Developing Marine Reserves for Biodiversity Conservation and Sustainable Fisheries in Rodrigues

Manual for the Fishing Database developed for Shoals Rodrigues for monitoring of the large seine-net lagoon fishery.

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Fishing database 2002-2007 Manual

The Fishing database is set up for annual use to lower the risk of things going wrong. The principal part of the database comprises three interlinked tables: **Fishing days, Set info** and **Catch data**. These have "relationships" established so that each fish measured can be linked to a single haul on a specific day by a specific fishing team at a specific place. The individual annual databases have also been combined into one large database for analysis purposes. A fourth key table is **Species list** which among other things allows lengths to be converted to weights for almost all species. Data entry is generally be means of **Forms**. A series of **Queries** have also been written to assist checking of data entered and to generate **Reports**. Some of these queries are combined in **Macros**. To use the database fully you need to be able to use all these different parts.

Fishing days table

The **Fishing days** table (see above for design) contains information about each fishing day sampled (125 fishing days were sampled from 2002-2006). The Fishing-day ID is automatically entered by the database (Autonumber) and should never be touched. It is the unique identifier which links each fish caught to each fishing day's information.

Fields are: Fishing base, Fishing team – both these are entered on the Fishing days form using drop-down menus which list the fishing bases and teams with which Shoals are working. Date is always entered as dd/mm/yyyy. (Make sure computer is set up correctly in Windows for this date format.)

Leave base is the time the fishing team set out from their home base. If the fishing team stops to eat lunch or take a <u>clear break</u> from fishing or travelling to the next fishing site (i.e. just sit around eating/drinking/chatting for in excess of 5-10 minutes), then the length of breaks are totalled and entered in the Breaks field. Return base is the time the team arrives back at base after fishing has finished. All these times are entered as hh:mm (hours and minutes) in the form.

The Total sets field is for the total number of hauls (sets of the net) made by the fishing team during the fishing day. Often not all these will be sampled. The Sampled sets records the number of hauls (sets of the net) that were sampled during the fishing day.

The next four fields (Time HW (High Water), Height HW, Time LW and Height LW) are for information on the state of the tide but have not been regularly entered. Ideally this information should be entered for each fishing day from the tide tables.

Finally the state of the weather and the names/initials of the observers on the fish sampling trip should entered. The latter is very important.

Field Name	Data Type	Description
Set ID	AutoNumber	
Fishing-day ID	Number	
Start time	Date/Time	in form 09:30
Finish time	Date/Time	in form 09:45
Latitude degrees S	Number	set to 19
Latitude	Number	Decimal minutes
Longitude degrees E	Number	set to 63
Longitude	Number	Decimal minutes
Nr fishers	Number	
Nr boats	Number	
Zero haul	Yes/No	
Notes	Text	

Set info table

The **Set info** table (see above for design) contains information about each set (haul) made by a fishing team during a fishing day. The **Set info** table is linked to the **Fishing days** table information by Fishing-day ID. Each set (haul) has a unique identifier Set ID which is set automatically by the database and should not be touched.

For each set, the Start time and Finish time should be recorded and entered in the form hh:mm. All sets are at 19°S and 63°E so only the decimal minutes S latitude and E longitude need entering. These will typically be in the form 40.788 and 27.435 and should be entered to 3 decimal places (accurate to approx. 2 m).

For every single set of the net (haul) the number of fishers participating and number of boats participating should be entered. These will seldom vary by very much during a fishing day.

If a haul is taken which contains no fish then the Zero haul checkbox on the form should be ticked.

The Notes section is important and is where things such as mixed hauls (i.e. fish are not passed over until more than one haul has been made) occur. For example, if sets 2, 3 and 4 were only passed over once set 4 had been hauled, so that there was a mix of fish from the 3 sets, then one third of each species would be assigned to each set as the best estimate. Thus, if 30 *Siganus sutor* and 10 *Lethrinus nebulosus* were passed across for measuring from 3 sets, then 10 sigsut would be measured for each set and 3 letneb for 2 sets and 4 letneb for the remaining one. The times and GPS coordinates of each set would be entered and the fish randomly assigned to each set. This provides a best estimate of the catch in the sets.

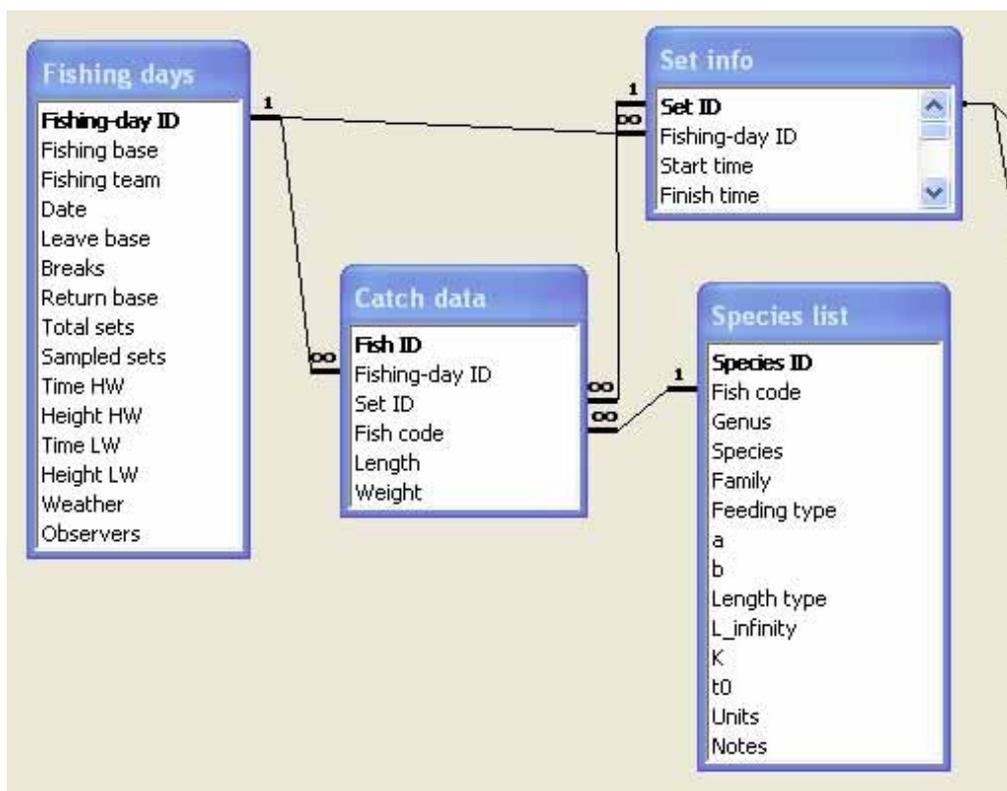| Field Name	Data Type	Description
Fish ID	AutoNumber	
Fishing-day ID	Number	Links each fish to a Fishing day
Set ID	Number	Links each fish to a Set
Fish code	Text	6 letter code which links fish to Species list
Length	Number	Total length in cm to nearest 0.5 cm
Weight	Number	Weight in grams calculated using a and b values in Species list

Catch data table

The **Catch data** table records the Fish code (e.g. sigsut for *Siganus sutor*) and total length for each fish sampled. The Weight is not entered by calculated from a and b values in **Species list** table using a macro. If Species code is not in the **Species list** table then no weight is calculated. (There about 30 fish

for which no weights are recorded out of about 68,000 sampled between 2002-2006.) The Fishing-day Id and Set ID fields allow each fish to be linked to a specific haul on a specific fishing day.

Species list table

The **Species list** table links details of each species to the **Catch data** table via the Fish code. No duplicate fish codes are allowed. The a and b values define the length-weight relationship for each species with the equation $W = a \times L^b$, where W = weight in grams and L = total length in cm. The table should be kept up to date as better information becomes available and new species are found in the catch. Each species has a unique automatically numbered Species ID and also a unique Fish code (which should be set to Indexed (No duplicates) in design view).

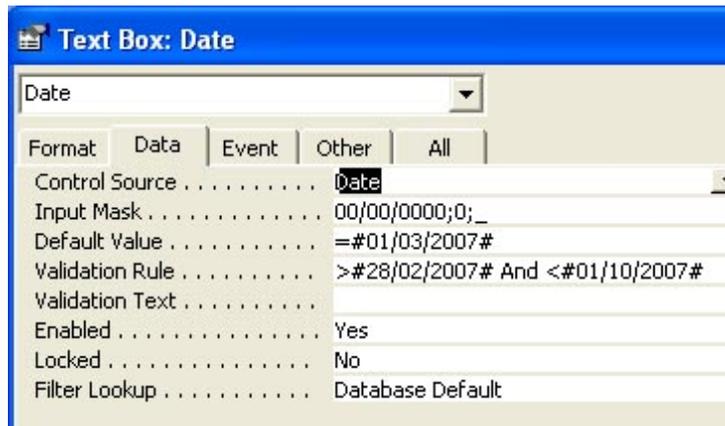The relationships between the principal data tables are summarised above.

Data are entered into the **Fishing days** form (above). This comprise a **Catch data** form nested inside a **Set info** form nested inside a **Fishing days** form. For a given Fishing day there will normally be data on several sets and for each set there will normally be data for many fish.

When entering the data from a fishing day the top (green) part of the form is filled in first. For a new fishing day, either the ▶※ or the "+" buttons can be selected. When selecting the ▶※ button, make sure it is the one for **Fishing days** and not that for **Set info** or **Catch data** records! When data are entered in the Fishing days form then the database will autonumber the Fishing ID field. Fishing base and Fishing team are entered using drop-down menus.

If these menus need to be changed. Open the Fishing days form in Design view. Right-click on the white area of the Fishing base or Fishing team "Combo box" and select Properties. Under the Data (or All) tab of the Combo box you will see an item labelled "Row source". This has a list of the items that can be displayed in the drop-down menu (e.g. "Pointe Corail";"Baie du Nord";"Pointe l'Aigle";"Port Sud Est" for Fishing base). Note that each item is in double quotes and separated by a semi-colon.

The date field can be set to default to the start date for the fishing year and can be validated such that it is a date within the fishing year. This is set up at present (but can be changed if found unhelpful). The validation rule and default value need to be changed each year. To do this, open the Fishing days form in Design view. Right-click on the white area of the Date "Text box" and select Properties. Under the Data (or All) tab of the Text box you will see various items (right). These control

how the date is entered and what values are acceptable. The validation rule means that only dates that are within the large seine-net fishing season for 2007 can be entered. The input mask makes sure that only numbers in the correct date format can be entered.

The screen-shot (right) shows part of 2006 data. The highlighted fish is a 29.5 cm *Gerres longirostris* which was the 5th out of 53 fish measured from the 3rd out of 11 sets sampled on the 5th out of 27 fishing days sampled during 2006. For this fish, the Fishing-day ID or 5 and Set ID of 29 are what link it to its fishing day and set information.

Note that clicking on the New set button will activate a new set record within the fishing day that is currently selected.

When a new set is entered using either the ▶✳ or the "+" buttons in the blue **Set info** part of the form, the autonumber Set ID should be left alone and this will update when data are entered. Data for ALL fields must be collected for each haul and all fields should be filled in. The Zero haul check box is ticked only if no fish are landed from a haul. This indicates that there will be no catch data for that Set ID. Thus for nil hauls nothing is entered in the **Catch data** subform for the set. The Notes section is for any unusual sets – e.g. when sets are combined, etc.

The Fish code for each fish measured is obtained via the drop-down menu (linked to **Species list** table) or by typing first few letters until correct Fish code appears. The length in cm is then entered and this is repeated for each fish measured in the set.

Checking data

Several queries have been written to allow each day's data to be checked.

Daily set number check query

Open this query in design view and change the Date field date in the Criteria row to the date of the Fishing day just entered. Then run the query. The query shows how many sets have been entered and their Set IDs. Check that the correct number of sets have been entered for the fishing day.

Daily set check query

Open this query in design view and change the Date field date in the Criteria row to the date of the Fishing day just entered. Then run the query. The query shows numbers of fish entered for each Set ID. Check the numbers are correct against the data sheets.

Daily data summary query

Open this query in design view and change the Date field date in the Criteria row to the date of the Fishing day just entered. Then run the query. The query shows numbers of each species entered for the fishing day and the minimum and maximum length. Check the numbers are correct against the data sheets and that the lengths are sensible.
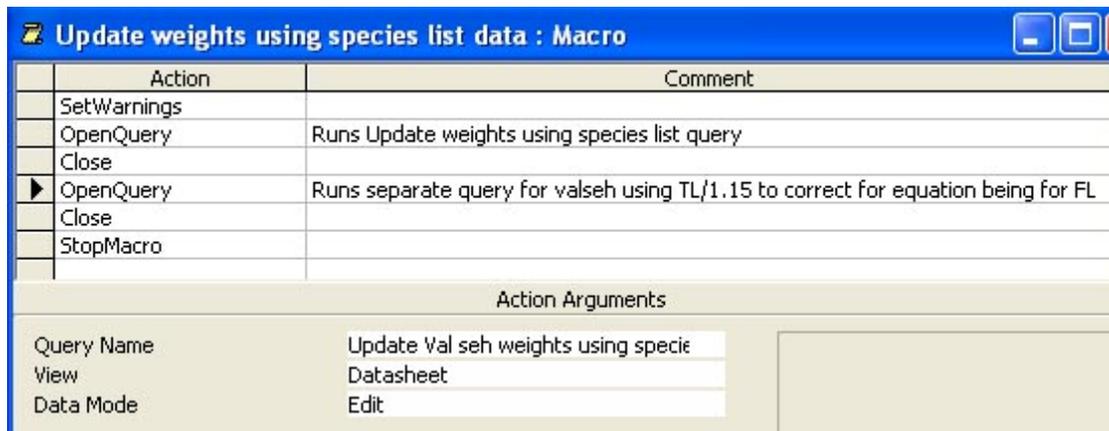
Daily data check query

Open this query in design view and change the Date field date in the Criteria row to the date of the Fishing day just entered. Then run the query. The query shows fish code, length and Set ID numbers of all fish entered for the fishing day. This may help in tracking down data entry errors if numbers do not tally with datasheets.

Macros

Update weights using species list macro

All weights in the **Catch data** table are calculated from the measured fish lengths using the equation $W = a \times L^{b}$, where W = weight in grams and L = total length in cm. The values for a and b constants for each species are stored in the **Species list** table. The only constants available for *Valamugil seheli* relate to FL and so a separate query is run to update weights of these with TL being divided by 1.15 before the equation is applied.

Essentially the two hidden queries update the Weight fields in the **Catch data** table.

(To see hidden macros and queries select **Tools, Options** and **View** tab and check the **Hidden objects** checkbox in the **Show** area.)

Reporting macro

Action	Comment
SetWarnings	
RunMacro	Runs Fishing sites summary macro
OpenTable	Opens Set summary table
RunCommand	Selects whole table
RunCommand	Deletes all records in Set summary table clean prior to append
Close	
OpenQuery	Runs Set summary query 1
Close	
OpenQuery	Runs Set summary query 2
Close	
OpenQuery	Runs Set summary query 3
Close	
OpenQuery	Runs Set summary query 4
Close	
OpenQuery	Runs Set summary query 5
Close	
OpenQuery	Runs Set summary query 6
Close	
OpenTable	
RunMacro	Runs Set by species summary macro
StopMacro	

Set summary : Macro

This macro runs two hidden macros (**Fishing sites summary** and **Set by species summary**) as well as 6 hidden queries. (To see hidden macros and queries select **Tools, Options** and **View** tab and check the **Hidden objects** checkbox in the **Show** area.)

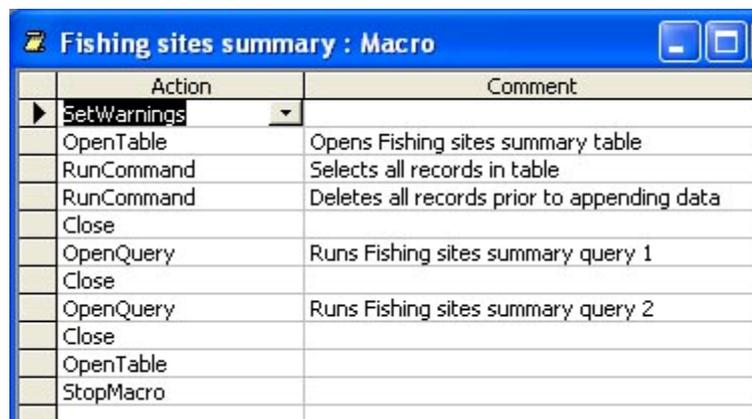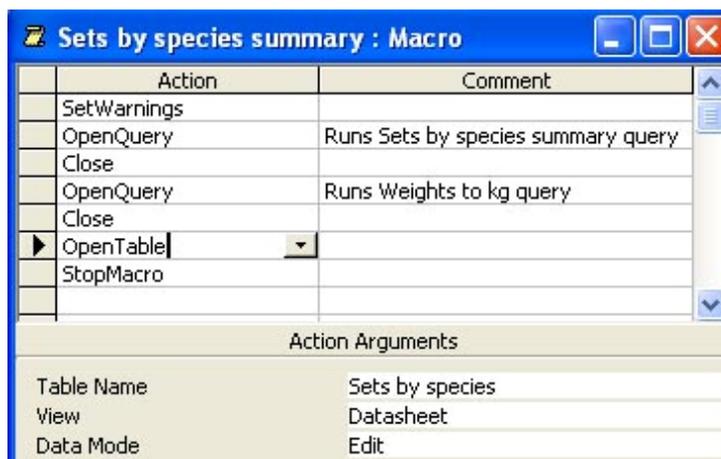The macros rely on three tables (**Fishing sites summary, Set summary,** and **Set by species summary**) whose structures are needed being present. These MUST NOT be deleted as macros and queries that use them will fail if they are. The **Set by species summary** table which is produced at the end provides the basis for the **Sets by species** report.

Action	Comment
SetWarnings	
OpenTable	Opens Fishing sites summary table
RunCommand	Selects all records in table
RunCommand	Deletes all records prior to appending data
Close	
OpenQuery	Runs Fishing sites summary query 1
Close	
OpenQuery	Runs Fishing sites summary query 2
Close	
OpenTable	
StopMacro	

Fishing sites summary : Macro

This hidden macro runs two queries which deletes any existing data, then appends latest data to and finally updates **Fishing sites summary** table so data is in correct format.

The main Set summary queries (numbered 1 to 6): 1) work with the **Fishing sites summary** table and the **Set info** and **Fishing days** tables to append the latest data to the **Set summary** table (having deleted any existing data), 2) update fields in the **Set summary** table, 3) further modify the data and make a new table called **Sums by set**, 4) update **Set summary** with total weights and total numbers of individuals per set from **Sums by set** table, 5) update Header1 and Header2 fields in Set summary table (needed for Report headings), 6) combine Header1 and Header2 fields into a Full Header and create Set header records within **Set summary** table. At this stage the **Set summary** table, **Species list** and **Catch data** tables contain all the information needed to generate the **Set by species summary** table.

The main macro then calls the **Sets by species** (hidden) macro (design above) which runs two queries. The **Sets by species summary** query firstly makes the **Sets by species** table. This table is then updated with weights in grams being converted to weights in kg. The final table can be used to produce a report on the year's fishery in standard Shoals format.

Both **Set summary** and **Fishing sites summary** tables require at least some data to be present, hence these tables have some spurious data entries in their first records.

All the hidden macros and queries should not need to be accessed unless they are to be modified (by an expert) and this is why they are set to be hidden.

Remember that the following secondary tables are needed specifically for these macros and should be left alone.

1. Fishing sites summary,
2. Set summary,
3. Sets by species,
4. Sums by set.

Creating clean database for new fishing season

To create a clean database for the next fishing season, open the current season's database to view the list of tables. Three clean (empty) tables need to be generated for the new season; these are **Fishing days**, **Set info** and **Catch data.**

Click on the Fishing days table to select it, click on the Copy button and then click on the Paste button. A **Paste Table As** dialog box appears. Click on the Structure only radio button and then type in a name for the table in the Table name: text box – I suggest **Fishing days 2008** if preparing for the 2008 fishing season. This creates a new blank table with the same design as **Fishing days**.

Repeat this copy and paste process for **Set info** to create a blank **Set info 2008** table and **Catch data** to create a blank **Catch data 2008** table.

At this point you should select **Tools, Relationships** to remind you of how the relationships between the new tables and between **Catch data** and **Species list** tables are set up.

Note that Fishing-day ID in **Fishing days** links to that field in **Set info** and **Catch data** as a 1 to many link with referential integrity enforced. Note that Set ID in **Set info** links to that field in **Catch data** as a 1 to many link with referential integrity enforced. Note that Fish code in **Species list** links to that field in **Catch data** as a 1 to many link with referential integrity enforced. See diagram on page 3.

Delete the old **Fishing days, Set info** and **Catch data** tables (you will need to delete their relationships when doing this) and then rename the three new blank tables (which should have been initially called **Fishing days 2008, Set info 2008,** and **Catch data 2008**) as **Fishing days, Set info** and **Catch data**. Once this is done you need to open the relationships and re-establish the links as on the

diagram. You should cascade updates and may wish to cascade deletes as well (see dialog box below). The latter could cause loss of data if someone deletes the wrong thing but would normally be in place.

For example, if a Fishing-day ID is deleted, any sets form that fishing day in **Set info** and any fish caught on that fishing day in **Catch data** will also be deleted. This is as it should be but means you must be very careful about deleting data in **Fishing days** and **Set info** tables.

Combining annual databases into a single relational database

This has already been done for years 2002 to 2006 to create Fishing database 2002-2006.mdb. The steps required are as follows.

First make sure that the annual database has been carefully checked and finalized for the year.

Open the annual database to be added in one Access window and the combined database in another Access window (start Access twice to do this). For the purpose of this example, we will assume that we are adding the 2007 fishing data to the combined database. For each append query make sure that the correct number of records are appended (i.e. check first how many records are in each table being appended).

1. In the annual database to be added, go to the Tables.

2. Copy the **Fishing days** table and then switch to the combined database and select Paste. In the **Paste Table As** dialog box, select the Structure and Data radio button and type in **Fishing days 2007** (i.e. "Fishing days" followed by the relevant year).

3. In Design view, change the Fishing-day ID field type in the **Fishing days 2007** table from AutoNumber to Number and check that the Format is Long Integer.

4. In Design view, inspect the **Append fishing days** query in the combined database. This should have an empty table (from the previous year) present. Right-click on the query and select Show Table and add the **Fishing days 2007** table to the query. Double-click on the * field above Fishing-day ID to set up the query append all records from **Fishing days 2007** to the **Fishing days new** table. Then delete the previous year's empty table. When all is ready, click on the red ! button or select **Query, Run** to run the query and append the new fishing days to the combined database.

5. In the annual database to be added, go to the Tables.

6. Copy the **Set info** table and then switch to the combined database and select Paste. In the **Paste Table As** dialog box, select the Structure and Data radio button and type in **Set info 2007** (i.e. "Set info" followed by the relevant year).

7. In Design view, change the Set ID field type in the **Set info 2007** table from AutoNumber to Number and check that the Format is Long Integer.

8. In Design view, inspect the **Append set info** query in the <u>combined database</u>. This should have an empty table (from the previous year) present. Right-click on the query and select Show Table and add the **Set info 2007** table to the query. Double-click on the * field above Set ID to set up the query append all records from **Set info 2007** to the **Set info new** table. Then delete the previous year's empty table. When all is ready, click on the red ! button or select **Query, Run** to run the query and append the new set info to the combined database.

9. You now need to update the "Fishing-day ID new" field in the **Set info new** table. You need to be sure that the field is ONLY updated for the new records you've just appended. Open the **Set info new** table and go to the end and then scroll up until you find the last record with a non-zero Fishing-day new ID. This is the last record from the previous year. (The record below should have a Set ID of 1). Make a note of the value of the "Set ID new" value of the last record from the previous year (this is 1126 for the year 2006).

10. Now, in Design view, inspect the **Update set info new with new fishing ID** query. Change the Date criteria to the 1 January of the year being added. Change the Set ID new criteria to > whatever the last Set ID new value was for the previous year (i.e. this should be >1126 if adding the 2007 data). When all is correct, click on the red ! button or select **Query, Run** to run the query and update the Fishing-day ID new field for the new set info data in the combined database.

11. In the <u>annual database</u> to be added, go to the Tables.

12. Copy the **Catch data** table and then switch to the combined database and select Paste. In the **Paste Table As** dialog box, select the Structure and Data radio button and type in **Catch data 2007** (i.e. "Catch data" followed by the relevant year).

13. In Design view, change the Fish ID field type in the **Catch data 2007** table from AutoNumber to Number and check that the Format is Long Integer.

14. In Design view, inspect the **Append catch data** query in the <u>combined database</u>. This should have an empty table (from the previous year) present. Right-click on the query and select Show Table and add the **Catch data 2007** table to the query. Double-click on the * field above Fish ID to set up the query append all records from **Catch data 2007** to the **Catch data new** table. Then delete the previous year's empty table. When all is ready, click on the red ! button or select **Query, Run** to run the query and append the new catch data to the combined database.

15. You now need to update both the "Fishing-day ID new" and "Set ID new" fields in the **Catch data new** table. You need to be sure that the fields are ONLY updated for the new records you've just appended. Open the **Catch data new** table and go to the end and then scroll up until you find the last record with a non-zero Fishing-day new ID and Set ID new. This is the last record from the previous year. Make a note of the value of the "Fish ID new" value of the last record from the previous year (this is 68058 for the year 2006).

16. Now, in Design view, inspect the **Update catch data with new set and fishing IDs** query. Change the Date criteria to the 1 January of the year being added. Change the Fish ID new criteria to > whatever the last Fish ID new value was for the previous year (i.e. this should be >68058 if adding the 2007 data). When all is correct, click on the red ! button or select **Query, Run** to run the query and update the Fishing-day ID new and Set ID new fields for the new catch data in the combined database.