A DATABASE FOR RESEARCH SURVEY AND COMMERCIAL FISHERY DATA ON SCOTIAN SHELF SHRIMP *(Pandalus borealis)*

C.M. Hunter and P.A. Koeller

Science Branch
Maritimes Region
Fisheries and Oceans Canada
Halifax Fisheries Research Laboratory
P.O. Box 550
Halifax, Nova Scotia B3J 2S7
Canada

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Science Branch
Maritimes Region
Invertebrate Fisheries Division
Department of Fisheries and Oceans
P.O. Box 550
Halifax, Nova Scotia B3J 2S7
Canada

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ABSTRACT

Hunter, C.M., and Koeller P.A. 1997. A database for research survey and commercial fishery data on Scotian Shelf shrimp *(Pandalus borealis).* Can. Manuscr. Rep. Fish. Aquat. Sci. 2410: iv + 34 p.

A database designed for the efficient storage and retrieval of shrimp research survey and commercial data from the Scotian Shelf is described. The database ("SHRDATA") utilizes ORACLE, a commercially available relational database management system. SHRDATA consists of four tables containing information from 1. survey stations (catch, locations, etc.), 2. survey trawl mensurations (e.g. from SCANMAR instruments), 3. observations on individual shrimp sampled from survey and commercial catches, and 4. commercial fishing logs. The tables can be updated from raw data files or interactively using "forms". A set of Structured Query Language (SQL) command files allow retrieval of data in various ways for research and assessment purposes.

RÉSUMÉ

Hunter, C.M., and Koeller P.A. 1997. A database for research survey and commercial fishery data on Scotian Shelf shrimp *(Pandalus borealis).* Can. Manuscr. Rep. Fish. Aquat. Sci. 2410: iv + 34 p.

On décrit ici une base de données conçue pour le stockage et l'extraction efficaces des données des relevés de recherche et des données commerciales sur le plateau néo-écossais. Cette base de donnée (SHRDATA) utilise ORACLE, système commercial de gestion de bases de données relationnelles. SHRDATA comporte quatre tableaux contenant des renseignements sur: 1) les stations de relevé de recherche (prises, emplacements, etc.); 2) des mesures sur les chaluts utilisés dans les relevés (provenant, p. ex., d'instruments SCANMAR); 3) des observations sur les crevettes échantillonnées dan les prises des relevés et les prises commerciales et 4) les journaux de pêche commerciale. Ces tableaux peuvent être mis à jour à [artir de fichiers de données brutes ou par l'utilisation interactive de formules. Un ensemble de fichiers de commandes en langage d'interrogation structuré (SQL) permet d'extraire des données de diverses façons, aux fins de recherche et d'évaluation.

INTRODUCTION

Biological advice for the assessment of the Scotian Shelf shrimp stock is based mainly on three data sources: logbooks kept by commercial fishers, research surveys, and detailed observations on shrimp samples collected during surveys and from commercial catches. In addition, data collected during special research projects is generally structured in a similar manner. Because of its varied sources and format, the data requires considerable manipulation before it can be analyzed for research or stock assessment purposes. Over the years the data have been maintained by different biologists in a variety of formats, including hard copies (e.g. original data sheets), ASCII type data files, and spreadsheet files (e.g. MICROSOFT EXCEL). Disparate storage and retrieval methods combined with personnel changes made stock assessments unnecessarily laborious and prompted the development of a single database with standardized formats. This report describes the structure and use of the resulting database, called SHRDATA.

ORACLE AS THE DATABASE MANAGEMENT SYSTEM

ORACLE (a registered trademark of Oracle Corporation) is a relational database management system which uses an easy to learn language (Structured Query Language, or SQL) to query the database and write reports (Hursch and Hursch 1989; Pepin 1989). ORACLE is both versatile and powerful - it is available on a number of platforms (e.g. HP9000, IBM PCs and Macintosh), allows loading of data files in a number of formats, and can interface with a variety of languages such as PRO C and PRO FORTRAN. ORACLE is the standard database for Department of Fisheries and Oceans.

Two of the "tools" or applications of ORACLE (SQL*Plus and SQL*Forms, both trademarks of Oracle Corporation) have been used in the development of SHRDATA. SQL*Plus is the language for storing, manipulating, and reporting of data. In addition to standard SQL commands, SQL*Plus includes commands that allow users to customize reports and edit SQL statements. SQL*Forms is a facility for data entry and data updates.

SHRDATA was developed on an IBM PC linked to the HP9000 at the Bedford Institute of Oceanography via the terminal emulator Telnet. An IBM PC configured with an appropriate Ethernet Card, NCSA Telnet or any appropriate terminal emulator package is all that is required.

Recent developments such as Open Database Connectivity (ODBC) allow the user to access a variety of database types, including ORACLE, with commonly used spreadsheet and database querying applications such as Microsoft Excel and Microsoft Query. Additional software is required to use these applications (see the section below on using Microsoft Excel and Query).

ACCOUNTS, UPDATING, AND ACCESS

Users with the appropriate access privileges to ORACLE and SHRDATA will be able retrieve data as required. Changes or additions to SHRDATA are restricted to the database owner, i.e. the biologist responsible for providing scientific advice on shrimp stocks.

LOADING DATA USING SQL*Loader

To load the shrsurvey data file type the following:

```
$sqlldr username/password
control = ldshrdetail
```

This will activate the SQL*Loader and commit the records. For more information on the loader files refer to Appendix 2.

PROGRAMMING "TRIGGERS"

Triggers are sets of commands which are generally transparent to the user. They perform specified operations during data input in SQL*forms (see below) including basic editing such as rejection of impossible values and calculation of some fields. For further information refer to Appendix 1 and the SQL*Forms Designer's Reference.

DATA TABLE DESCRIPTIONS

SHRDATA currently consists of four tables:

SHRSURVEY contains shrimp catch and associated environmental/navigational observations for each trawl set completed during research surveys by RV E.E. Prince from 1981-88 and various commercial vessels from 1993 to the present. These data are used to standardize shrimp catches and calculate stratified means and biomass estimates using the swept area method.

SHRSCANMAR contains information on trawl geometry collected by mensuration equipment mounted on the survey trawl, including wing and door spread, headline height and distance of the footrope off bottom. Observations on trawl geometry are used to determine the actual time the trawl is on the bottom and the actual area or volume swept by the trawl. Swept area is determined from the average wingspread multiplied by the tow length, and filtered volume is calculated as the product of wingspread, headline height and tow length. The raw mensuration data requires some interpretation by an experienced technician to determine trawl touchdown and liftoff times, deployment or retrieval problems, tearups, instrument noise, error messages, etc. This interpretation, data editing, and determination of mean trawl parameters is best done by visual inspection of graphed data and spreadsheet calculations. The resulting mean trawl parameters are then entered into the SHRSURVEY table using "forms" or SQL*Loader.

SHRDETAIL contains detailed observations of individual shrimp from samples collected during surveys, from commercial catches, or during special research projects. Generally, each sample consists of about 500 individual shrimp, each of which was weighed, measured, and examined for reproductive status. Each row in the table represents observations on an individual shrimp.

SHRCOMLOG contains information retrieved from commercial logs. Generally, each row in the table represent one day's fishing activity, however, some fishers have provided information on a set by set basis, while others recorded only by trip.

The contents of each table are described below. Null values in any field indicate that no observations were made or data is not available.

SHRSURVEY

Column	Data type	Sample data	Field Description
Cruise	Varchar2(6)	CK9501	Cruise identifier
Xset	Number(3)	35	set number
SFA	Number(2)	13	Shrimp fishing area, Areas 13, 14 and 15 correspond to Louisbourg,

Column	Data type	Sample data	Field Description
			Misaine and Canso (Figure 1). The inshore area has been assigned "17" (unofficial, for coding purposes only)
Stratum	Number(2)	-	not implemented at writing. This anticipates the subdivision of the existing 3 strata, which correspond to areas in the three fishing holes or SFA's deeper than 100 fathoms.
Setcode	Number(1)	1	type of survey station: 1 - random stratified, 2 - fixed, 3 - invalid, 4- rative fishing
Gear	Number(1)	1	type of gear used: 1 - Yankee 36 shrimp, 2 - #1168, 3 - 1000 mesh IC Denmark, 4 - #1320 Gourock, 5 - #1305/872 Gourock
Fdate	Date	01-MAY-95	date set completed
Speed	Number(3,1)	2.2	Speed in knots
How_Speed	Number(1)	1	Method used to determine speed: 1 - ship's log, 2 - calculated from distance traveled and tow duration, 3 - no information available, survey average used
Blat	Number(6)	464489	Latitude at begin of set i.e. when warp is all out, in degrees, minutes and hundredths of minutes
Blong	Number(6)	600600	Longitude at beginning of set degrees, minutes and hundredths of minutes
Elat	Number(6)	464512	Latitude at end of set, i.e. at start of haulback, in degrees, minutes and hundredths of minutes
Elong	Number(6)	595874	Longitude at end of set, in degrees, minutes and hundredths of minutes
Btime	Varchar2(5)	09:25	Time at beginning of set, i.e. when warp is all out, in 24 hour format
Etime	Varchar2(5)	10:05	Time at end of set, i.e. at beginning of haulback, in 24 hour format

Column	Data type	Sample data	Field Description
Bearing	Number(3)	180	Compass bearing during set, in degrees
Duration	Number(3)	30	Duration of set, in minutes. The target duration is 30, and is generally recorded as such. SCANMAR information may allow determination of the exact time the trawl is on the bottom, but this data is presently stored elsewhere
Dist	Number(4,2)	1.12	Distance between the beginning and end positions given above unless this is not available, in nautical miles
How_dist	Number(1)	1	How the distance was calculated: 1 - from LORAN bearings, 2 - from ship's speed and tow duration 3 - no information available, survey average used
H_Height	Number(9,6)	5.354765	Mean headline height , in metres. This is calculated from mensuration data given in SHRSCANMAR, and is the mean of headline height readings taken while the trawl was on the bottom. If SCANMAR information for this set was not available H_Height may be derived from previous measurements, or theoretical values from trawl diagrams
Bdepth	Number(3)	145	Depth at beginning of set in fathoms determined from the ship's sounder
Edepth	Number(3)	153	Depth at the end of set in fathoms
Adepth	Number(3)	148	Average depth in fathoms. This can be the average of the beginning and end depths above, or, if available, the average of depths collected throughout the set
Temp	Number(3,1)	2.9	Bottom temperature at the set location, in degrees Centigrade. This can be determined using reversing thermometers, CTD, sensor in a headline transducer, or a continuous recorder attached to the trawl such as VEMCO Ltd's MINILOG. If continuous readings were made

Column	Data type	Sample data	Field Description
			throughout a set the temperature in this field represents an average of readings while the trawl was on bottom
Wind_dir	Number(3)	180	Wind direction in degrees
Wind_sp	Number(2)	25	Wind speed in knots
Wave_ht	Number(2)	1	Wave height in metres
Weight	Number(4)	365	Shrimp catch in kilograms
Xcount	Number(3)	60	Number of shrimp per pound
Wing	Number(9,6)	15.243658	Average wing spread in metres. This is calculated from mensuration data given in SHRSCANMAR, and is the mean of wing spread readings taken while the trawl was on the bottom. If SCANMAR information for this set was not available WING may be derived from previous measurements, or theoretical values from trawl diagrams

SHRSCANMAR

Column	Data type	Sample data	Field Description
Cruise	Varchar2(6)	CK9501	Cruise identifier
Xset	Number(3)	45	Set Number
Fdate	Date	01-Jun-95	Date set completed
Logtime	Varchar2(5)	17:23	Time (24 hour Format) when trawl measurement was taken
Wingspread	Number(5,2)	15.46	Wing spread measurement at LOGTIME in metres
Doorspread	Number(5,2)	35.21	Door spread measurement at LOGTIME in metres
Clearance	Number(5,2)	3.67	Distance between footrope and bottom at LOGTIME in metres
Opening	Number(5,2)	6.34	Headline height measurement at LOGTIME in metres

SHRDETAIL

Column	Data type	Sample data	Field Description
Bcode	Varchar2(6)	108438	Vessel identifier. For commercial fishing vessels this corresponds to the CFV number. For research vessel surveys this is the same as the CRUISE in SHRSURVEY
Fdate	Date	25-JUN-95	Date sample was collected
Lat	Number(6)	450689	Latitude where sample was collected
Xlong	Number(6)	604630	Longitude where sample was collected
SFA	Number(2)	13	Shrimp Fishing Area. Areas 13, 14, 15 and 17 correspond to Louisbourg, Misaine and Canso holes, and the inshore, respectively (Figure 1)
Xset	Number(3)	36	Set number. For survey samples this is the survey set samples it is the number of the set for the day
Gear	Number(1)	1	Type of fishing gear used to collect the sample: 1 - commercial trawl, 2 - Maine trap, 3 - small mesh trap, 4 - survey trawl, 5 - survey trawl, codend cover or sorting table escapes; 6 - comparative fishing
Wtind	Number(5)	1469	Individual weight of shrimp in milligrams
Carlen	Number(4,1)	218	Carapace length in tenths of millimeters. The decimal point is not included
Sex	Number(1)	6	Sexual development stage: 1 - juvenile, 2 - immature male, 3 - mature male, 4 - transitional, 5 - immature female, 6 - non-ovigerous female, 7 - ovigerous female, 8 - partially spent female (eggs hatching), 9 - spent female (traces of egg cement)

Column	Data type	Sample data	Field Description
Eggs	Number(1)	9	Egg development stage: 1 - eggs opaque, not eyed; 2 - eggs opaque, not eyed non-segmented blastoderm; 3 - eggs opaque, not eyed, segmented blastoderm; 4 - eyes barely visible; 5 - eyes pigmented, abdomen poorly developed; 6 - eyes well pigmented, yolk 8 - 9/10; 7 - yolk 6-7/10; 8 - yolk 4-5/10; 9 yolk < 3/10, abdomen well developed
Sspines	Number(1)	2	prominence of sternal spines: 1 - prominent, 2 - blunt, 3 - remnant, 4 - absent
Parasite	Number(2)	1	type of parasite found: 0 - none present; 1 - bopyrid; 2 - blackspot, light; 3 - blackspot, heavy; 4 - other blemish or disease; 5 - bopyrid and blackspot; 6 - egg disease, light; 7 - egg disease medium; 8 - egg disease, heavy; combination of any 2, e.g. 28 = light blackspot plus heavy egg disease
Hroe	Number(1)	1	Presence or absence of roe in head; 1 - present; 0 - absent
Totnum	Number(4)	500	Number of shrimp in the sample

SHRCOMLOG

Column	Data type	Sample data	Field Description
Bcode	Number(6)	164700	Vessel identifier (CFV number)
Btype	Varchar2(4)	4	Boat type: 1 - trawler < 19.8m LOA, 2 - trawler 19.8-30m, 3 - trawler > 30m 4 - trapper < 19.8m
Xset	Number(2)	3	Set number of the day if information is provided
Fdate	Date	6-AUG-95	Fishing Date
Ldate	Date	8-AUG-95	Landing Date

Column	Data type	Sample data	Field Description
Lat	Number(6)	454080	Latitude of tow if set information provided, otherwise this can indicate the general area the vessel was fishing for the reporting day
Xlong	Number(6)	594602	Longitude
SFA	Number(2)	15	Shrimp fishing area in which fishing activity reported occurred
Dcode	Number(1)	5 8	Depth code representing the depth interval fished: 0 - 251 to 999.9, 1 - 0 to 25.9, 2 - 26 to 50.9, 3 - 51 to 75.9, 4 - 76 to 100.9, 5 - 101 to 125.9, 6 - 126 to 150.9, 7 - 151 to 175.9, - 176 to 200.9, 9 - 201 to 250.9
Depth	Number(3)	156	Actual depth in fathoms if available. This is added after from original logs, using forms
Fhours	Number(3)	12	Number of hours fished during the set, day or trip
Weight	Number(5)	8460	Weight of shrimp caught in kilograms
Value	Number(5)	7502	Value of catch in dollars
Xcount	Number(3)	65	Number of shrimp per pound from a sample
Ntraps	Number(3)	100	Number of traps fished during the period

DATA ENTRY USING SHRLOGFORM, SHRDETAILFORM, SHRSURVEYFORM OR SHRSCANMARFORM

SQL*Forms is a screen painter that allows for easy data entry, updates and deletions. The survey form (called SHRSURVEYFORM) is a screen layout of blank pages that is divided into 3 screens, 2 of which are pop-up screens. The form appears on the screen as follows:

Shrimp Survey and set information

Cruise	Set	SFA	Strat	Setcode	Gear	Date	How Speed	Wing
CK9501	1	15		1	4	31-MAY-95	2.3	16.401136
CK9501	2	15		1	4	31-MAY-95	2.5	20.745977
CK9501	3	17		1	4	31-MAY-95	2.3	15.868
CK9501	4	17		1	4	31-MAY-95	2.3	15.096739
CK9501	5	17		1	4	31-MAY-95	2.1	14.751961
CK9501	6	17		1	4	31-MAY-95	2.3	13.906316
CK9501	7	13		1	4	01-JUN-95	2.4	15.144444

Shrimp Survey and set information
Shrimp Survey Information

Blat	Blong	Elat	Elong	Btime	Etime	Bearing	Duration	Dist
452176	605822	452171	605657	05:38	06:08	110	30	
452700	604146	452668	604322	08:37	09:08	110	30	1.25
452402	603250	452416	603081	10:37	11:07	115	30	1.2
453306	602310	453323	602151	13:18	13:48	85	30	1.13
453423	600581	453454	600435	16:08	16:38	90	30	1.1
453636	593840	453597	593999	19:57	20:26	275	30	1.22
454161	590383	454233	590214	04:59	05:29	80	30	1.3

Shrimp Survey and set information
Shrimp Survey Information

How dist	Head Ht	Begin Depth	End Depth	Avg Depth	Wind Temp	Wind Dir	Wind Speed	Wave Ht	Wt	Cnt
		61	69	65	.2	315	10	0	90	71
		75		75	.7	293	5	1	31	75
		100		100	.9	293	5	2	40	78
		95	103	99	.8		0	0	681	84
		93	98	96	.7	45	10	1	211	91
		110	99	105	1.4	23	10	1	16	88
		104	103	104	1.9		0	1	245	

In a similar manner, shrscanmar , detail and logform are combined in a form ("SHRSCANMARFORM"), ("SHRDETAIL"), ("SHRLOGFORM") respectively. The forms appears on the screen as follows:

Shrimp Scanmar Information

Cruise	Set	Date	Logtime	Wing_spd	Door_spd	Clearance	Opening
CK9501	7	31-MAY-95	5:27		55	.3	6
CK9501	7	31-MAY-95	5:27		55.2	0	6.5
CK9501	7	31-MAY-95	5:27		55.5	.3	5.5
CK9501	7	31-MAY-95	5:28		54.7	.5	5.6
CK9501	7	31-MAY-95	5:28		55.5	.5	5.8
CK9501	7	31-MAY-95	5:28		55.5	.4	6
CK9501	7	31-MAY-95	5:29		55	0	6.2

Shrimp Detail Sampling

Bcode	Fdate	Lat	Long	SFA	Set	Gear	Wtind	Len	Sex	Egg	Ssp	Par	Hroe	Tot
OLSOCK	23-NOV-94					2	1097	270	6		3			
OLSOCK	23-NOV-94					2	968	270	6		3			
OLSOCK	23-NOV-94					2	1184	270	7	4	3			
OLSOCK	23-NOV-94					2	970	260	6		2			
OLSOCK	23-NOV-94					2	610	230	3		1			
OLSOCK	23-NOV-94					2	301	180	2		4	2		
OLSOCK	23-NOV-94					2	613	210	4		1			

Shrimp Log Data

Bcode	Btype	Set	Fdate	Ldate	Lat	Long	SFA	Dep	Hr	Wt	Value	Cnt	Ntraps
100785			17-MAY-93	24-DEC-46	444437	592747	14	135	18	2023	2676	50	
100785			18-MAY-93	24-DEC-46	445659	593156	14	135	18	1839	2432	48	
100787			23-APR-93	24-DEC-46	443823	601720	15	130	8	157	204	55	
100787			26-APR-93	24-DEC-46	444337	602124	15	124	19	1520	1977	54	
100787			27-APR-93	24-DEC-46	444440	602029	15	124	7	301	392	5	
100787			01-MAY-93	24-DEC-46	443911	595934	14	110	20	1709	2223	63	
100787			02-MAY-93	24-DEC-46	444504	600910	15	105	20	1495	1945	45	

Features

SHRSURVEYFORM provides structured support for the data. A few edit checks are performed automatically. For example when a date is entered, SQL*Forms has a built in calendar that checks all dates including leap years. SQL*Forms also reads the ORACLE data dictionary to ensure the information entered is of the correct data type. For example if a field was specified as numeric, and the user typed a character the following message would appear on the bottom of the screen: **Legal characters are 0-9**.

Other features of SHRSURVEYFORM are as follows:

(1) copies the Cruise, set, setcode, and gear to the next record automatically
(2) sets the SFA automatically depending on the latitude and longitude range

The Shrimp Scanmar information(SHRSCANMARFORM), Shrimp Detail Sampling (SHRDETAIL), and Shrimp Log Data (SHRLOGFORM) are structures similarly to SHRSURVEYFORM.

Getting started in SQL*Forms

To enter SHRSURVEYFORM type the following while in UNIX:

RUNFORM30 SHRSURVEYFORM <cr>

The user will be prompted for username and password.
The same command applies for the 3 other shrimp forms.

Operations within Forms are controlled by functions keys. The key(s) corresponding to a given function will depend upon the terminal emulator and keyboard definition; examples are given in Appendix 3.

LIBRARY OF QUERY COMMAND FILES

Some queries commonly used in shrimp stock assessment and their output are given below as examples only. They do not represent all queries that might be required in shrimp stock assessment and research - users will probably have to adapt one of these queries for their specific requirements or develop their own. Simple queries such as retrieval of survey station or sample lists are not included. Such lists can be obtained directly by typing a short query at the SQL> prompt or using MS Query.

millim.sql: creates view Millim where each sex, egg and spine code in SHRDETAIL has its own column for final length frequency summaries.

```
SQL> start millim.sql

create view millim as
select bcode, fdate, lat, xlong, sfa, xset, gear,wtind,carlen,
decode(sex,1,1,0) juve,
decode(sex,2,1,0) immm,
decode(sex,3,1,0) male,
decode(sex,4,1,0) tran,
decode(sex,5,1,0) immf,
decode(sex,6,1,0) novi,
decode(sex,7,1,0) ovig,
decode(sex,8,1,0) pspe,
decode(sex,9,1,0) spen,
decode(eggs,1,1,0) egg1,
decode(eggs,2,1,0) egg2,
decode(eggs,3,1,0) egg3,
decode(eggs,4,1,0) egg4,
decode(eggs,5,1,0) egg5,
decode(eggs,6,1,0) egg6,
decode(eggs,7,1,0) egg7,
decode(eggs,8,1,0) egg8,
decode(eggs,9,1,0) egg9,
decode(sspines,1,1,2,1,0) prim,
decode(decode(sspines,1,1,2,1,0)-decode(sex,1,1,0)-decode(sex,2,1,0)-
decode(sex,
3,1,0)-decode(sex,4,1,0),1,1,0) primnet,
decode(sex,5,1,0)+decode(sex,6,1,0)+decode(sex,8,1,0)+decode(sex,9,1,0)
novinet,
decode(decode(sspines,3,1,4,1,0)-decode(sex,1,1,0)-decode(sex,2,1,0)-
decode(sex,
3,1,0)-decode(sex,4,1,0),1,1,0) mult,
decode(hroe,1,1,0) hroe, totnum
from shrdetail

view created.
```

totals.sql: this creates the view TOTALS which is used in queries requiring various summary statistics and updates such as the total of individual weights in the sample (TOTWT), the average individual weight in the sample (AVEWT), and the count/pound (CTLB), among others.

```
SQL> start totals.sql
```

```
create view totals as
select bcode, fdate,sfa,xset,count(*) totnum,
sum(wtind/100) totwt, avg(wtind) avewt,
count(*)/((sum((wtind/100000)*2.204))+0.0000001)
 ctlb from shrdetail
group by bcode, fdate,sfa,xset

view created.
```

NOTE: Some updates of SHRDETAIL require creation of a temporary table similar to the view TOTALS. For example, to update the TOTNUM column of SHRDETAIL, first create a table TOTAB using the same query as above but substituting "table totab" for "view totals" in line 1. Then update SHRDETAIL with the following:

```
SQL> start updatedet.sql

update shrdetail
set totnum=
(select tottab.totnum from tottab
where
shrdetail.bcode=tottab.bcode and
shrdetail.fdate=tottab.fdate and
shrdetail.sfa=tottab.sfa and
shrdetail.xset=tottab.xset)

1478 records updated.
```

standard.sql: gives the standard length frequency used in assessments by half centimeter groups. The query below provides the unweighted sum of all the length frequency samples. This query combines various life history stages (i.e. immature, non-ovigerous, ovigerous, partially spent and spent females) into primiparous and multiparous females.

```
SQL> start standard.sql

select round(carlen/5)*5/10 "CL(mm)",
sum(juve) "juv",
sum(immm) "i.male",
sum(male) "males",
sum(tran) "trans",
sum(primnet) "prim",
sum(mult) "mult"
from millim where
bcode='CK9501' and sfa<>17
group by round(carlen/5)*5/10
```

CL(mm)	juv	i.male	males	trans	prim	mult
11.5	1	0	0	0	0	0
13.5	1	0	0	0	0	0
14.5	2	2	0	0	0	0
15	1	4	0	0	0	2
15.5	0	8	0	0	0	0
16	0	8	0	0	0	0

```
  16.5       0       6       0       0       0       0
    17       0       7       0       0       0       0
  17.5       0       5       0       0       0       0
    18       0      15       0       0       0       0
  18.5       0      18       1       0       0       0
    19       0      19       9       0       0       0
  19.5       0      10       9       0       0       0
    20       0       8      21       0       0       0
  20.5       0       1      40       0       0       0
    21       0       2      32       0       0       1
  21.5       0       2      52       0       0       2
    22       0       0      32       0       0       7
  22.5       0       0      31       1       0       9
    23       0       0      27       1       0      34
  23.5       0       0       7       0       0      36
    24       0       0       5       0       1      63
  24.5       0       0       3       0       0      35
    25       0       0       0       0       1      56
  25.5       0       0       0       0       0      49
    26       0       1       1       0       2      65
  26.5       0       0       0       0       1      31
    27       0       0       0       0       0      37
  27.5       0       0       0       0       1      18
    28       0       0       0       0       0      15
  28.5       0       0       0       0       1      10
    29       0       0       0       0       0       9
  29.5       0       0       0       0       0       1
    30       0       0       0       0       0       3

34 rows selected.
```

halfcent.sql: provides unweighted length frequencies for all life history stages recorded in the database by half centimetre groups.

```
SQL> start halfcent.sql

select round(carlen/5)*5/10 "CL",
sum(juve) "ju",sum(immm) "im",
sum(male) "ml",sum(tran) "tr",sum(immf) "if",
sum(novi) "no",sum(ovig) "ov",
sum(pspe) "ps",sum(spen) "sp",
sum(prim)-sum(juve)-sum(immm)-sum(male)-sum(tran) "pr",
sum(mult) "mu", sum(hroe) "hr"
from millim where fdate = '04-jun-95' and xset=32 and bcode='CK9501'
group by round(carlen/5)*5/10


  CL   ju   im   ml   tr   if   no   ov   ps   sp   pr   mu   hr
---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
   8    1    0    0    0    0    0    0    0    0    0    0    0
11.5    1    0    0    0    0    0    0    0    0    0    0    0
  12    1    0    0    0    0    0    0    0    0    0    0    0
12.5    9    0    0    0    0    0    0    0    0    0    0    0
```

```
  13    20     0     0     0     0     0     0     0     0     0     0     0
13.5    15     0     0     0     0     0     0     0     0     0     0     0
  14    17     1     0     0     0     0     0     0     0     0     0     0
14.5    22     4     0     0     0     0     0     0     0     0     0     0
  15     8     5     0     0     0     0     0     0     0     0     0     0
15.5     2     5     0     0     0     0     0     0     0     0     0     0
  16     0    21     0     0     0     0     0     0     0     0     0     0
16.5     1    23     1     0     0     0     0     0     0     0     0     0
  17     0    40     0     0     0     0     0     0     0     0     0     0
17.5     0    39     0     0     0     0     0     0     0     0     0     0
  18     0    35     4     0     0     0     0     0     0     0     0     0
18.5     0    19     3     0     0     0     0     0     0     0     0     0
  19     0    13     3     0     0     0     0     0     0     0     0     0
19.5     0    10    19     0     0     0     0     0     0     0     0     0
  20     0     8    34     0     0     0     0     0     0     0     0     0
20.5     0     1    19     0     0     0     0     0     0     0     0     0
  21     0     0    28     0     0     0     0     0     0     0     0     0
21.5     0     0    14     0     0     0     0     0     0     0     0     0
  22     0     0    10     0     0     0     0     0     0     0     0     0
22.5     0     0     9     5     0     0     0     0     0     0     0     3
  23     0     0     2     1     0     0     0     0     0     0     0     1
23.5     0     0     1     1     0     0     0     0     0     0     0     1
  24     0     0     1     4     0     1     0     0     0     1     0     5
24.5     0     0     0     5     0     0     0     0     0     0     0     5
  25     0     0     0     2     0     3     0     0     0     2     1     5
25.5     0     0     0     0     0     2     0     0     0     0     2     2
  26     0     0     0     0     0     1     0     0     0     1     0     1
26.5     0     0     0     1     0     1     0     0     0     0     1     2
  27     0     0     0     0     0     2     0     0     0     0     2     2
27.5     0     0     0     0     0     1     0     0     0     0     1     0
  28     0     0     0     0     0     1     0     0     0     0     1     1

35 rows selected.
```

halfconcat.sql: gives output as comma-delimited fields for direct import (copy and paste) into a spreadsheet, if required. Other queries can be modified to this form.

```
select round(carlen/5)*5/10||','||sum(juve)||','||
sum(immm)||','||sum(male)||','||sum(tran)||','||sum(immf)||','||
sum(novi)||','||sum(ovig)||','||sum(pspe)||','||sum(spen)||','||
sum(primnet)||','||
sum(mult)||','||
sum(hroe)
from millim where fdate = '25-mar-95' and gear=2
group by round(carlen/5)*5/10


SQL> start halfconcat

21,0,0,1,0,0,0,0,0,0,0,0,0
21.5,0,0,1,2,0,0,0,0,0,0,0,2
22,0,0,4,4,0,0,0,0,0,0,0,1
```

```
22.5,0,0,1,0,0,2,0,0,0,1,1,2
23,0,0,0,11,1,1,0,0,0,2,0,10
23.5,0,0,0,6,2,1,0,0,0,3,0,8
24,0,0,0,10,0,8,0,0,0,7,1,17
24.5,0,0,0,5,1,10,0,0,0,9,2,13
25,0,0,0,5,3,15,0,0,0,12,6,18
25.5,0,0,0,1,0,9,0,0,0,9,0,5
26,0,0,0,0,0,20,1,0,0,10,11,16

11 rows selected.
```

meanlength.sql: gives the mean length for any group of samples.

```
SQL> start meanlength.sql

select fdate, xset, sum(carlen/10)/count(*)
"mean carapace length (mm)"
from shrdetail where bcode='CK9501'
group by fdate, xset


FDATE            XSET mean carapace length (mm)
--------- ---------- -------------------------
24-DEC-46          52                  20.565261
25-DEC-46          52                       19.2
31-MAY-95           1                    20.9232
31-MAY-95           2                    21.6016
31-MAY-95           3                    21.8286
31-MAY-95           4                    20.5704
31-MAY-95           5                    20.4736
31-MAY-95           6                  18.4211494

8 rows selected.
```

meanlensfa.sql: gives the mean lengths by SFA for any group of samples.

```
SQL> start meanlensfa.sql

select bcode, sfa, sum(carlen/10)/count(*) "mean carapace length (mm)"
from shrdetail where gear=4 and bcode='CK9501'
group by bcode, sfa

BCODE          SFA mean carapace length (mm)
------ ---------- -------------------------
CK9501          13                 22.0065956
CK9501          14                 21.212879
CK9501          15                 20.2946552
CK9501          17                 20.4563492

4 records selected.
```

ovigerous.sql: gives percent of females which are ovigerous for a particular group of samples.

```
SQL> start ovigerous.sql


select fdate "date",
round(sum(ovig)/(sum(primnet)+sum(mult))*100,2) "% of females ovigerous"
from millim where gear=2 and fdate>'1-sep-94'
group by fdate

date      % of females ovigerous
--------- ----------------------
23-NOV-94                   22.9
25-NOV-94                   26.1
26-NOV-94                   29.8
28-NOV-94                   28.8
30-NOV-94                   33.6
01-DEC-94                   46.8
03-DEC-94                   26.1
04-DEC-94                   37.6
05-DEC-94                   26.1
13-DEC-94                   46.6
29-DEC-94                   58.9
09-JAN-95                     74
15-JAN-95                   59.2
19-JAN-95                   65.3
27-JAN-95                   66.2
15 rows selected.
```

hroe.sql: gives the percent of animals with head roe for any group of samples.

```
SQL> start hroe.sql

select fdate "date",
round(sum(hroe)/(sum(tran)+sum(primnet)+sum(mult))*100,2) "% head roe"
from millim where bcode='CK9501'
group by fdate

date      % head roe
--------- ----------
31-MAY-95       76.2
01-JUN-95       85.4
02-JUN-95       95.4
03-JUN-95       70.4
04-JUN-95       82.3
05-JUN-95       86.7
07-JUN-95       84.9
09-JUN-95       85.4
10-JUN-95       88.7


9 rows selected.
```

eggs.sql: gives frequency of eggs in the nine egg developmental stages

```
SQL>start eggs

select fdate "date", sum(egg1) "e1", sum(egg2) "e2",
sum(egg3) "e3", sum(egg4)"e4",
sum(egg5) "e5", sum(egg6) "e6", sum(egg7) "e7",
sum(egg8) "e8", sum(egg9) "e9"
from millim where gear=4
group by fdate
```

date	e1	e2	e3	e4	e5	e6	e7	e8	e9
24-APR-82	0	0	0	0	0	0	1	40	215
21-NOV-82	0	6850	6008	504	98	10	0	0	0
10-MAY-83	0	0	0	0	0	0	13	366	812
21-NOV-83	0	601	2229	77	10	0	0	0	0
01-MAY-84	0	0	0	0	0	0	0	0	8
25-JUL-84	0	6	1	0	0	0	0	0	0
23-OCT-84	2	3565	2146	7	1	1	0	0	0
19-APR-85	0	0	0	0	0	0	0	19	226
11-OCT-85	5	6500	51	0	0	0	0	0	0
10-MAY-86	0	0	0	0	0	0	0	6	615
19-OCT-86	0	5983	413	0	0	0	0	0	0
07-MAY-87	0	0	0	0	0	0	0	3	57
10-OCT-87	0	5749	106	0	0	0	0	0	0
07-MAY-88	0	0	0	0	0	0	0	0	195
25-SEP-88	0	4879	42	0	0	0	0	0	0
24-JUL-93	81	0	1	0	0	1	11	13	913
25-JUL-93	30	0	0	0	0	1	11	6	523
17-AUG-93	997	0	0	0	0	0	0	2	125
18-AUG-93	501	0	0	0	0	3	15	12	59

```
19 rows selected.
```

densitywt.sql: calculates the density of shrimp, as grams · m^{-2} or metric tons · km^{-2}, in each stratum (i.e. SFA). Biomass is determined by multiplying density in each stratum by its total area. The formula for calculating density is as follows:

$$\sum_n \frac{\text{weight/distance x wingspread}}{\text{no. of sets}}$$

```
SQL> start densitywt.sql

1 select cruise, sfa, avg(weight*1000/(dist*1852*duration/30*wing))
2 "density (gm/m2 or mt/km2)"
3 from shrsurvey where cruise = 'CK9501' and setcode=1
4 group by cruise, sfa
```

CRUISE	SFA	density (gm/m2 or mt/km2)
CK9501	13	4.22
CK9501	14	8.72

```
CK9501    15                          7.96
CK9501    17                          4.52

4 rows selected.
```

densityno.sql: calculates the density as above, but in numbers · m^{-2}. It uses the average individual weights per sample (AVEWT) from view TOTALS to change weight caught per set to numbers. This query requires a join between table SHRSURVEY and view TOTALS.

```
SQL> start densityno.sql

select cruise,shrsurvey.sfa,
avg((weight*1000/(totals.avewt/100))/(dist*1852*wing))
"density (no/m2 or no/km2*10-6)"
from shrsurvey, totals where cruise = 'CK9501' and setcode=1
and shrsurvey.cruise=totals.bcode
and shrsurvey.fdate=totals.fdate
and shrsurvey.sfa=totals.sfa
and shrsurvey.xset=totals.xset
group by cruise, shrsurvey.sfa

CRUISE    SFA density (no/m2 or no/km2*10-6)
------ ------ ------------------------------
CK9501     13                         .64157
CK9501     14                        1.4887
CK9501     15                        1.3955
CK9501     17                         .87823

4 rows selected.
```

smeans.sql: calculates the stratum (i.e. SFA) mean catch per standardized tow. The catch is standardized to the "standard" tow length (1.25 nautical miles), using the "corrected" distance traveled (actual distance traveled between all warp out and start of haulback corrected for the actual time the trawl was on the bottom (duration).

```
SQL> start smeans.sql

select cruise,sfa,avg(weight*1.25/(dist*duration/30)) "smeans"
from shrsurvey
group by cruise, sfa

CRUISE         SFA        smeans
----------     ---------- ----------
AC9301          14        60.9384936
AC9302          15        48.0989714
CK9501          13        145.460933
CK9501          14        287.401367
CK9501          15        272.231647
CK9501          17        156.934436
WM9301          13        103.558791
```

```
7 rows selected.
```

Percentage.sql: calculates the weighted (by sample size) length frequency by stage for any given combination of samples. The result can then be imported into a spreadsheet and used to calculate percentages, if desired. Calculation of percentages by ORACLE itself would require another step, i.e. the creation of a view containing the totals of the combination of samples being analyzed, before running the main query. The frequency is standardized to the usual sample size of 500 animals per sample.

```
SQL start percentage.sql

set pages 60
set num 6
select round(carlen/5)*5/10 "CL(mm)",
sum(juve*500/totnum) "juv",
sum(immm*500/totnum) "i.male",
sum(male*500/totnum) "males",
sum(tran*500/totnum) "trans",
sum(primnet*500/totnum) "prim",
sum(mult*500/totnum) "mult"
from millim where
gear=4 and bcode='CK9501' and sfa=13
group by round(carlen/5)*5/10


SQL> start percentage.sql
```

CL(mm)	juv	i.male	males	trans	prim	mult
7.5	2	0	0	0	0	0
8	3	0	0	0	0	0
8.5	4	0	0	0	0	0
9	5	0	0	0	0	0
9.5	1	0	0	0	0	0
10	2	0	0	0	0	0
11	1.073	0	0	0	0	0
12	2	0	0	0	0	0
12.5	2	1	0	0	0	0
13	10.146	2	0	0	0	0
13.5	9.1013	0	0	0	0	0
14	28.146	4	0	1.073	0	0
14.5	12.443	8.073	0	0	0	0
15	3	17.146	0	0	0	0
15.5	2	28.292	0	0	2	0
16	0	103.96	0	0	0	0
16.5	0	91.957	0	0	1.073	0
17	0	239.31	0	0	0	0
17.5	0	174.12	5.3697	0	0	1
18	0	176	10.109	0	0	0
18.5	0	132.53	15.812	0	0	0
19	0	106.52	23.69	0	0	0
19.5	0	95.814	63.276	2.3697	0	0
20	0	53.341	155.75	0	1.1547	0
20.5	0	14.309	203.01	3.073	0	0

```
    21       0  3.073 189.43       2       2 1.1013
  21.5       0      0 232.65   16.09 6.1459       1
    22       0      1 153.83 26.861 11.247 6.1013
  22.5       0      0 88.432 59.935 30.072  9.304
    23       0      1 44.017 77.418 44.689 23.385
  23.5       0      0 33.626 122.67 102.97 38.244
    24       0      0  12.69 125.97 150.23 96.307
  24.5       0      0 3.1459 124.61 177.74 117.93
    25       0      0      1 92.657 171.24 230.41
  25.5       0      1      0 47.285 98.845 244.83
    26       0      0      0 8.2756 55.455 214.69
  26.5       0      3      0 2.1547 16.776 132.96
    27       0      0      0      3 14.223 93.094
  27.5       0      2      0      0      0 41.504
    28       0 2.1013      0      0      2 30.473
  28.5       0      0      0      0      0 17.788
    29       0      0      0      0      0 3.2277
  29.5       0      0      0      0      0 6.8941
  30.5       0      0      0      0      0  1.073

43 rows selected.
```

lfbysfa.sql: calculates the combined (all stages) weighted (by sample size, standardized to the usual 500 animals per sample) length frequency for each shrimp fishing area.

```
SQL> start lfbysfa.sql
set pages 60
set num 6
select round(carlen/5)*5/10 "CL(mm)",
sum(decode(sfa,13,500/totnum,0)) "SFA 13",
sum(decode(sfa,14,500/totnum,0)) "SFA 14",
sum(decode(sfa,15,500/totnum,0)) "SAF 15",
sum(decode(sfa,17,500/totnum,0)) "SFA 17"
from millim where
gear=4 and bcode='CK9501'
group by round(carlen/5)*5/10

CL(mm)  SFA 13  SFA 14  SAF 15  SFA 17
------ ------ ------ ------ ------
     1      0      0      0      1
     4      0      0      0 1.0373
   4.5      0      0      1      0
     7      0      0      1      1
   7.5      2      0      2 3.2989
     8      3      0  7.004 6.2989
   8.5      4      2      3      4
     9      5      2      2 7.1494
   9.5      1 7.1364      1 5.1494
    10      2      2      3 8.2989
  10.5      0 2.1574      2      3
    11  1.073 10.273 10.002 12.448
  11.5      0 12.512      8      8
    12      2 31.037 15.006 16.372
```

```
  12.5       3 22.386 35.006 28.969
    13 12.146 46.292 115.02  70.57
  13.5 9.1013 59.973 114.18 80.269
    14 33.219 116.83 158.17 90.466
  14.5 20.516 112.37 105.17 55.121
    15 20.146 128.02 76.484 64.794
  15.5 32.292 137.94 62.163 64.488
    16 103.96 176.82 127.17 102.53
  16.5  93.03  154.4 182.48 159.95
    17 239.31 251.45 302.35 314.43
  17.5 180.49 191.39  267.5 322.53
    18 186.11 269.06 291.12 317.28
  18.5 148.35 173.99 258.59 185.79
    19 130.21 175.82 233.81 154.88
  19.5 161.46 176.94 310.31 221.04
    20 210.25 204.38 350.74 226.96
  20.5 220.39 268.52 296.25 265.75
    21 197.61 297.06 277.88 273.78
  21.5 255.88 354.27 262.72 224.64
    22 199.04 340.44 210.56  260.2
  22.5 187.74 290.11 182.26 248.82
    23 190.51 261.37 185.57 287.57
  23.5 297.51 245.94 155.71 288.69
    24 385.19 292.79 167.41 287.39
  24.5 423.42 246.42 208.79 223.18
    25 495.31 269.88 241.44 167.84
  25.5 391.96 237.88 230.71 117.29
    26 278.42 235.34 205.45 82.928
  26.5 154.89 194.34 103.36 55.255
    27 110.32 136.74  73.69 60.177
  27.5 43.504 102.43 50.265 35.143
    28 34.575 82.048 36.474 37.141
  28.5 17.788 62.779     21  16.11
    29 3.2277 56.098 24.157 14.992
  29.5 6.8941 27.413      4  9.998
    30      0 15.794      5      2
  30.5  1.073 7.0823     10      2
    31      0 6.0823      1      0
  31.5      0      0      1   .998

53 rows selected.
```

lfpopsfa.sql: calculates the combined (all stages) length frequencies weighted by sample size and area swept by the trawl using information in SHRSURVEY and length frequencies from SHRDETAIL. This length frequency, as a percentage, can be multiplied by the output from "densityno.sql" and then the total area per SFA to produce densities and population estimates by length groups, respectively.

```
SQL> start lfpopsfa.sql

select round(carlen/5)*5/10 "CL(mm)",
sum(decode(millim.sfa,13,(500/totnum)/(dist*wing),0)) "SFA 13",
sum(decode(millim.sfa,14,(500/totnum)/(dist*wing),0)) "SFA 14",
sum(decode(millim.sfa,15,(500/totnum)/(dist*wing),0)) "SFA 15",
```

```
sum(decode(millim.sfa,17,(500/totnum)/(dist*wing),0)) "SFA 17"
from millim, shrsurvey where
millim.bcode=shrsurvey.cruise
and millim.fdate=shrsurvey.fdate
and millim.sfa=shrsurvey.sfa
and millim.xset=shrsurvey.xset
and millim.gear=4 and millim.bcode='CK9501'
group by round(carlen/5)*5/10
```

CL(mm)	SFA 13	SFA 14	SFA 15	SFA 17
1	0	0	0	.05304
4	0	0	0	.05675
4.5	0	0	.05379	0
7	0	0	.05379	.05392
7.5	.10292	0	.111	.19412
8	.15438	0	.33808	.30966
8.5	.20584	.11287	.18515	.22987
9	.26218	.11311	.11605	.40754
9.5	.05146	.41062	.05934	.2315
10	.10292	.11725	.17337	.40699
10.5	0	.11003	.11313	.16656
11	.06391	.53475	.55365	.702
11.5	0	.6871	.44746	.40414
12	.11662	1.6589	.79725	.81659
12.5	.18083	1.2205	1.8955	1.3559
13	.70965	2.543	6.4007	3.532
13.5	.52275	3.303	5.6692	3.8847
14	1.9572	6.4206	8.3	4.7336
14.5	1.1796	6.2245	5.5426	2.4719
15	1.1843	7.1217	4.0694	3.3771
15.5	1.9159	7.6432	3.5134	3.3327
16	6.0902	9.7214	6.9907	5.2415
16.5	5.4335	8.4275	9.5408	7.9589
17	14.002	13.637	16.133	16.586
17.5	10.438	10.421	13.304	16.939
18	10.676	14.641	14.899	16.756
18.5	8.411	9.657	13.377	9.7775
19	7.4375	9.6806	11.989	7.8865
19.5	9.1098	9.7883	16.089	11.197
20	11.815	11.068	18.549	11.747
20.5	12.671	14.726	15.295	13.451
21	11.352	16.218	13.722	12.224
21.5	14.698	19.445	13.94	10.602
22	11.486	18.663	11.354	12.259
22.5	10.521	15.881	10.072	11.403
23	10.466	14.234	9.7489	14.541
23.5	16.033	13.477	8.4407	14.471
24	20.701	15.995	8.9328	14.603
24.5	22.456	13.437	10.604	10.729
25	26.115	14.653	12.804	8.188
25.5	20.507	13.052	12.636	5.8067
26	14.639	12.901	10.703	4.0996
26.5	7.8424	10.639	5.5759	2.4287

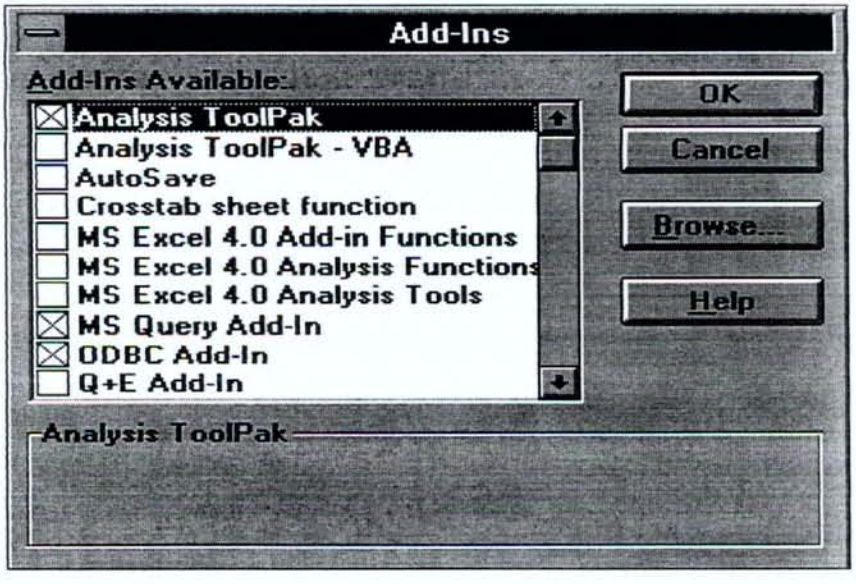
```
  27 5.7965 7.5129 4.1482 2.7021
27.5 2.2276 5.6307 2.6075 1.5764
  28 1.7984  4.503 1.9239 1.6012
28.5 .96694 3.4645 1.1141 .59342
  29 .16695  3.077 1.3306  .6451
29.5  .3409 1.5256 .22497 .31988
  30      0  .8549  .2699 .11114
30.5 .06391 .39216 .55219 .05252
  31      0 .34934 .05732      0
31.5      0      0 .05934 .05589

53 rows selected.
```

USING MICROSOFT QUERY AND EXCEL

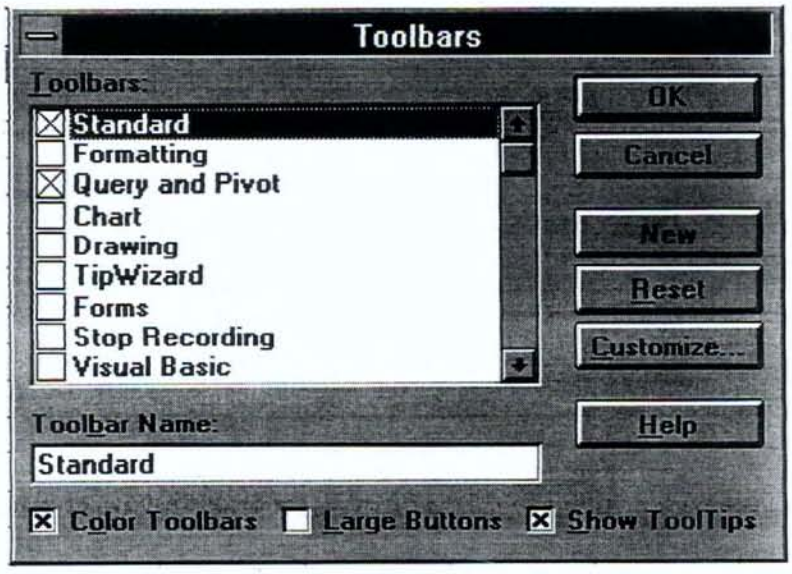
ODBC (Open Database Connectivity) is Microsoft's standard protocol for accessing data in database systems. To run Oracle queries through Microsoft Query with or without Excel, you must have installed the correct Oracle ODBC driver and Oracle SQL*net.

Running ORACLE queries directly in EXCEL

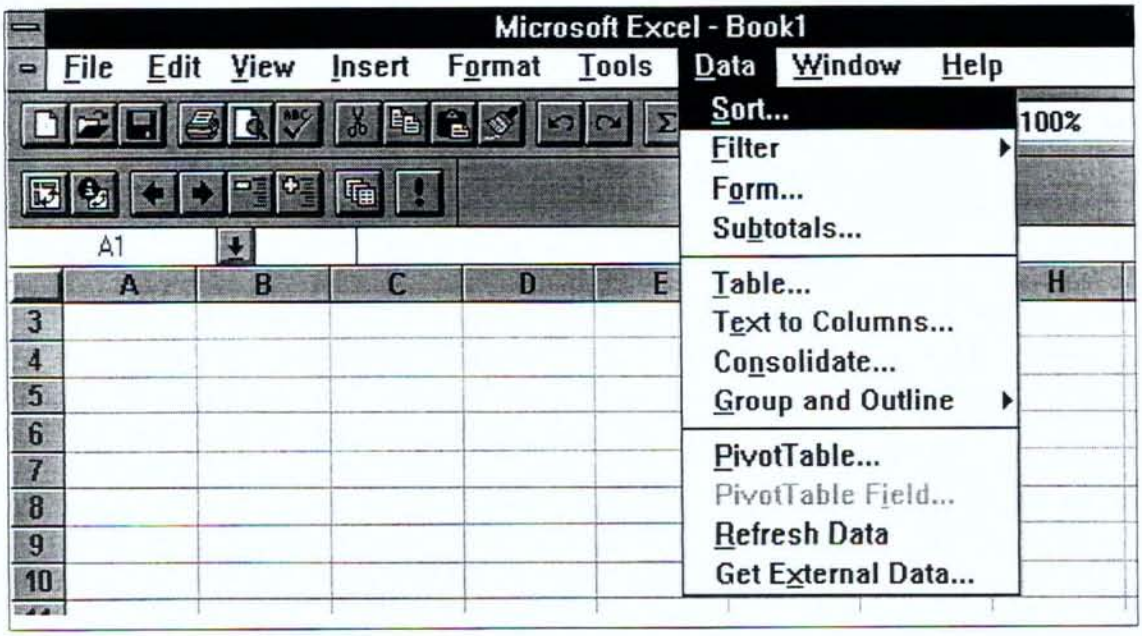
To enable MS-Query ODBC add ins within Excel, in the Excel menu choose Tools Add-Ins.... and click on MS Query Add-In and ODBC Add-In:



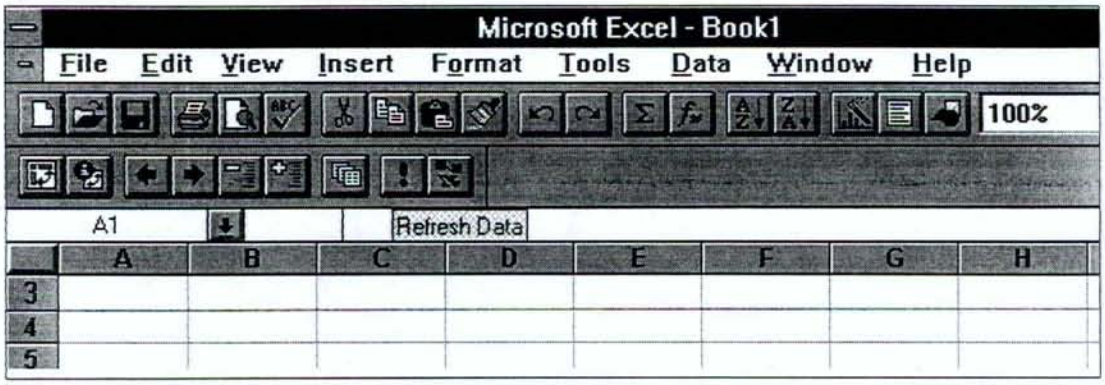
To enable the Query and Pivot toolbar within Excel, from the Excel menu, choose View, Toolbars..., and the Query and Pivot toolbar:



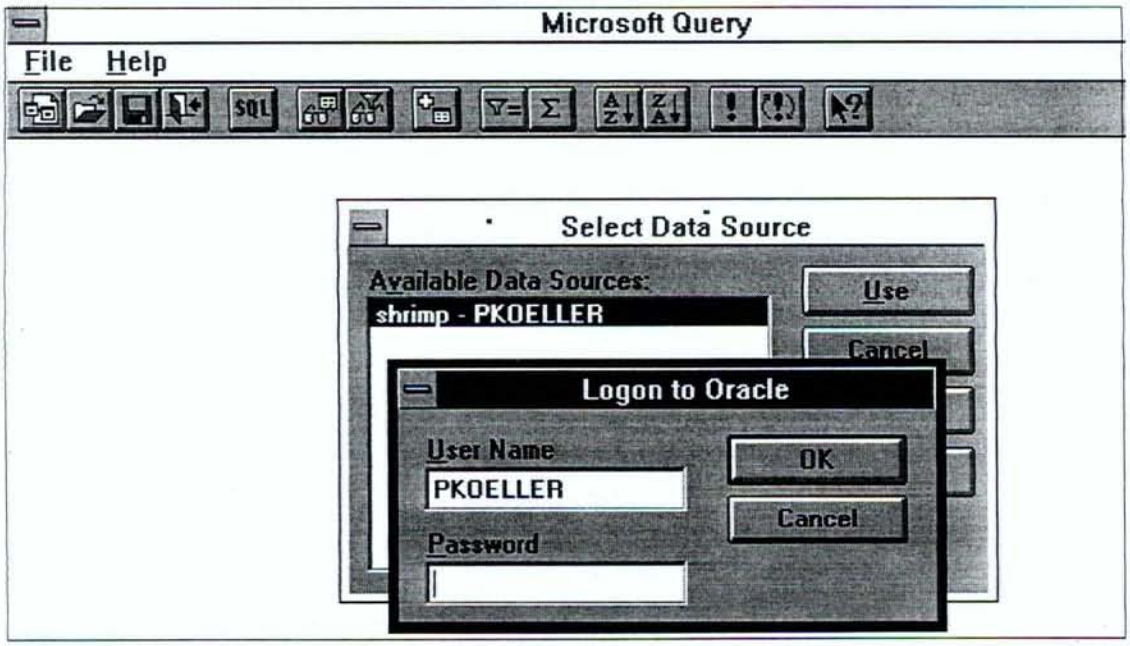
To connect to the Oracle database, within Excel choose Data Get External Data



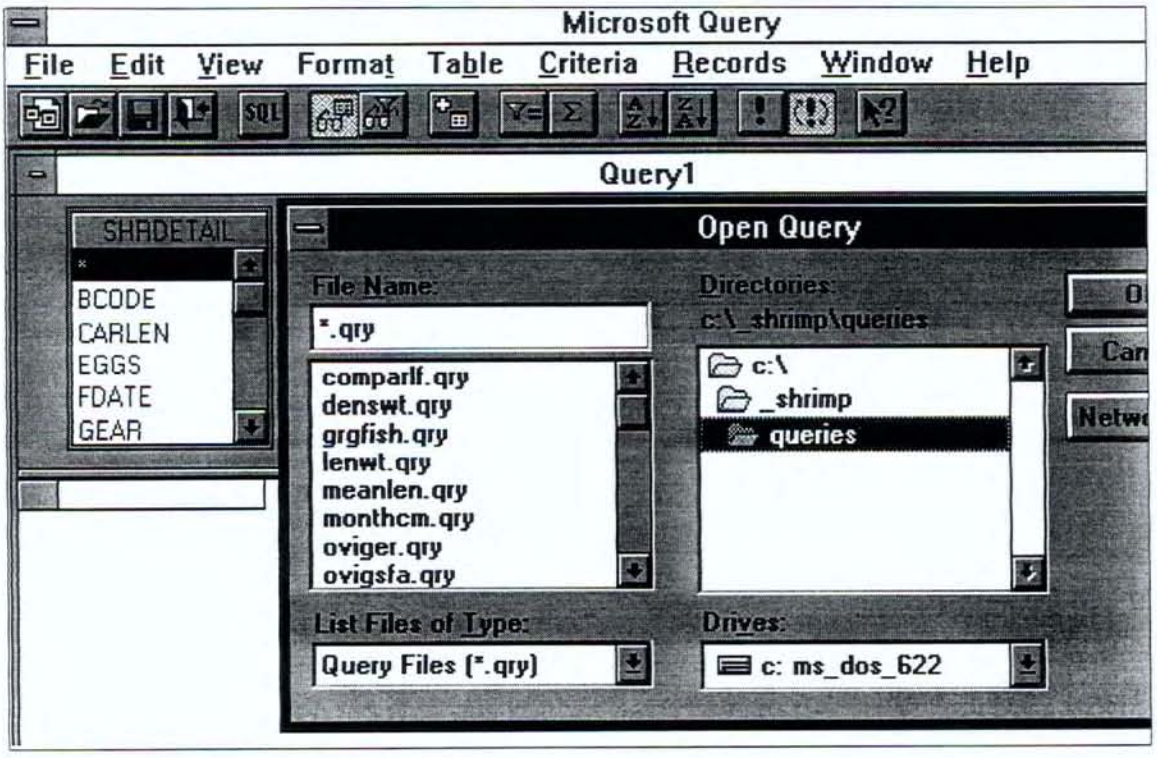
The Query button will appear in the Query and Pivot Toolbar:



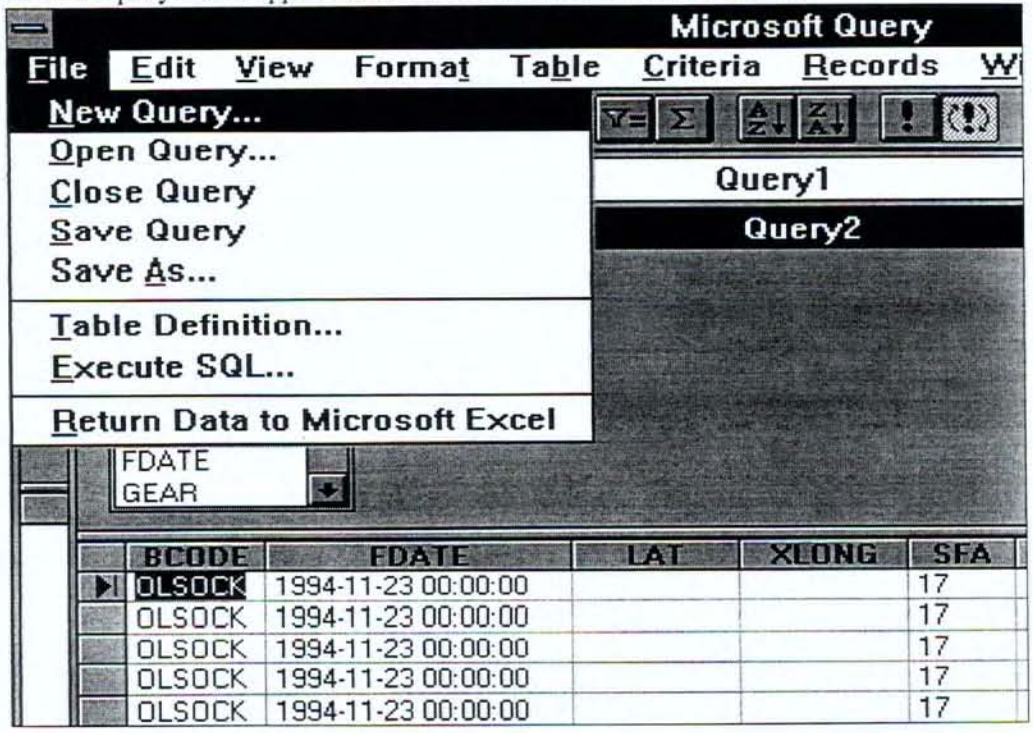
and Microsoft Query will start and prompt for the data source (e.g. shrimp) and the Oracle logon user name and password:



Microsoft Query will now start. You can now open a saved query or enter a new one. To open a saved query choose File Open:



After the query results appear choose File Return data to Microsoft Excel.



The data then appears in the Excel spreadsheet. Alternatively you can run a query directly from a formula typed into an Excel spreadsheet cell using e.g. the SQL.REQUEST function. Another approach is to open Microsoft Query and Excel independently and simply cut and paste results from MS-Query to MS-Excel.

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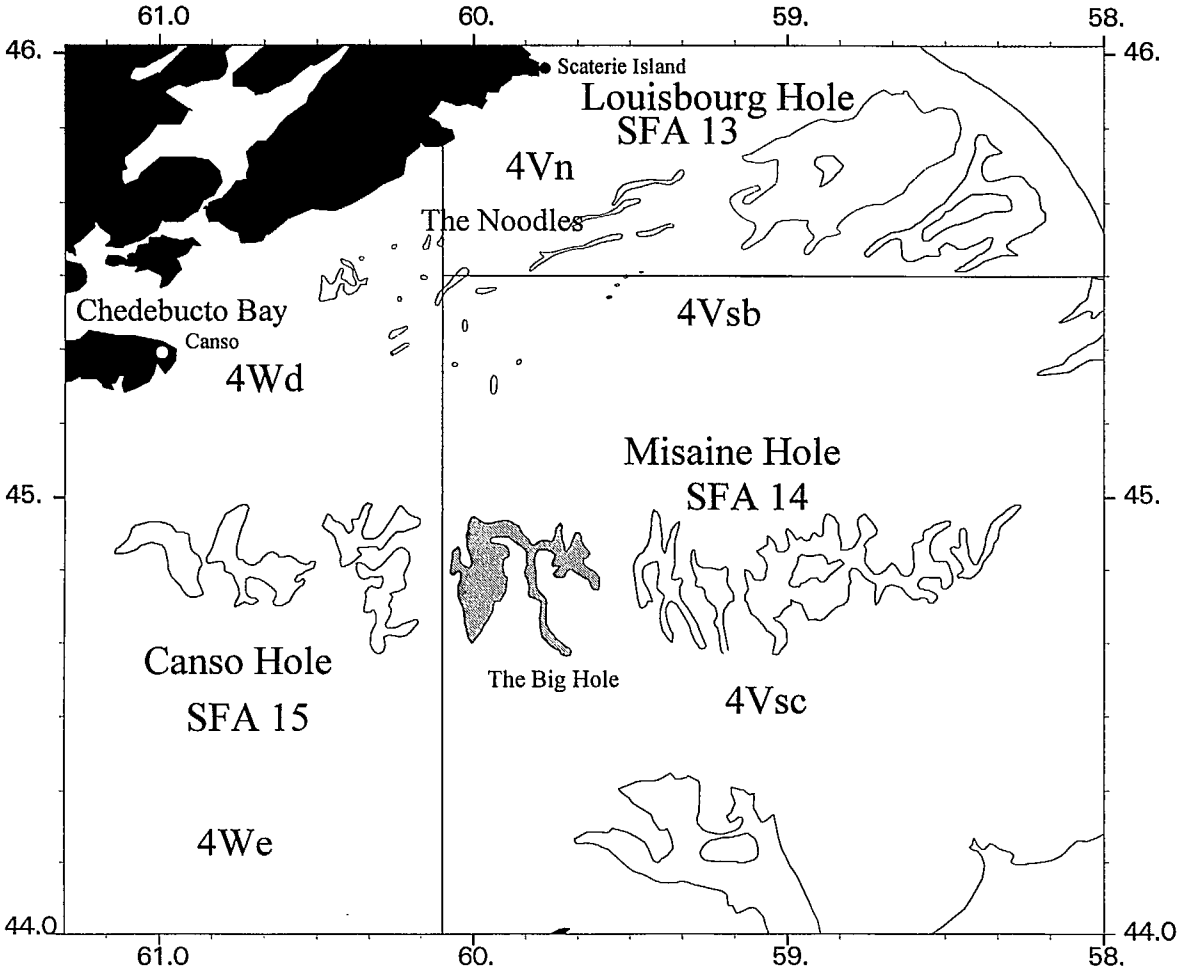

Figure 1. Shrimp Fishing areas on the Eastern Scotian Shelf.

Appendix 1. Programming notes on triggers

Triggers have been incorporated into the forms to serve several functions, including:
(i) automatic calculations on data entered (ii) ease of data entry by automatically carrying down certain fields which can be overwritten by the user.

All triggers are transparent to the general user. An example trigger is given below:

The key-nxtfld trigger allows automatic entry of the SFA field .

```
BEGIN
        IF :survey.blat > 453000 and :survey.blong < 600600
        THEN :survey.sfa:= 13;NEXT_FIELD;END IF;
        IF :survey.blat < 453000 and :survey.blong < 600600
        THEN :survey.sfa:= 14;NEXT_FIELD; END IF;
        IF :survey.blong > 600600 and :survey.blong < 632000
        THEN :survey.sfa:= 15; NEXT_FIELD; END IF;
        If :survey.blong > 632000 THEN :survey.sfa:= 16;
        NEXT_FIELD;END IF;
END;
```

Appendix 2. Sample Loader Files

The ldshrsurvey.ctl file

```
load data
infile survey951.blk
into table shrsurvey
(cruise position(1:6) char(6),
xset position(8:10) char(3),
sfa position(12:13) char(2),
stratum position(15:16) char(2),
setcode position(18:18) char(1),
gear position(20:20) char(1),
fdate position(22:30) char(9),
speed position(32:34) char(3),
how_sp position(36:36) char(1),
blat position(38:43) char(6),
blong position(45:50) char(6),
elat position(52:57) char(6),
elong position(59:64) char(6),
btime position(66:70) char(5),
etime position(72:76) char(5),
bearing position(78:80) char(3),
duration position(82:84) char(3),
dist position(86:89) char(4),
how_dist position(91:91) char(1),
h_height position(93:95) char(3),
bdepth position(97:99) char(3),
edepth position(101:103) char(3),
adepth position(105:107) char(3),
temp position(109:111) char(3),
wind_dir position(113:115) char(3),
wind_sp position(117:118) char(2),
wave_ht position(120:121) char(2),
weight position(123:126) char(4),
xcount position(128:130) char(3))
```

The ldshrlog.ctl file

```
load data
infile logs.txt
into table shrcomlog
(bcode position(1:6) char(6),
btype position(8:11) char(4),
xset position(13:14) char(2),
fdate position(16:24) date,
ldate position(26:34) date,
lat position(36:41) char(6),
xlong position(43:48) char(6),
sfa position(50:51) char(2),
dcode position(53:53) char(1),
depth position(55:57) char(3),
fhours position(59:61) char(3),
weight position(63:67) char(5),
value position(69:73) char(5),
```

Appendix 2. (cont'd)

xcount position(75:77) char(3),
ntraps position(79:81) char(3))

The ldshrdetail.ctl file

load data
infile length1.txt
into table shrdetail
(bcode position(1:6) char(6),
fdate position(8:16) date,
lat position(18:23) char(6),
xlong position(25:30) char(6),
sfa position(32:33) char(2),
xset position(35:37) char(3),
gear position(39:39) char(1),
wtind position(41:45) char(5),
carlen position(47:50) char(4),
sex position(52:52) char(1),
eggs position(54:54) char(1),
sspines position(56:56) char(1),
parasite position(58:59) char(2),
hroe position(61:61) char(1),
totnum position(63:65) char(3))

The ldshrscanmar.ctl file

load data
infile scanmar95a1.txt
into table shrscanmar
append
(cruise position(1:6) char(6),
xset position(8:10) char(3),
fdate position(12:20) date,
logtime position(22:26) char(5),
wingspread position(28:32) char(5),
doorspread position(34:38) char(5),
clearance position(40:44) char(5),
opening position(46:50) char(5))

Appendix 3. SQL*Forms function keys for different terminal emulators

Function	IBM PC with CONNECT Keystroke(s)	Macintosh with Telnet Keystroke(s) (no. on pad)
Block Menu	Ctrl-F1	Escape-b
Clear Block	Shift-F6	3
Clear Field	F6	9
Clear Form/Rollback	Home	Escape-c
Clear Record	F5	6
Commit Transaction	End	PF3
Count Query Hits	Shift-F1	Escape-4
Create Record	F9	PF2
Delete Backward	Backspace	DELETE
Delete Character	Del	
Delete Record	Shift-F5	Escape-d
Display Error	Shift-F10	,
Duplicate Field	Shift-F7	Escape-1
Duplicate Record	F7	Escape-2
Enter Query	F1	ENTER
Execute Query	F2	PF1
Exit/Cancel	F3	PF4
Help	F10	0
Insert/Replace	Ins	.
Left	Left arrow	Left arrow
List Field Values	F4	Escape-v
Next Block	Alt j[i]	1
Next Field	Tab or Return	
Next Primary Key Fld	Escape-Tab	Escape-Tab
Next Record	Down arrow	Down arrow or 4
Next Set of Records	Shift F2	Escape-s
Previous Block	Alt u[i]	2
Previous Field	Shift-Tab	8
Previous Record	Up arrow	Up arrow or 5
Print	Shift-F9	Escape-p
Redisplay Page	Shift-F8	-
Right	Right arrow	Right arrow
Scroll Left	Ctrl-Left arrow	Escape-Left arrow
Scroll Right	Ctrl-Right arrow	Escape-Right arrow
Show Function Keys	F8	Escape-k
Interrupt		Ctrl-Y

[i] if you are using an IBM PC and the Alt j and Alt u keys do not perform the desired function, define the keys by using the DEFINE option and specifiying:

alt j = 1b 4f 21 Od

alt u = 1b 4f 25 Od

The Define option is described in the Control Data CONNECT for the IBM PC Version 1.4 User's Guide.

Appendix 4. Summary of Editing Operations and Keys

Function	IBM PC with CONNECT Keystroke(s)	Macintosh with Telnet (VT100 emulation) Keystroke(s) (no. on pad)
First (beginning of file)	Ctrl-PgUp	0 followed by 1
Last (end of file)	Ctrl-PgDn	0 followed by 2
Middle (middle of sreen)	Ctrl-F1	Enter
Fwd (next screen of file)	PgDn	2
Bkw (previous screen of file)	PgUp	1
Quit (End and Save session)	F6	6
Exit (End session without saving)	Shift-F6	0 followed by 6
Back (Ends session, save changes &resume on 1st file)	F3	3
Undo	F5	5
Help	F4	4
Home (editor home line)	Home	0 followed by 3
Refrsh (rewrite screen)	Alt-I	0 followed by Enter
Width	Shift-F4	0 followed by PF4
Mark	F2	PF1
Unmrk	Shift-F2	0 followed by PF1
MrkCh	F7	PF2
MrkBx	Shift-F7	0 followed by PF2
Copy	F1	0 followed by 4
Move	Shift-F1	9
InsCh (Inserts a blank character)	Ins	7
InsLn (Inserts a blank line)	Alt-I	8
DelCh (Deletes current character)	Del	0 followed by 7
DelLn (Deletes current line)	Alt-D	0 followed by 8
Locate	F8	PF3
LocNxt	Shift-F8	0 followed by PF3
LocAll	Shift-F3	PF4
CirEl (deletes all characters to end of line)	Shift-F10	0 followed by ,(comma)
SkpEl (skip to end of current line)	F10	,(comma)
Join	Shift-F9	0 followed by - (minus sign)
Break	F9	- (minus sign)
LinUp (positions current line to top of the screen)	Ctrl-F2	0 followed by 9