

CHAPTER 14

FISH POPULATION ESTIMATES: STREAMS

There are many methods to assess fish populations in streams, including electrofishing, pool seining, counting fish passing through barriers and fences placed across streams, and counting redds and spawning fish immediately after spawning has occurred. Electrofishing is a common method of assessing juvenile salmonid and smallmouth bass populations in New Brunswick, while pool seining, barrier/fence counts and redd/spawner counts are methods generally employed to assess adult salmonid stocks.

ELECTROFISHING

Electrofishing is a method which utilizes electric current to stun fish so they may be handled for enumeration and measurement. The total population is projected from the number of fish collected and the capture efficiency. Permanent electrofishing sites are established on streams to compare year to year fish densities. One time “spot checks” are also undertaken to assess species presence and relative abundance.

Permanent electrofishing sites are especially useful in providing time-series data for juvenile salmonid abundance. Site location and description are particularly important to ensure the same habitat type and area is re-sampled in subsequent years. In general, new permanent electrofishing stations should represent a single habitat type, i.e. riffle, run, pool or rapid unless the stream is very small (< 3 m wide).

Fish populations in streams are estimated with electrofishing using one of three indirect methods:

- < **Zippin’s Total Removal Estimate** - This is a multiple sweep method with 3 or more sweeps. It is based on the principle that a decrease in catch per effort (c/e) as the population is depleted bears a direct relationship to the extent of the population. Population size is derived by plotting a regression line of c/e on the cumulative catch. The linear regression technique to calculate population size first determines probability of capture (P):

$$= \frac{-(K3T_x - 3T3x)}{K3x^2 - (3x)^2}$$

and then the population estimate (N):

$$= \frac{3T + P3x}{KP}$$

where: K = number of sweeps completed
T = number of fish caught per sweep
x = cumulative number of fish removed in previous sweep(s)

- < **Catch per Unit Effort (CPUE) : One Sweep Method** - This method can only be used to obtain a population estimate where several Zippin or Petersen total abundance estimates have been previously calculated. If a relationship between the first sweep catch and the Zippin or Petersen total population

estimate can be established, i.e. the first sweep catch per unit effort relates to total abundance, the CPUE method can be used as a rapid assessment technique. The CPUE method usually employs a 180 to 300 second effort on the first and only sweep whereas Zippin or Petersen methods often require several hours to a few days to complete. Population estimates are calculated from the one sweep count and the predetermined relationship. The CPUE data form is the same as the Zippin form.

- < **Petersen Mark and Recapture Estimate** - A sample of fish is collected, marked and released. At a later time, usually within a few days, a second recapture sample is obtained. The Petersen population estimator is:

$$N = \frac{MC}{R}$$

where:

N = population size
 M = number of marked fish released
 C = recapture sample size
 (marked and unmarked fish)
 R = number of marked fish recaptured

or if the number of marked recaptures (R) is small, Chapman's (1951) modified Petersen formula may be used:

$$N = \frac{(M+1)(C+1)}{(R+1)}$$

Once juvenile salmonid densities for a site have been estimated, the Percent Habitat Saturation (PHS) index may be calculated for each species' age class (Grant and Kramer 1990). This index determines the amount of use of the site by juveniles and can be used to predict the probability that the fish are exhibiting density-dependent behaviour.

Percent Habitat Saturation indices are calculated for each age class separately, then combined to determine the total PHS for the site.

$$PHS = 100 \times D \times T \times 1.19$$

where:

D = Density/m²
 T = Territory Size ($\log_{10} T = 2.61 \log_{10}$
 Average Fork Length(cm) - 2.83)
 1.19 = Correction Factor

FISH TRAP COUNTS

Various fish trapping facilities are operated by Fisheries and Oceans Canada, the New Brunswick Department of Natural Resources and Energy, the University of New Brunswick, J.D. Irving Limited, and in the past, Bowater Pulp and Paper Canada Inc. Their purpose is to assess brook trout and Atlantic salmon populations. The facilities include trap nets which sample a portion of the total population, and counting fences, fish lifts and barrier traps which count all fish. Counting fences simply count fish as they migrate up or down stream. Containment barriers, on the other hand, trap upstream migrating fish and retain them in a large holding pool until spawning season when the fish are released.

All trapping facilities are checked daily for fish counts; water levels and temperatures are also recorded. In addition, tagged fish are identified; fin clipped fish may or may not be identified. In some instances, observations may be made on individual fish, such as length and sex.

The various trapping facilities have unique characteristics and as such, collect different types of information. For instance,

- < the Catamaran Brook fence operated by the University of New Brunswick and Fisheries and Oceans Canada assesses the upstream and downstream movements of salmonids and other species,

- < Fisheries and Oceans' estuarial sites monitor fish species larger than 15 cm moving upstream, including two age classes of Atlantic salmon (grilse and multi-sea-winter salmon), and
- < Natural Resources and Energy sites record upstream movement only of adult brook trout and three adult age classes of Atlantic salmon (grilse, small multi-sea-winter and large multi-sea-winter salmon).

The New Brunswick Department of Natural Resources and Energy has developed a computer application for entering barrier count data and generating summary reports.

All trapping facility sites have been incorporated within GIS.

POOL SEINING

Pool seining is undertaken on several rivers in the fall of each year to count adult Atlantic salmon and/or collect them for broodstock. Within the Miramichi basin, this activity is now directed by Miramichi Fisheries Ltd. with various private industries or user groups which undertake satellite rearing and stocking of hatchery-raised juvenile salmonids.

A variety of information of various Atlantic salmon stocks is gained by seining pools, including ratios of male to female salmon, grilse to multi-seawinter salmon, and wild to hatchery-raised salmon, the latter indicated by clipped adipose fins. Any salmon with tags, obtained at DFO trap nets in the estuary, are noted and the data is cross-referenced with data obtained during the tagging process.

A sample of individual fish may be collected at this time for broodstock, usually multi-seawinter salmon unless not available (male fish are mostly grilse). These fish are transported to the Southesk Hatchery and spawned. The progeny are raised until the following spring when they are stocked out to stock-specific satellite rearing tank sites

around the province. Please refer to Chapter 21 **Management Activities: Fish Stockings** for more details on the satellite rearing program.

REDD/SPAWNER COUNTS

Counts of Atlantic salmon redds and spawning fish are undertaken just after spawning in the fall of the year on many New Brunswick streams. Actual dates will vary for individual streams, but spawning is usually mid to late October until early November. By surveying the same stretch of a stream each year, called an "index" stretch, annual comparisons may be made to observe temporal and spatial trends in salmon distribution.

Redds and spawning salmon are counted simultaneously as the surveyor travels down a stretch of stream on foot or by canoe. Redds are obvious depressions or pits in the streambed with clean gravel and small rubble on top and are the more reliable count since they don't move. Spawning fish may be missed or may have left the stream between spawning and the survey. Counts of spawning fish may be referenced to a particular site or within a more general stretch of a stream.

DATA SOURCES

The electrofishing results data set includes data from Fisheries and Oceans Canada, the New Brunswick Department of Natural Resources and Energy, J.D. Irving, Limited, Bowater Pulp & Paper Canada Inc. and various conservation organizations. Pool seining data was obtained from Bowater Pulp and Paper Canada Inc. Redd/spawner counts are available from the Department of Natural Resources and Energy, Bowater Pulp and Paper Canada Inc., and J. D. Irving, Limited.

The fish migration counts data set includes data from Fisheries and Oceans Canada, the New Brunswick Department of Natural Resources and Energy, J.D. Irving Limited, and Bowater Pulp and Paper Canada Inc. Fisheries and Oceans data

records all fresh and salt water species, but only brook trout and Atlantic salmon data has been incorporated within the Data Warehouse.

POSITIONAL ACCURACY

The positional accuracy of the stream population assessment sites is based on textual descriptions of locations and known road access points. The positional accuracy of the hydrographic spatial data is $\pm 1.5\text{m}$ to $\pm 2.5\text{m}$. Please refer to **SNB's Land and Water Standards Manual** for further details.

DATA FILES

Tabular Data

There are ten data tables within fish population estimates for streams. Four tables are associated with electrofishing; one maintains general information on electrofishing sites, the second table contains details of an electrofishing session, the third contains data obtained during a session, and the fourth contains population estimates derived from the data. Three data tables are related to fish migration counts; one maintains the general information on the fish counting facilities, the second table contains the daily fish counts entering the facility, and the third contains various measurements on individual fish passing through the facility. There are two data tables related to pool seining; the first maintains general information on the seining sites, and the second table contains numbers of fish caught at each site. Two data tables are associated with redd and spawner surveys; the first contains numbers of redds and spawners counted over stretches of stream, and the second table contains numbers of fish counted at specific sites within streams since they usually occur in groups in pools. Numbers of redds and spawning fish are usually obtained during the same survey.

- , **Electrofishing Sites** - Maintains general information on each site, including the locational data for referencing within GIS.

- , **Electrofishing Sessions** - Contains information specific to each survey session, including water and air temperatures and site dimensions.
 - , **Electrofishing Sweep Data** - Contains numbers of fish captured per sweep and mean fork lengths by species and age class.
 - , **Electrofishing Population Estimates** - Contains estimates of population density and percent habitat saturation.
 - , **Fish Trapping Sites** - Maintains general information on each site, including the years of operation.
 - , **Fish Migration Counts** - Contains daily counts of each fish species (brook trout and Atlantic salmon) and age class of fish entering the fence or trap. Some fences are able to monitor fish moving up and down.
 - , **Fish Migration Totals** - Contains annual summary of each fish species (brook trout and Atlantic salmon) and age class of fish entering the fence or trap.
 - , **Individual Fish Observations** - Contains data on individual fish passing through the counting facility such as species, age, sex, and length.
 - , **Pool Seining Sites** - Maintains general information on each site, including the locational data for referencing within GIS.
 - , **Pool Seining** - Contains dates of seining and counts of fish caught.
 - , **Redd and Spawner Counts by Stream Reach** - Contains data from redd and spawner count surveys, as well as measurements of individual stretches along the stream routes and locational data for referencing within GIS.
 - , **Spawner Counts by Site** - Contains data from spawner count surveys for a specific site
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as well as locational data for referencing within GIS.

Spatial Data

ArcView shape files were created for electrofishing sites, fish counting facility sites, and pool seining sites. Point coverages are used rather than dynamic segmentation for electrofishing sites due to the large number of Fisheries and Oceans sites which are provided as coordinates, and for counting facilities as Fisheries and Oceans sites are located within the estuary where there are no stream routes.

Redd and spawner count survey stretches are mapped through Route System files and dynamic segmentation.

References:

- Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological censuses. Univ. California Publ. Stat., 1(7): 131-160.
- Grant, J. and D. L. Kramer. 1990. Territory size as a prediction of the upper limit to population density of juvenile salmonids in streams. Can. J. Fish. Aquat. Sci. 47: 1724-1737.
- Petersen, C. G. J. 1896. The yearly immigration of young plaice into the Limfyord from the German Sea. Rept. Danish Biol. Sta., 6: 5-48.
- Zippin, C. 1958. The removal method of population estimation. J. Wildl. Manage. 22(1): 82-90.
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**TABULAR
DATA
FILES**

ELECTROFISHING SITES

The *Electrofishing Sites* table (ef-site.dbf) maintains a list of permanent and non-permanent electrofishing sites within the province. Permanent sites have been established by the NB Natural Resources and Energy, Fisheries and Oceans Canada, J. D. Irving, Limited, Bowater Pulp and Paper Canada Inc. and Hammond River Angling Association. Non-permanent sites are generally “one-time” assessments. Occasionally two agencies may share a site; extra fields have been added to accommodate information from both agencies, e.g. agency site ID.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Electrofishing Site ID	Identifier for permanent electrofishing site assigned by the Data Warehouse	EFSite_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the electrofishing site	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Agency responsible for the site or who collected the data	Agency_Cd	Character (4)	Code Table 6
Second Agency Code	Second agency responsible for the site or who collected the data, if applicable	Agency2_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (10)	
Second Agency's Site No.	Site identifier used by the second agency, if applicable	Ag2Site_ID	Character (10)	
Site Description	Description of location of electrofishing site	Site_Des	Character (150)	
Habitat Unit No.	Habitat unit ID where site is located (if area previously surveyed). Assigned by data warehouse.	HabUnit_ID	Numeric (10)	
Stream Type Description	Description of stream type(s)	StrTyp_Des	Character (30)	Code Table 7
Year Started	First year electrofishing data collected at the site	Start_Yr	Character (4)	
Year Ended	Last year electrofishing data collected at the site	End_Yr	Character (4)	
Second Agency's Year Started	First year electrofishing data collected at the site by the second agency, if applicable	Ag2_St_Yr	Character (4)	
Second Agency's Year Ended	Last year electrofishing data collected at the site by the second agency, if applicable	Ag2_End_Yr	Character (4)	

ELECTROFISHING SURVEY

The *Electrofishing Survey* table (ef-survey.dbf) contains information pertaining to an individual electrofishing sampling session, e.g., air and water temperatures and sampling methodology. Occasionally two agencies may share a site; extra fields have been added to accommodate information from both agencies, e.g. agency site ID.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Electrofishing Survey ID	Identifier for electrofishing survey session assigned by the Data Warehouse	EFAssmt_ID	Numeric (8)	
Electrofishing Site ID	Identifier for permanent electrofishing site assigned by the Data Warehouse	EFSite_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the electrofishing site	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Agency responsible for the site or who collected the data	Agency_Cd	Character (4)	Code Table 6
Second Agency Code	Second agency responsible for the site or who collected the data, if applicable	Agency2_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Second Agency's Site No.	Site identifier used by the second agency, if applicable	Ag2Site_ID	Character (6)	
Assessment Date	Date electrofishing occurred - Format YYYY.MM.DD	Assmt_Date	Character (10)	
Assessment Time	Time of day when electrofishing occurred	Assmt_Time	Character (5)	
Stream Type Description	Description of stream type(s)	StrTyp_Des	Character (30)	Code Table 7
Population Estimation Method	Method used to estimate populations	Pop_Method	Character (25)	
Sampling Device	Device used for sampling (e.g., Backpack, Boat)	Device	Character (10)	
Site Setup	Site setup used (e.g., Open, Closed)	Site_Setup	Character (6)	
Air Temperature	Ambient air temperature measured in °C	Air_Temp	Numeric (5.1)	
Water Temperature	Water temperature measured in °C	Water_Temp	Numeric (5.1)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Flow (cms)	Flow of water measured in cubic meters per second	Water_Flow	Numeric (6.4)	
Assessment Length	Length of sample area (m)	Assmt_Len	Numeric (6.2)	
Assessment Area	Surface area of the stream section being sampled (m ²)	Assmt_Area	Numeric (8.1)	
Number of Sweeps	Number of sweeps performed at the site	No_Sweeps	Numeric (1)	
Comments	General comments	Comments	Character (100)	

ELECTROFISHING SWEEP DATA

The *Electrofishing Sweep Data* table (ef-data.dbf) contains data collected during an electrofishing session. Each entry represents one age class of one fish species and records sweep catch numbers and mean fork lengths. In some cases, exact dates of electrofishing may not be known; at the very least, year is recorded. The table accommodates mark and recapture, removal and CPUE methods. Occasionally two agencies may share a site; extra fields have been added to accommodate information from both agencies, e.g. agency site ID.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Electrofishing Sweep Data ID	Identifier for electrofishing sweep data (per age class per species) assigned by the Data Warehouse. May or may not have corresponding record(s) in <i>Electrofishing Populations Estimates</i> table.	EfData_ID	Numeric (10)	
Electrofishing Survey ID	Identifier for electrofishing survey session assigned by the Data Warehouse	EFAssmt_ID	Numeric (8)	
Electrofishing Site ID	Identifier for permanent electrofishing site assigned by the Data Warehouse	EFSite_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the electrofishing site	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Agency responsible for the site or who collected the data	Agency_Cd	Character (4)	Code Table 6
Second Agency Code	Second agency responsible for the site or who collected the data, if applicable	Agency2_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Second Agency's Site No.	Site identifier used by the second agency, if applicable	Ag2Site_ID	Character (6)	
Assessment Date	Date electrofishing occurred - Format YYYY.MM.DD	Assmt_Date	Character (10)	
Stream Type Description	Description of stream type(s)	StrTyp_Des	Character (30)	Code Table 7
Population Estimation Method	Method used to estimate populations	Pop_Method	Character (25)	
Assessment Area	Area of the stream being sampled (m ²)	Assmt_Area	Numeric (8.1)	
Number of Sweeps	Number of sweeps performed at the site	No_Sweeps	Numeric (1)	
Species Code	Species code of fish electrofished	Species_Cd	Character (2)	Code Table 17

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Species	Name of fish species electrofished	Species	Character (30)	
Age Class	Age class of fish electrofished (e.g., 0+, 1+, 2+, Fry, Parr)	Age_Class	Character (10)	
Average Weight (gm)	Average weight of the captured fish measured in grams	Ave_Weight	Numeric (8.1)	
Mean Fork Length (cm)	Average fork length of captured fish measured in centimeters	Ave_Flen	Numeric (6.1)	
Mean Total Length (cm)	Average total length of captured fish measured in centimeters	Ave_Tlen	Numeric (6.1)	
No. Captured on 1 st Sweep OR No. Captured & Marked on 1 st Sweep	Zippin: No. of fish captured in first sweep of the electrofishing device Petersen: No. of fish captured, marked and released on the first sweep	No_Sweep1	Numeric (6)	
1 st sweep time	Number of shocking seconds for first sweep	Time_Swp1	Numeric (6)	
No. Captured on 2nd Sweep	Zippin: No. of fish captured in second sweep of the electrofishing device Petersen: No. unmarked fish on the second sweep	No_Sweep2	Numeric (6)	
2 nd sweep time	Number of shocking seconds for second sweep	Time_Swp2	Numeric (6)	
No. Captured on 3rd Sweep	Zippin: No. of fish captured in third sweep of the electrofishing device Petersen: No. marked fish on the second sweep	No_Sweep3	Numeric (6)	
3 rd sweep time	Number of shocking seconds for third sweep	Time_Swp3	Numeric (6)	
No. Captured on 4th Sweep	Zippin: No. of fish captured in fourth sweep of the electrofishing device	No_Sweep4	Numeric (6)	
4 th sweep time	Number of shocking seconds for fourth sweep	Time_Swp4	Numeric (6)	
No. Captured on 5th Sweep	Zippin: No. of fish captured in fifth sweep of the electrofishing device	No_Sweep5	Numeric (6)	
5 th sweep time	Number of shocking seconds for fifth sweep	Time_Swp5	Numeric (6)	
No. Captured on 6th Sweep	Zippin: No. of fish captured in sixth sweep of the electrofishing device	No_Sweep6	Numeric (6)	
6 th sweep time	Number of shocking seconds for sixth sweep	Time_Swp6	Numeric (6)	
Total No. Fish Captured All Sweeps	Total number of fish captured in all sweeps	Tot_Allswp	Numeric (8)	
Percent Fish Clipped	Percentage of fish captured with adipose fin clips (indicating hatchery origin)	Prcnt_Clip	Numeric (6.1)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Comments	General comments	Comments	Character (100)	

ELECTROFISHING POPULATION ESTIMATES

The *Electrofishing Population Estimates* table (ef-results.dbf) contains population estimates calculated from the electrofishing sweep data, e.g., densities and Percent Habitat Saturations (PHS). Each record represents one population parameter for one species and one age class if possible, but may encompass all age classes of a species if the data is only available in this format. If a population estimate cannot be calculated from the sweep numbers obtained, the minimum estimate is recorded in the comments field (total of sweep counts divided by area of site).

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Electrofishing Sweep Data ID	Identifier for electrofishing sweep data (per age class per species) assigned by the Data Warehouse. If blank, there is no associated sweep information in the <i>Electrofishing Sweep Data</i> table.	EfData_ID	Numeric (10)	
Electrofishing Survey ID	Identifier for electrofishing survey session assigned by the Data Warehouse	EFAssmt_ID	Numeric (8)	
Electrofishing Site ID	Identifier for permanent electrofishing site assigned by the Data Warehouse	EFSite_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the electrofishing site	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Agency responsible for the site or who collected the data	Agency_Cd	Character (4)	Code Table 6
Second Agency Code	Second agency responsible for the site or who collected the data, if applicable	Agency2_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Second Agency's Site No.	Site identifier used by the second agency, if applicable	Ag2Site_ID	Character (6)	
Assessment Date	Date electrofishing occurred - Format YYYY.MM.DD	Assmt_Date	Character (10)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Stream Type Description	Description of stream type(s)	StrTyp_Des	Character (30)	Code Table 7
Population Estimation Method	Method used to estimate populations	Pop_Method	Character (25)	
Assessment Area	Area of the stream being sampled (m ²)	Assmt_Area	Numeric (8.1)	
Species Code	Species code of fish electrofished	Species_Cd	Character (2)	Code Table 17
Species	Name of fish species electrofished	Species	Character (30)	
Age Class	Age class of fish electrofished (e.g., 0+, 1+, 2+, Fry, Parr)	Age_Class	Character (10)	
Relative Size	Relative size of fish, generally large or small, e.g. small parr, large parr	Rel_Size	Character (10)	
Mean Fork Length (cm)	Average fork length of captured fish measured in cm	Ave_Flen	Numeric (6.1)	
Population Parameter	Population parameter - Density, PHS, Minimum Density or Minimum PHS	Pop_Param	Character (20)	
Population Estimate	Population estimate (Density in per 100 m ² , PHS in %)	Pop_Estmat	Numeric (7.2)	
Comments	General comments	Comments	Character (100)	

FISH COUNTING SITES

The *Fish Counting Sites* table (frunsite.dbf) maintains a list of counting fences and protection barriers within the province. The counting facilities are operated by NB Natural Resources and Energy, Fisheries and Oceans Canada, J.D. Irving Limited and Bowater Pulp and Paper Canada Inc.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Facility ID	Identifier for the counting fences and barriers assigned by the Data Warehouse	Facil_ID	Character (8)	Code Table 16
Water Body ID	Unique identifier of the stream where facility is located	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency responsible for the site	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (8)	
Facility Type	Type of facility - trap net, counting fence or protection barrier	Facil_Type	Character (20)	
Facility Name	Name of fish counting facility	Facil_Name	Character (20)	
Active Years	Lists the range of years the counting facility was active	Yrs_Active	Character (16)	

FISH MIGRATION COUNTS

The *Fish Migration Counts* table (fishrun.dbf) maintains daily counts of fish entering the various counting facilities. For ease of use, the counts for each species and age class are stored in individual fields. Since each site collects data differently, all records will not contain the same information.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Counting Facility ID	Internal number to uniquely identify each counting facility. Assigned by the Data Warehouse	Facil_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the counting facility	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency responsible for the site	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Assessment Date	Date of count - Format YYYY.MM.DD	Assmt_Date	Character (10)	
Direction of Movement	Direction the fish are moving - upstream or downstream	Direction	Character (6)	
Species Code	Species code of fish	Species_Cd	Character (2)	Code Table 17
Species	Name of fish species	Species	Character (30)	
Origin of Fish	Indicates whether the fish are wild or hatchery stock	Origin	Character (10)	
Age Class	Age class of fish captured (e.g. Fry, Parr, Grilse, MSW)	Age_Class	Character (30)	
Relative Size	Relative size of fish, generally large or small, e.g. small MSW, large MSW	Rel_Size	Character (10)	
Fish Status	Indicates the status of the fish - whether it released, sacrificed or found dead	Status	Character (50)	
Number of Fish	Number of fish counted	No_Fish	Numeric (10)	

FISH MIGRATION SUMMARY

The *Fish Migration Counts* table (fishrun-sum.dbf) maintains an annual summary of the numbers of Atlantic salmon entering the various counting facilities.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Counting Facility ID	Internal number to uniquely identify each counting facility. Assigned by the Data Warehouse	Facil_ID	Character (8)	
Water Body ID	Unique identifier of the stream with the counting facility	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the surveyed stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency responsible for the site	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (4)	
Assessment Date	Date of count - Format YYYY.MM.DD	Assmt_Date	Character (10)	
Assessment Year	Year of assessment	Assmt_Year	Character (4)	
Atlantic Salmon Smolt	Total number of Atlantic salmon smolt moving through the facility during the year	Smolt	Numeric (6)	
Atlantic Salmon Grilse	Total number of Atlantic salmon grilse (1SW) moving upstream through the facility during the year	Grilse	Numeric (6)	
Atlantic Salmon Small MSW	Total number of small multi-sea winter (2SW) Atlantic salmon moving upstream through the facility during the year	Sm_MSW	Numeric (6)	
Atlantic Salmon Large MSW	Total number of large multi-sea winter (3SW or older) Atlantic salmon moving upstream through the facility during the year	Lg_MSW	Numeric (6)	
Atlantic Salmon Total MSW	SUBTOTAL - Number of small and large multi-sea winter Atlantic salmon moving upstream through the facility during the year	Tot_MSW	Numeric (6)	
Total Atlantic Salmon	TOTAL - Number of adult Atlantic salmon moving upstream (grilse + small MSW + large MSW) through the facility during the year	Tot_AS	Numeric (6)	

INDIVIDUAL FISH OBSERVATIONS

The *Individual Fish Observations* table (indvfish.dbf) contains measurements taken from individual fish passing through a counting fence or protection barrier.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Individual Fish ID	Unique identifier for the fish being measured. Assigned by the Data Warehouse	Indvfishid	Numeric (8)	
Site ID	Identifier for the counting facility or other site where fish sample was captured and measured	Site_ID	Character (8)	
Water Body ID	Unique identifier of the stream where facility is located	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code representing the agency responsible for the site	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Assessment Date	Date of observation - Format YYYY.MM.DD	Assmt_Date	Character (10)	
Assessment Time	Time of day	Assmt_Time	Character (5)	
Water Level	Water level measured in centimeters	Water_Lvl	Numeric (6.1)	
Sweep No.	The electrofishing sweep number which captured the fish	Sweep_No	Numeric (4)	
Fish Species Code	Code representing the fish species	Species_Cd	Character (2)	Code Table 17
Fish Species	Fish species name	Species	Character (30)	
Age Class	Age or age class category (e.g., fry, parr, 1SW, MSW) of fish	Age_Class	Character (20)	
Age	Actual age of the fish	Age	Character (5)	
Relative Size	Relative size of fish, generally large or small, e.g. small MSW, large MSW	Rel_Size	Character (10)	
Sex	Sex of fish if known	Sex	Character (1)	Code Table 20
Maturity	Indicates whether fish is mature	Maturity	Character (15)	
Fish Status	Indicates the status of the fish - whether it released, sacrificed or found dead	Status	Character (50)	
Fish Weight (gm)	Average fish weight measured in grams	Weight	Numeric (8.1)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Fork Length (cm)	Fork length of fish, measured in centimeters	Frk_Len	Numeric (8.1)	
Total Length (cm)	Total length of fish, measured in centimeters	Tot_Len	Numeric (8.1)	
Comments	General comments	Comments	Character (250)	

BROODSTOCK COLLECTION SITES

The *Broodstock Collection Sites* table (broodstock-site.dbf) maintains data on sites where broodstock are collected, such as pools have been seined for adult Atlantic salmon. Each site has been assigned a unique ID in addition to the site ID number assigned by the agency.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Seining Site ID	Unique number representing an individual habitat unit. Assigned by the Data Warehouse	Sensite_ID	Numeric (6)	
Water Body ID	Unique identifier of stream	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code for agency or group performing the seining	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (10)	
Site Description	Description of where the seining site is located	Site_Des	Character (150)	
Habitat Unit No.	Unique number representing an individual habitat unit based on stream habitat survey. Assigned by the Data Warehouse	HabUnit_ID	Numeric (10)	
Stream Type Description	Description of stream type	StrTyp_Des	Character (30)	Code Table 7
Year Started	First year seining data collected at the site	Start_Yr	Character (4)	
Year Ended	Last year seining data collected at the site	End_Yr	Character (4)	

BROODSTOCK

The **Broodstock** table (broodstock.dbf) contains data obtained during seining of pools for Atlantic salmon, including counts of males and females, grilse and multi-seawinter salmon, and wild and hatchery-raised (adipose fin-clipped) salmon.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Seining Site ID	Unique number representing an individual habitat unit. Assigned by the Data Warehouse	Sensite_ID	Numeric (6)	
Water Body ID	Unique identifier of stream	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code for agency or group performing the seining	Agency_Cd	Character (4)	Code Table 6
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (10)	
Date Surveyed	Date of survey - YYYY.MM.DD	Assmt_Date	Character (10)	
Method		Method	Character (15)	
Wild Male Salmon	Number of wild male multi-sea winter (MSW) Atlantic salmon seined	Wild_M_MSW	Numeric (5)	
Wild Female Salmon	Number of wild female multi-sea winter (MSW) Atlantic salmon seined	Wild_F_MSW	Numeric (5)	
Clipped Male Salmon	Number of hatchery-raised (adipose fin-clipped) male multi-sea winter (MSW) Atlantic salmon seined	Clip_M_MSW	Numeric (5)	
Clipped Female Salmon	Number of hatchery-raised (adipose fin-clipped) female multi-sea winter (MSW) Atlantic salmon seined	Clip_F_MSW	Numeric (5)	
Total Male Salmon	Total number of all male multi-sea winter (MSW) Atlantic salmon seined	Tot_M_MSW	Numeric (5)	
Total Female Salmon	Total number of all female multi-sea winter (MSW) Atlantic salmon seined	Tot_F_MSW	Numeric (5)	
Total Salmon	Total number of all multi-sea winter (MSW) Atlantic salmon seined	Tot_MSW	Numeric (5)	
Wild Male Grilse	Number of wild male grilse (1SW) Atlantic salmon seined	Wild_M_Gr	Numeric (5)	
Wild Female Grilse	Number of wild female grilse (1SW) Atlantic salmon seined	Wild_F_Gr	Numeric (5)	
Clipped Male Grilse	Number of hatchery-raised (adipose fin-clipped) male grilse (1SW) Atlantic salmon seined	Clip_M_Gr	Numeric (5)	
Clipped Female Grilse	Number of hatchery-raised (adipose fin-clipped) female grilse (1SW) Atlantic salmon seined	Clip_F_Gr	Numeric (5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Total Male Grilse	Total number of all male grilse (1SW) Atlantic salmon seined	Tot_M_Gr	Numeric (5)	
Total Female Grilse	Total number of all female grilse (1SW) Atlantic salmon seined	Tot_F_Gr	Numeric (5)	
Total Grilse	Total number of all grilse (1SW) Atlantic salmon seined	Tot_Gr	Numeric (5)	
Total Female Atlantic Salmon	Total number of all female Atlantic Salmon seined	Tot_F_AS	Numeric (5)	
Total Male Atlantic Salmon	Total number of all male Atlantic Salmon seined	Tot_M_AS	Numeric (5)	
Total Atlantic Salmon	Total number of all Atlantic salmon seined	Total_AS	Numeric (5)	
Comments	Any relevant comments e.g. tagged fish, other species seined, etc.	Comments	Character (250)	

REDD COUNT AND SPAWNER SURVEYS BY STRETCH

The *Redd Count and Spawners Surveys by Stretch* table (reddcnts.dbf) maintains data obtained from surveys of Atlantic salmon redds and spawning fish along stretches of streams. Normally, the same stretches are surveyed each year, called index stretches, which enables annual comparisons. Each survey stretch has been assigned a unique ID.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Redd Count Survey ID	Unique number representing an individual redd count survey stretch. Assigned by the Data Warehouse	Reddsvy_ID	Numeric (4)	
Water Body ID	Unique identifier of stream	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code for agency or group performing the redd count survey	Agency_Cd	Character (4)	Code Table 6
Assessment Date	Date of survey - YYYY.MM.DD	Assmt_Date	Character (10)	
Start Point	Description of starting point of section being surveyed	Startpoint	Character (50)	
End Point	Description of ending point of section being surveyed	Endpoint	Character (50)	
From Measure	FOR GIS PURPOSES. Distance from the mouth of the stream where redd count survey stretch began. Measurement in metres	From_Meas_m	Numeric (12.2)	
To Measure	FOR GIS PURPOSES. Distance from the mouth of the stream where redd count survey stretch ended. Equals From Measure + Stretch Length. Measurement in metres	To_Meas_m	Numeric (12.2)	
Length of Stretch	Length of surveyed stretch in kilometres	Survey_Len_km	Numeric (10.2)	
Personnel	Initials or names of individuals performing the survey	Personnel	Character (30)	
Assessment Method	Method used during survey i.e. canoe or on foot	Method	Character (10)	
Number of Small Redds	Number of small redds counted throughout stretch	Sm_Redds	Numeric (5)	
Number of Large Redds	Number of large redds counted throughout stretch	Lg_Redds	Numeric (5)	
Total Number of Redds	Total number of redds counted throughout stretch	Tot_Redds	Numeric (5)	
Number of Grilse	Number of grilse counted throughout the stretch	No_Grilse	Numeric (5)	

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Number of MSW's	Number of MSW salmon counted throughout the stretch	No_MSW	Numeric (5)	
Total Number of Atlantic Salmon	Total number of Atlantic salmon counted throughout the stretch	Tot_AS	Numeric (5)	
Comments	General Comments	Comments	Character (150)	

SPAWNER COUNT SURVEYS BY POINT LOCATIONS

The *Spawner Count Point Surveys* table (spawners.dbf) contains data obtained during surveys of spawning Atlantic salmon at specific sites on streams. This data is usually collected the same time redds are counted along stretches of stream, but in this instance the specific site or pool within the stream containing the fish is captured. Each survey point has been assigned a unique ID.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Spawner Count Survey ID	Unique number representing an individual spawner count survey site. Assigned by the Data Warehouse	Spnsite_ID	Numeric (6)	
Water Body ID	Unique identifier of stream	Water_ID	Numeric (8)	
Water Body Name	Name of stream	Water_Name	Character (40)	
Drainage Codes	Drainage system codes indicating the drainage unit of the stream	Drainge_Cd	Character (17)	Appendix A
Agency Code	Code for agency or group performing the spawner survey	Agency_Cd	Character (4)	Code Table 6
Site Description	Description of location of site where spawners were counted	Site_Des	Character (150)	
Point Measure	FOR GIS PURPOSES. Distance from the mouth of the stream where spawners were counted. Measurement in metres	Point_Meas	Numeric (12.1)	
Assessment Date	Date of survey - YYYY.MM.DD	Assmt_Date	Character (10)	
Personnel	Initials or names of individuals performing the survey	Personnel	Character (30)	
Assessment Method	Method used during survey (enter "Canoe" or "Foot")	Method	Character (10)	
Number of MSW Salmon	Number of multi-seawinter Atlantic salmon counted at site	No_MSW	Numeric (4)	
Number of Grilse	Number of Atlantic salmon grilse counted at site	No_Grilse	Numeric (4)	
Total Number of Atlantic Salmon	Total number of Atlantic salmon counted at site	Total_AS	Numeric (4)	

**SPATIAL
DATA
FILES**

ELECTROFISHING POINTS

The *Electrofishing Points* spatial file (ef-sites.shp) is a point coverage representing electrofishing sampling sites. A point coverage is used rather than dynamic segmentation due to the large number of Fisheries and Oceans sites which are provided as coordinates.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Internal ID	Internal ID generated by GIS to uniquely identify each point	ID	Numeric (8)	
Electrofishing Site ID	Unique number representing an electrofishing site. Assigned by the Data Warehouse	EfSite_ID	Numeric (4)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Water Body ID	Unique number of the surveyed stream	Water_ID	Numeric (8)	
Water Name	Name of surveyed stream	Water_Name	Character (30)	
Drainage Codes	Drainage system codes representing the drainage unit of the surveyed stream.	Drainge_Cd	Character (14)	Appendix A

FISH COUNTING FACILITY POINTS

The *Fish Counting Facility Points* spatial file (fish-count-sites.shp) is a point coverage representing protection barrier and counting fence sites. A point coverage is used rather than dynamic segmentation as Fisheries and Oceans trap net sites are located within the estuary where there are no stream routes .

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Internal ID	Internal ID generated by GIS to uniquely identify each point	ID	Numeric (8)	
Fish Counting Facility Site ID	Unique number representing a fish counting facility site. Assigned by the Data Warehouse	Facil_ID	Numeric (4)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Water Body ID	Unique number of stream with counting facility	Water_ID	Numeric (8)	
Water Name	Name of stream with counting facility	Water_Name	Character (40)	
Drainage Codes	Drainage system codes representing the drainage unit of the stream with counting facility	Drainge_Cd	Character (14)	Appendix A
Year	First year of operation, if known. Accommodates movement of facility within a stream	Year	Character (4)	

POOL SEINING POINTS

The *Pool Seining Points* spatial file (seine-sites.shp) is a point coverage representing pool seining sites.

Field of Information	Description	Dbase Field Name	Field Type (Length . Decimals)	Comments
Internal ID	Internal ID generated by GIS to uniquely identify each point	ID	Numeric (8)	
Pool Seining Site ID	Unique number representing a pool seining site. Assigned by the Data Warehouse	SenSite_ID	Numeric (6)	
Agency Code	Code for agency who collected the data	Agency_Cd	Character (4)	
Agency's Site No.	Site identifier used by the agency	Ag_Site_ID	Character (6)	
Water Body ID	Unique number of the surveyed stream	Water_ID	Numeric (8)	
Water Name	Name of surveyed stream	Water_Name	Character (30)	
Drainage Codes	Drainage system codes representing the drainage unit of the surveyed stream.	Drainage_Cd	Character (14)	Appendix A