and ending dates blank to export all of the data on the table, as will usually be desired when exporting from the temporary tables. Finally, if you have already exported some data to the file, click the append box to append the new data to the existing file.

Pressing run displays an hourglass. It disappears after the file has been written successfully. The created file will be in comma-delimited format (*.csv). If you are generating banding schedules with the program Bandit instead of Band Manager, it is recommended that you create an Excel file from the database instead of using the Band Manager input file.

Generating Custom Reports and Queries

Due to security restrictions, only *Administrators* can create new reports and queries from within the main Steller's eider database. Other users can create new reports and queries by creating a new database (described below) containing copies of the relevant tables from the main Steller's eider database. **If you do this, remember that the new database copy will become out of date and out of synch with the actual main database at the next the main database update.**

To create a new database with copies of the relevant tables, first create a new Access database in the directory of your choice. From the main menu of this database, choose File>>Get External Data >>Import. **Do not choose the Link Tables option as this can corrupt the main database.** A pop-up menu will open asking you to choose the source database; find the main Steller's eider database and press *Import*. In the next window, choose all of the tables you need for your queries and then press okay. The new database will contain copies of the selected tables, but will not have any of the data integrity security restrictions, so you can create queries and edit data without affecting the main database.

COMMON TASKS: MAINTAINING DATABASE INTEGRITY

The automated database forms make the following assumptions:

- 1) Each band number is associated with one and only one Bird ID.
- 2) If a given Bird ID has more than one sex in the database, its Sex Error Flag should be set to true.
- 3) Each band number appears exactly once in the *All Bands* table.

- 4) Each Bird ID in the *all birds*, *recaps*, or *newbands* table appears at least once in the *All Bands* table

CAUTION: If you directly modify the permanent data, these four assumptions must be met or you will corrupt the database and the forms may cease to function properly. Band number, bird ID, sex, and dates/locations are the fields playing key roles in the database structure; they should (almost) never be directly edited. AGAIN, BE SURE EVERYTHING IS CORRECT BEFORE UPDATING THE DATABASE WITH NEW RECORDS IN ORDER TO PREVENT ANY NEED FOR EDITING THE PERMANENT TABLES! The other fields, which are optional, can be edited directly without risk to the database's integrity – i.e., wing measurements, etc.

Integrity Checks

The *Integrity Checks* option on the main switchboard provides access to three forms for checking that the preceding database assumptions are met:

- Duplicate Bands on Different Birds* checks assumption 1.
- Duplicate Band Numbers in All Bands* checks assumption 3.
- Missing Bird IDs from All Bands* checks assumption 4.

Adding a new bird directly as an *Administrator*

In the extremely rare situation where you need to add a new bird directly to the permanent tables (i.e. problem birds whose initial banding event was not recorded into the database for some reason), log-on as an *Administrator* and following these steps:

- 1) Save a copy of the current data base (so you can restore it if you mess up).
- 2) Add a new blank record to the *All Bands* table.
- 3) Find the largest Bird ID in the *All Bands* table, and add one to it. This will be the new Bird ID for your record. Alternatively, choose any Bird ID that is not currently in the table.
- 4) Enter the appropriate band number and fill out the other fields as necessary.
- 5) Using that Bird ID, add a new banding record to the *newbands* table.
- 6) Add any other records as necessary.
- 7) Run the integrity checks described above.
- 8) Run the Update command.

Incorrectly entered band number in the permanent tables

When re-etching reveals that an already entered and updated recapture record was entered using the wrong band number follow the steps below.

- 1) Save a copy of the current data base (so you can restore it if you mess up).
- 2) Log-on as an *Administrator*.
- 3) Look up the correct Bird ID in the *newbands* table.
- 4) Open the *recaps* table and locate the erroneous record.
- 5) Edit the Bird ID and band number fields, correcting the *recaps* table (open table, right-click on left margin of row you want to edit).
- 6) If the record had originally been assigned to the *Problem Birds* table, delete it (see page 12).
- 7) Run the integrity checks described above.
- 8) Run the Update command.

Correcting a bird accidentally associated with two bands (but not recorded as double-banded)

Situation: a bird was accidentally banded twice (the second bander did not notice the original band and added a second new band) and entered as new band twice, thus shows up on the *Problem Birds* table. For example, say one band was placed in 1991, the second in 2001, and the bird was recaptured in 2005 and the accidental double-banding discovered. Log-on as an *Administrator* and:

- 1) Save a copy of the current data base (so you can restore it if you mess up).
- 2) Look up and record the 2001 capture record information and Bird Id.
- 3) Delete the 2001 Bird Id and associated records from the *All Bands*, *newbands*, and *recaps tables* (follow details in 'Other Editing Tasks Involving the Permanent Tables').
- 4) Run the integrity checks described above (?).
- 5) Log out and log-in as User; enter the 2001 recapture as a double-band, establishing the linkage to the 1991 band.
- 6) Update the database as usual, etc., then enter the 2005 recapture event as usual.

Archiving the database after updating

An archive of the most up-to-date database is maintained at the Division of Realty and Natural Resources at the Regional Office. After the database has been updated with a season's survey results, burn a copy of the database onto a cd and send this archive to the Regional Refuge Biologist in care of:

(name of current RRB)
Division of Realty and Natural Resources
U. S. Fish and Wildlife Service, Refuges
1011 E. Tudor Rd MS 221
Anchorage, AK
99503

MISCELLANEOUS DATA STRUCTURE FACTS

- Re-band events from pre-2005 are stored in the *recaps* table, after 2005 they are stored in the *newbands* table. Re-banding events are entered in the *newbands* table rather than *recaps* table to allow for data integrity checks on the new band numbers and to simplify scheduling of bands for the USGS Bird Banding Laboratory.
- Some data fields are included as they are required by Band Manager to complete the band schedules for the USGS Bird Banding Laboratory: numerical codes for rebands, lost bands, lost records, and destroyed bands (all band numbers must be accounted for); footnote codes; and status codes.
- Some data fields are included for bookkeeping purposes of the data manager: drive number, band type.
- Optional fields include data collected for other research purposes: measurements, presence/absence of brood patch.

The database was created from several annual spreadsheets maintained by different data managers, leading to inconsistent treatment of non-essential data across years. Inconsistencies include:

- The *Left Band Number* is the only band number for most birds. It may or may not have occurred on the left leg. The *Right Band Number* column has been used for both double banded birds and for re-bands. Post-2000, the *second band* column stores the second band number for double banded birds while the *Right Band Number* column stores the old band number for re-band events. Pre-2005, the second band field was left blank if the band was unreadable or only partially readable. The post-1998 data did not use right or left band column headings.
- The status codes pre-2001 are not reliable and should not be used to distinguish event types; use the event codes instead.

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Appendix 1. Field and Code definitions

Locations Table

Location – Unique code identifying the flock capture location.

Band Manager Code – Eight letter location code for import into Band Manager.

Other Names Used – Alternate names used for same location.

Historical Zone – The zone numbers discussed in Flint et al. (2000) and used in the old database created by Paul Flint. Included for reference.

Zone To Use – The zone numbers used in updating the database (see Flint et al. 2000 Figure 1): 1 – SW Izembek Lagoon, 2 – Central Izembek Lagoon, 3 – NW Izembek Lagoon, 4 – W Nelson Lagoon, 5 – E Nelson Lagoon.

Only captures from zones 1 and 2 are used in the EiderSurvive input file.

Lagoon – Lagoon where bird was captured.

Flock Location- Location where flock originated before it was driven to trap site. Note that birds from one flock location may be trapped at more than one site.

All Bands Table

Band Num – Band number.

Bird ID – Unique code identifying the bird associated with each band number.

Corresponds to the Bird ID in the main tables below.

Band Code- Bands from pre-2005 captures use 3 codes:

L = band number was in the Left Band column

R = band number was in the Right Band column

S = band number was in the Second Band column

Bands from 2005 and later use 2 codes:

N = New Band

5 = Re-band

These codes are taken from the *Event Code* field in the main tables below.

Band Type- The type of metal from which the band is made. Corresponds to the *Type of Left Band* field in the main tables below.

A – aluminum,

I – incoloy,

M – monel,

S – stainless steel.

Main Tables

The three main tables, *newbands*, *recaps*, and *all birds*, all share the same field names, as do the temporary tables *Temp-newbands* and *Temp-recaps*. The fields are as follows:

Bird ID – An identifier created by the database to uniquely denote an individual bird.

Necessary because one bird can have several band numbers associated with it over time.

Event Code – Referred to by Band Manager as the banding category.

N = New band

R = Recapture

M = Foreign recovery (someone other than Izembek recovered the band).

F = Foreign recapture (Izembek capture of bird banded elsewhere).

(‘foreign bird’)

4 = Band Destroyed

5 = Replacement band (re-band)

6 = Band added to bird (should not occur normally)

8 = Band Lost

9 = Record Lost (unclear if band was used or lost since no data recorded)

Pre – The 4 digit prefix of the band number; the last digit is the band size. If a band has only three numbers in its prefix, add a zero at the beginning.

Left – The 5 digit suffix of the band number

Left Band Number – The full band number (prefix + suffix)

Right Band Number – For data pre-1998, this field includes the second band for double banded birds and possible some new bands for birds that were re-banded. Post-1997, this field is only used to record the old band number (the one that is being replaced) during re-band events

Second band – Only used for post-1997 data. It stores the second band number for birds that were double banded.

Age – The Bird's age at time of capture

AHY = after hatch year

ASY = after second year

ATY = after third year

HY = hatch year

SY = second year

TY = third year

U = unknown.

Sex – The Bird's sex: M = Male, F = Female, U = unknown

Date – The date that the bird was captured.

Year – The year that the bird was captured

Location – The location where the bird was captured. See the table Locations for a current listing of all the location codes.

Zone – The zone where the bird was captured. See the table Locations for a current listing of all the zones.

Type of Left Band – The type of band on the bird. Refers to the band number in the *Left Band Number* field above. A – aluminum, I - incoloy, M - monel, S – stainless steel.

Pre Right – The prefix of the band number in the *Right Band Number* field

Right – The suffix of the band number in the *Right Band Number* field

Type Right – The type of band on the bird. Refers to the band number in the *Right Band Number* field above

Broodpatch - TRUE or T = broodpatch present, FALSE or F = broodpatch not present (should be used for females only), U = unknown, N = none (should be used for males only), NA = Not applicable (old code, not used any more).

Culmen- recorded in millimeters, to the nearest 0.1 mm.

Total Tarsus- recorded in millimeters, to the nearest 0.1 mm.

Diagonal Tarsus- recorded in millimeters, to the nearest 0.1 mm.

Primary- recorded in millimeters, to the nearest 0.1 mm.

Weight – The bird's weight at the time of capture (grams).

Drive - On which of the year's drives did the recapture occur? First, second, etc. Used to help locate original field data sheets.

Status – The status codes used in banding schedules by the USGS Bird Banding Laboratory. An explanation of the codes can be found at <http://www.pwrc.usgs.gov/BBL/manual/status.htm>.

Common codes are:

- 300 - Banded and released
- 301 - Color banded
- 307 - Doubled banded
- 318 - Blood sample taken
- 389 - Equipped with radio transmitter

Footnote – For data from 2001-2005 only; code for commonly occurring footnotes used for importing into Band Manager:

- AJ = Band was above the tibio-tarsal joint and caused swelling of leg; band removed and new band placed on other leg.
- DO = Bands used out of order; date sequence okay
- DR = Double-banded bird; did not remove worn band
- EB = Removed and etched worn band
- RB = Previously double-banded bird, but removed one band

Remarks – Additional comments about the record.

Sex Error Flag – Denotes birds who have records with conflicting sex. = True (1 in Access) if two records for the same bird have different sex.

Old Sex – If a sex discrepancy is resolved using the *Examine/Fix Sex Discrepancies* form, the old value for sex is placed in this field.

Appendix 2- Internals of the Forms

The following sections describe the internal events triggered by using each form. The descriptions are provided for later *Administrators* in the rare case they need to edit the underlying Visual Basic code.

Main Switchboard

Recap Entry Form

- 1) Check that data was entered into the 5 required fields. If the Double Banded check box is clicked, check that a second band number was entered.
- 2) Create the band number from the prefix and the suffix
- 3) Search for the main band number by running the queries:

```
SELECT * FROM [All Bands] WHERE [Band Num] = '????????'
```

Here `????????` is the band number entered by the user. If neither of these queries returns any records, the band number does not exist, and the process aborts. If records are returned, record the Bird ID associated with this band number to **theId**.
- 4) If the Double Banded check box is clicked, search for the second band number.
- 5) If:
 - a. Both band numbers (BN) are already in the database (DB) and the associated Bird IDs match, go to step 6
 - b. Both BNs are already in the DB but the Bird IDs don't match, give the user the option of aborting or converting the second BN to UNREADABLE
 - c. If the main BN is not in the DB, but the second is, tell the user to swap the two BNs on the form.
 - d. If neither BN is already in the DB, give the user a choice between aborting, calling this a foreign bird, or calling it a problem bird.
- 6) Check for a sex identity problem by running the query:

```
SELECT [all birds].Sex, [all birds].[Bird ID] FROM [all birds]  
WHERE ((([all birds].Sex)<>'theSex' ) AND (([all birds].[Bird ID])= theId ));
```

If the query returns any results, raise the Sex Error Flag and ask the user if she wants to continue. Here **theSex** is the sex entered by the user and **theId** is as above.
- 7) Add a new record to the *Temp-rebands* table, and then copy the values entered by the user to the appropriate fields. If the bird has been identified as a problem bird or a foreign bird, add a new record to the *Problem Birds* or *Foreign Birds* table instead.
Note: data validation on this form is handled exclusively by the form (i.e. not by the database or in the visual basic code). Thus if you would like to change the validation rules, you need to open the form in design view, right click on one of the text entry boxes, choose properties, and then on the data tab of the popup window, change the validation rule.

Note also that the contents of the list boxes (the drop down lists) are also accessible through the properties pop up window, but on the data tab in the field "row source". The locations list box is linked to the main Locations table, and takes its choices from there.

New Bands Entry Form

- 1) Check that data was entered into the 6 required fields (7 if re-band box checked)

- 2) If re-banding, search for the old band number by running the two queries listed above in step 3, but in addition to running the query with All Bands as the source table, also search in Temp-All Bands.
- 3) Create the new band number from the prefix and suffix, and store it in the variable **bandNum**
- 4) If re-banding, check for a sex identity problem as in step 6 above.
- 5) Make sure the new band number does not exist by running two queries:
SELECT * FROM [All Bands] WHERE [Band Num] = '**bandNum**';
And
SELECT * FROM [Temp-All Bands] WHERE [Band Num] = '**bandNum**';
If either of these queries returns any records, the new band number already exists, and the process aborts.
- 6) Add a new record to the *Temp-All Bands* table, and fill in the appropriate fields as entered by the user.
- 7) Add a new record to the *Temp-newbands* table, and fill in the appropriate fields as entered by the user.

Note: See note for the new bands entry form.

Edit Temp New Bands

Most of the fields get edited in place by the user, with no validation whatsoever. However, all of the band number fields, the bird ID, and the sex are only editable by double clicking the margin of the form and opening the pop up window. The pop up window is actually the *New Bands Entry Form* running with an **editingData** flag set to true. The steps of execution are identical, with the change that after step 5 and before step 6 the old record is deleted. This means that there will be 'holes' in the Bird IDs (some numbers between 1 and Max(Bird IDs) that aren't in the database).

Edit Temp Recaps

See 12.2 and 12.3. After step 6 of the *Recaps Entry Form* the original record is deleted and a new one is added. Problem birds and foreign birds cannot be edited with this form.

Sex ID Problems Form

To generate the list of sexual identity problems the following steps are taken before the form opens. The code is actually internal to the Main Switchboard, not the form itself, which is why this form will not function properly if not opened from the switchboard.

- 1) Create a temporary table (*Temp-all birds*) containing all of the captures in the *all birds* table:
SELECT [all birds].* INTO [Temp-all birds] FROM [all birds];
- 2) If the *Temp-newbands* table exists, append all those records to the *Temp-all birds* table:
INSERT INTO [Temp-all birds] SELECT [Temp-newbands].* FROM [Temp-newbands];
- 3) If the *Temp-recaps* table exists, append all those records to the *Temp-all birds* table:
INSERT INTO [Temp-all birds] SELECT [Temp-recaps].* FROM [Temp-recaps];
- 4) Create a new query, *sexQuer8675309*, with the following SQL code:
TRANSFORM Count([Temp-all birds].Year) AS CountOfYear

```
SELECT [Temp-all birds].[Bird ID], Count([Temp-all birds].Year) AS [Total Of Year]
FROM [Temp-all birds] GROUP BY [Temp-all birds].[Bird ID]
PIVOT [Temp-all birds].Sex;
```

This query basically counts the number of times a bird has been entered with each possible sex.

- 5) Create the *sexually confused birds* table, and fill it with all the birds who appear with more than one sex by running the following three SQL statements (it's really slow to run them all as a single statement):

```
SELECT [sexQuer8675309].[Bird ID], [sexQuer8675309].[F], [sexQuer8675309].[M],
[sexQuer8675309].[U] INTO [sexually confused birds] FROM [sexQuer8675309]
WHERE (([sexQuer8675309].F>0) AND ([sexQuer8675309].M>0))
```

And

```
INSERT INTO [sexually confused birds] SELECT [sexQuer8675309].[Bird ID],
[sexQuer8675309].[F], [sexQuer8675309].[M], [sexQuer8675309].[U] FROM [sexQuer8675309]
WHERE (([sexQuer8675309].F>0) AND ([sexQuer8675309].U>0));
```

And

```
INSERT INTO [sexually confused birds] SELECT [sexQuer8675309].[Bird ID],
[sexQuer8675309].[F], [sexQuer8675309].[M], [sexQuer8675309].[U] FROM [sexQuer8675309]
WHERE (([sexQuer8675309].U>0) AND ([sexQuer8675309].M>0));
```

- 6) Delete *sexQuer8675309* and *Temp-all birds*

At this point, the form itself will open, displaying all the problematic birds. When the user double clicks the margin, enters a valid sex in the popup window, and presses okay, the following steps are taken:

- 1) Store chosen sex in the variable **sexChoice**, and the bird ID in another variable, which we will call **theId**.
- 2) Set the Old Sex field appropriately for all records where the sex doesn't match the **sexChoice**. This query is run up to 5 times, once each for the three main tables (*newbands*, *recaps*, and *all birds*) and once each for the temporary tables *Temp-newbands* and *Temp-recaps* if they exist (simply replace all occurrences of all birds below with the appropriate table name):

```
UPDATE [all birds] SET [all birds].[Old Sex] = [all birds].[Sex]
WHERE (([all birds].[Bird ID]= theId) AND ([all birds].[Sex] <> 'sexChoice'));
```

- 3) Similarly change the sex of all the records to the **sexChoice**, and update the Sex Error Flag to true with the following query:

```
UPDATE [all birds] SET [all birds].Sex = 'sexChoice', [all birds].[Gender Error Flag] = False
WHERE (([all birds].[Bird ID]=theId));
```

Update Form

- 1) If the *Temp-All Bands* table exists, append it to the *All Bands* table by running:
INSERT INTO [All Bands] SELECT [Temp-All Bands].* FROM [Temp-All Bands];
- 2) If the *Temp-newbands* table exists, append it to the *newbands* table:
INSERT INTO [newbands] SELECT [Temp-newbands].* FROM [Temp-newbands];
- 3) If the *Temp-recaps* table exists, append it to the *recaps* table:
INSERT INTO [recaps] SELECT [Temp-recaps].* FROM [Temp-recaps];
- 4) Update the zone codes in the *newbands* and *recaps* tables by running:

```
UPDATE recaps INNER JOIN Locations ON recaps.Location = Locations.Location
SET recaps.[Zone] = Locations.[Zone To Use];
```

And

```
UPDATE newbands INNER JOIN Locations ON
```

- ```

newbands.Location = Locations.Location
SET newbands.[Zone] = Locations.[Zone To Use];

```
- 5) Delete all of the records in *all birds*
  - 6) Append the *recaps* to *all birds*:  

```
INSERT INTO [all birds] SELECT recaps.* FROM recaps;
```
  - 7) Append the *newbands* to *all birds*:  

```
INSERT INTO [all birds] SELECT newbands.* FROM newbands;
```
  - 8) Search for second bands that are not in the *All Bands* table, and add them to the *All Bands* table.

## Create Eider-Survive Input File

- 1) Ask the user if there were any years w/o capture effort, if so pop-up the form *Select Missing Years Form* so that the user can specify those years.
  - a. If missing years are specified, write them to the top of the file.
- 2) Create a query called *first EidSurv\_Crosstab\_Abran* with the following SQL code:  

```

TRANSFORM Min([all birds].Zone) AS MinOfZone
SELECT [all birds].[Bird ID] FROM [all birds]
WHERE ([all birds].[Gender Error Flag] = False)
GROUP BY [all birds].[Bird ID] PIVOT [all birds].Year;

```

This query basically creates a table with each bird ID as the rows, and each year as the columns, and the zone number in the column where the bird was captured that year, or blank if not captured. (but only for the birds without sex errors)
- 3) Based on the starting and ending years specified by the user, create a query like:  

```

SELECT [first EidSurv_Crosstab_Abran].[Bird ID],
[first EidSurv_Crosstab_Abran].[startYear], [first EidSurv_Crosstab_Abran].[year2],[first
EidSurv_Crosstab_Abran].[endYear]
INTO [history list] FROM [first EidSurv_Crosstab_Abran]

```

This query will fill the table *history list*, with the capture records for only the years that the user requested. Here **startYear**, **year2**, etc are all the numeric years in the user's requested range.
- 4) Add two fields to the *history list* table, called HISTORY and SEX. Then fill the SEX field by running:  

```

UPDATE [all birds] INNER JOIN [history list]
ON [all birds].[Bird ID] = [history list].[Bird ID]
SET [history list].SEX = [all birds].[SEX];

```
- 5) Convert null values in the capture records to zeroes by running  

```

UPDATE [history list] SET [history list].[theYear] = '0' _
WHERE ((([history list].[theYear]) Is Null));

```

For **theYear** = **startYear** to **endYear**
- 6) Create a string containing the capture history, i.e. 100102, and add this string to the *history list* by running  

```

UPDATE [history list] SET [history list].HISTORY =
[history list].[startYear] & [history list].[year2] && [history list].[end year];

```
- 7) Create a table *mini history list*, selecting only those records where the capture history is not all zeroes (i.e. 000000) by running:  

```

SELECT [history list].[Bird ID], [history list].SEX, [history list].HISTORY INTO [mini history
list] FROM [history list] WHERE ((([history list].HISTORY)<>'emptyStr'));

```

Where **emptyStr** is the appropriate string of all zeroes
- 8) Create a new query, *second EidSurv\_Crosstab\_Abran*, that counts the number of birds of each sex with each capture history:

```
TRANSFORM Count([mini history list].[Bird ID]) AS [CountOfBird ID]
SELECT [mini history list].HISTORY AS Expr1 FROM [mini history list] GROUP BY [mini
history list].HISTORY PIVOT [mini history list].SEX;
```

- 9) Write all of the contents of *second EidSurv\_Crosstab\_Abran* to the file specified by the user.
- 10) Delete *second EidSurv\_Crosstab\_Abran*, *first EidSurv\_Crosstab\_Abran*, *history list*, and *mini history list*.