

GFBioField: A Brief History of Problems and Solutions

(now with extra problems!)

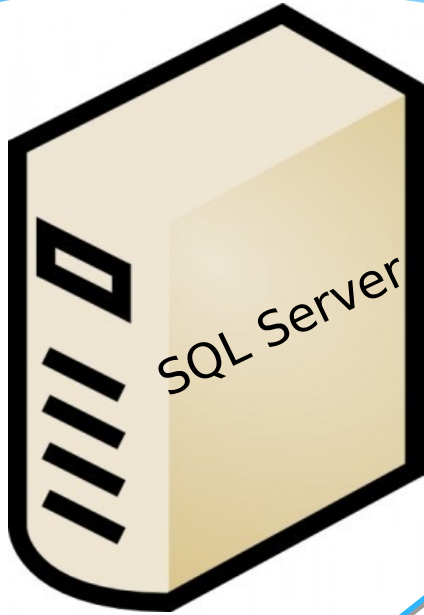
Topics

- * Some background ...
- * Sensors Data Capture and Processing.
- * Marine Scales and Sablefish Surveys.
- * Survey Block Management.
- * Hardware Issues.
- * Quality Assurance.

In The Beginning: GFBio

- * Oracle relational database to store biological data collected on Groundfish surveys and from commercial sampling.
- * Developed in the 1990s by Stanley, Rutherford, Coulson, and Lee.
- * Effectively models the entire process of collecting Groundfish biological data all the way from leaving the dock to returning again.

“GFBioField”



Data Processing
and Storage

Server
Clients



User Interface:
Data-entry
forms,
reports, and
tools

Hardware

- * Semi-ruggedized server laptops
- * Ruggedized laptops and tablets
- * Marel marine scales
- * Fish measuring board
- * Wi-Fi router
- * RAID storage
- * Webcams
- * Bluetooth headphones
- * Barcode scanners



Typical Configuration



Sensor Data Capture and Processing

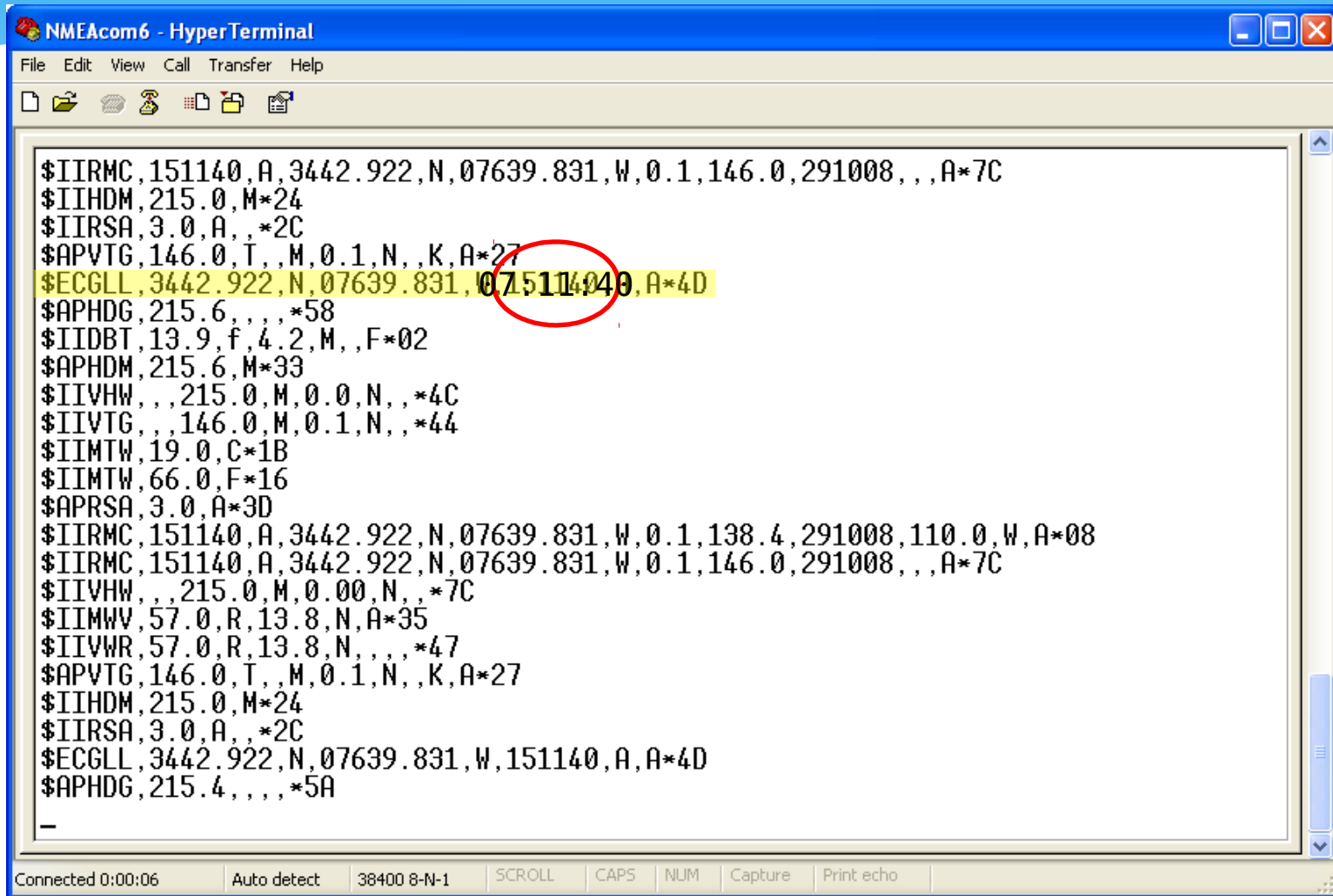


Sensor Data

- * Broadcast live (not logged) at regular intervals over serial (RS-232) or network (TCP/IP) interfaces.
- * Usually use NMEA standard for transmission.

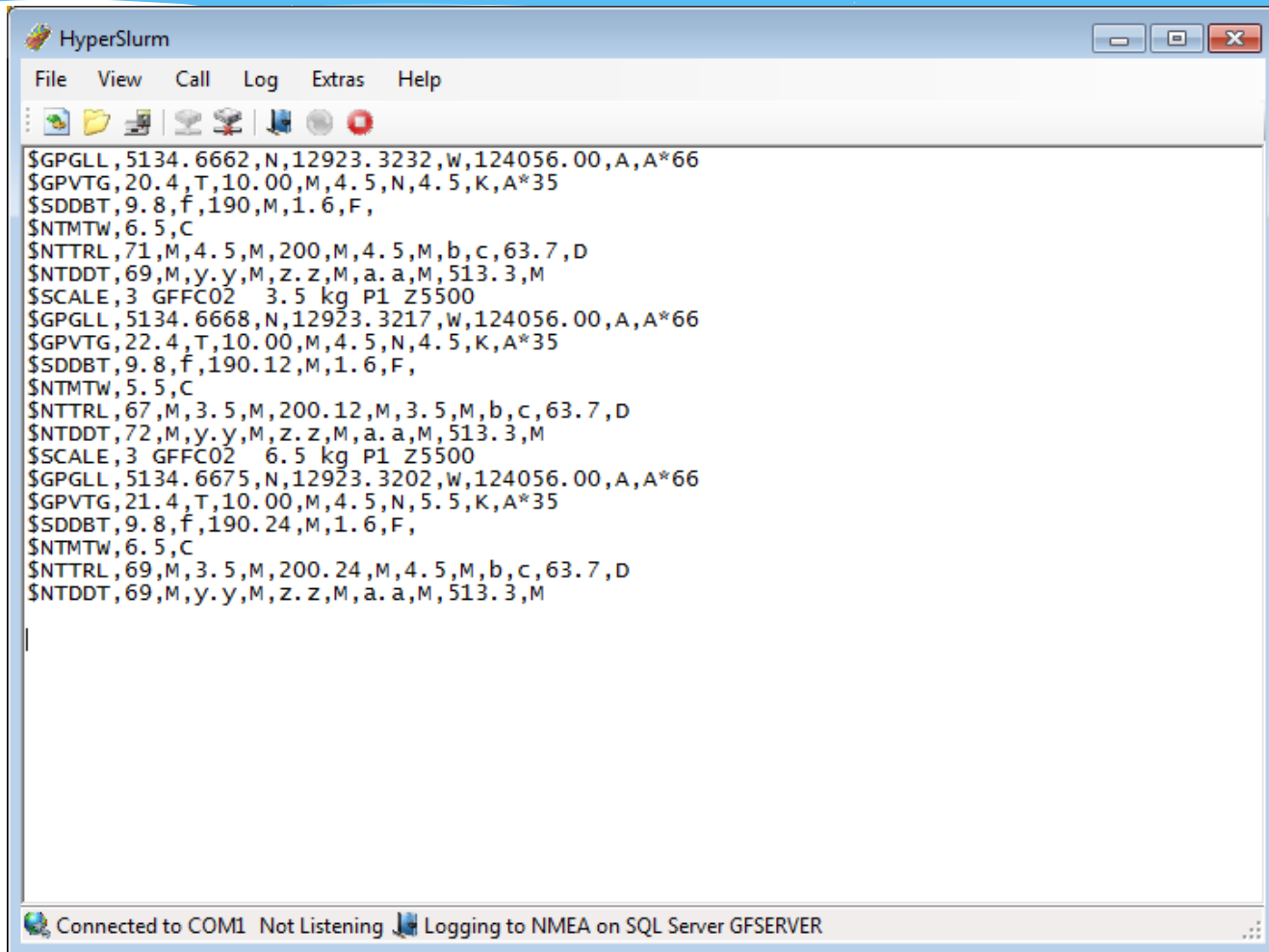
**\$GPGLL,4916.45,N,12311.12,W,225444
,A**

HyperTerm



```
NMEacom6 - HyperTerminal
File Edit View Call Transfer Help
$IIIRC,151140,A,3442.922,N,07639.831,W,0.1,146.0,291008,,A*7C
$IIHDM,215.0,M*24
$IIRSA,3.0,A,,*2C
$APVTG,146.0,T,,M,0.1,N,,K,A*27
$ECGLL,3442.922,N,07639.831,075114040,A*4D
$APHDG,215.6,,,,*58
$IIDBT,13.9,f,4.2,M,,F*02
$APHDM,215.6,M*33
$IIVHW,,215.0,M,0.0,N,,*4C
$IIVTG,,146.0,M,0.1,N,,*44
$IIMTW,19.0,C*1B
$IIMTW,66.0,F*16
$APRSA,3.0,A*3D
$IIIRC,151140,A,3442.922,N,07639.831,W,0.1,138.4,291008,110.0,W,A*08
$IIIRC,151140,A,3442.922,N,07639.831,W,0.1,146.0,291008,,A*7C
$IIVHW,,215.0,M,0.00,N,,*7C
$IIMWV,57.0,R,13.8,N,A*35
$IIVWR,57.0,R,13.8,N,,,*47
$APVTG,146.0,T,,M,0.1,N,,K,A*27
$IIHDM,215.0,M*24
$IIRSA,3.0,A,,*2C
$ECGLL,3442.922,N,07639.831,W,151140,A,A*4D
$APHDG,215.4,,,,*5A
-
Connected 0:00:06 Auto detect 38400 8-N-1 SCROLL CAPS NUM Capture Print echo
```

HyperSlurm



The screenshot shows a window titled "HyperSlurm" with a menu bar (File, View, Call, Log, Extras, Help) and a toolbar. The main area contains a list of job configurations, each starting with a job name and followed by various parameters. The status bar at the bottom indicates "Connected to COM1 Not Listening" and "Logging to NMEA on SQL Server GFSERVER".

```
$GPGLL, 5134.6662, N, 12923.3232, W, 124056.00, A, A*66
$GPVTG, 20.4, T, 10.00, M, 4.5, N, 4.5, K, A*35
$SDDBT, 9.8, f, 190, M, 1.6, F,
$NTMTW, 6.5, C
$NTTRL, 71, M, 4.5, M, 200, M, 4.5, M, b, c, 63.7, D
$NTDDT, 69, M, y. y, M, z. z, M, a. a, M, 513.3, M
$SCALE, 3 GFFC02 3.5 kg P1 Z5500
$GPGLL, 5134.6668, N, 12923.3217, W, 124056.00, A, A*66
$GPVTG, 22.4, T, 10.00, M, 4.5, N, 4.5, K, A*35
$SDDBT, 9.8, f, 190.12, M, 1.6, F,
$NTMTW, 5.5, C
$NTTRL, 67, M, 3.5, M, 200.12, M, 3.5, M, b, c, 63.7, D
$NTDDT, 72, M, y. y, M, z. z, M, a. a, M, 513.3, M
$SCALE, 3 GFFC02 6.5 kg P1 Z5500
$GPGLL, 5134.6675, N, 12923.3202, W, 124056.00, A, A*66
$GPVTG, 21.4, T, 10.00, M, 4.5, N, 5.5, K, A*35
$SDDBT, 9.8, f, 190.24, M, 1.6, F,
$NTMTW, 6.5, C
$NTTRL, 69, M, 3.5, M, 200.24, M, 4.5, M, b, c, 63.7, D
$NTDDT, 69, M, y. y, M, z. z, M, a. a, M, 513.3, M
```

Connected to COM1 Not Listening Logging to NMEA on SQL Server GFSERVER

HyperSlurm

```
01/13/2016 08:02:05|  
$GPGLL,5134.6662,N,12923.3232,W,124056.00,A,A*66  
01/13/2016 08:02:05|$GPVTG,22.4,T,10.00,M,4.5,N,4.5,K,A*35  
01/13/2016 08:02:06|$SDBBT,9.8,f,190,M,1.6,F,  
01/13/2016 08:02:06|$NTMTW,5.5,C  
01/13/2016 08:02:06|$NTTRL,71,M,3.5,M,200,M,3.5,M,b,c,63.7,D  
01/13/2016 08:02:07|$NTDDT,72,M,y.y,M,z.z,M,a.a,M,513.3,M  
01/13/2016 08:02:07|$SCALE,3 GFFC02 4.5 kg P1 Z5500  
01/13/2016 08:02:09|  
$GPGLL,5134.6668,N,12923.3217,W,124056.00,A,A*66  
01/13/2016 08:02:10|$GPVTG,23.4,T,10.00,M,4.5,N,4.5,K,A*35  
01/13/2016 08:02:10|$SDBBT,9.8,f,190.12,M,1.6,F,  
01/13/2016 08:02:10|$NTMTW,6.5,C
```

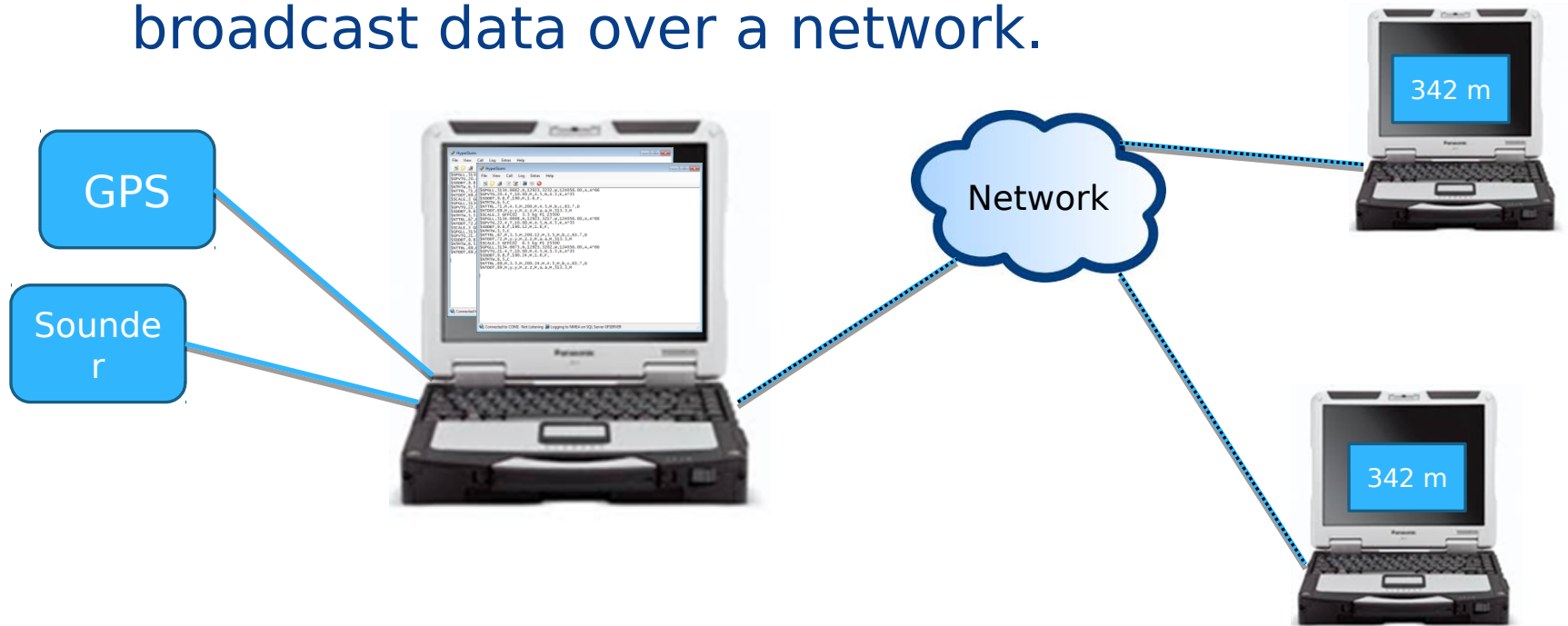
Then Came GFBioField

- * Began to use GFBioField in 2005 for bridge logs.
- * Need to populate bridge log fields like latitude, longitude, and bottom depth directly from sensor data without having to hand-enter.

| | Latitude | Longitude | Bottom Depth |
|---------------|----------|-----------|--------------|
| Begin Fishing | 52.453 | 132.021 | 162.5 |

HyperSlurm (again)


- * Modified HyperSlurm so that it could broadcast data over a network.



Room for Improvement

- * Now we can populate data-entry fields like latitude and longitude without entering by hand.
- * BUT: Timing is an issue – what if e.g. latitude and longitude aren't available exactly when I need them?

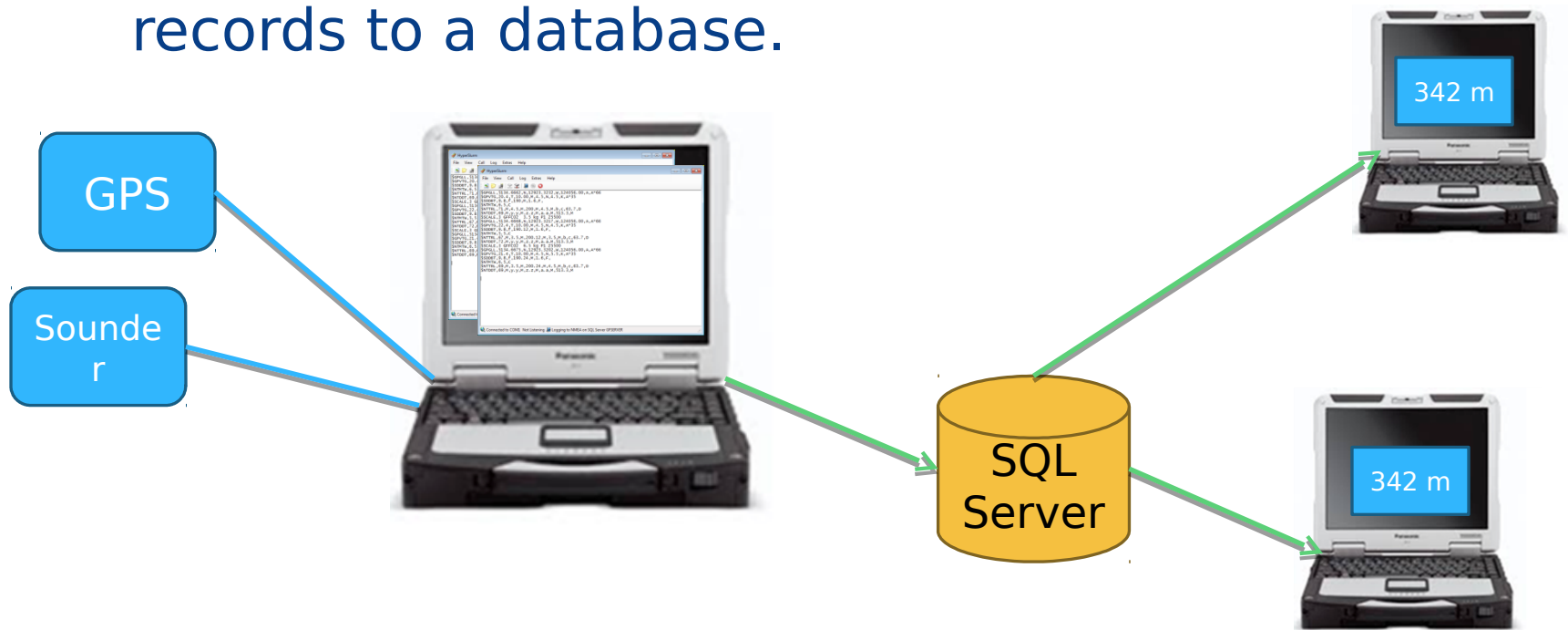
- * And what if I need to retrieve values from the past?

| | Latitude | Longitude | Bottom Depth |  |
|---------------|----------|-----------|--------------|---|
| Begin Fishing | 52.453 | 132.021 | 162.5 | |

at any time.

HyperSlurm (again) + SQL Server

- * Modified HyperSlurm so that it logs all NMEA records to a database.



\$ABCD,nn,yy,zz*E

NMEA Database

NMEA_LOG 52.345 N / 132.34 W
453.23 m
4.3 m

**NMEA_VESSEL_POSITIO
N**

NMEA_BOTTOM_DEPTH

**NMEA_HEADROPE_HEI
GHT**

NMEA_VESSEL_POSITION

| Column Name | Example Value |
|-------------|---------------------------|
| RECORD_ID | 1876 |
| TIME_STAMP | 06/15/2015 5:34:23.412 |
| LATITUDE | 52.5243 |
| LONGITUDE | 130.8376 |

Sablefish Trap Survey

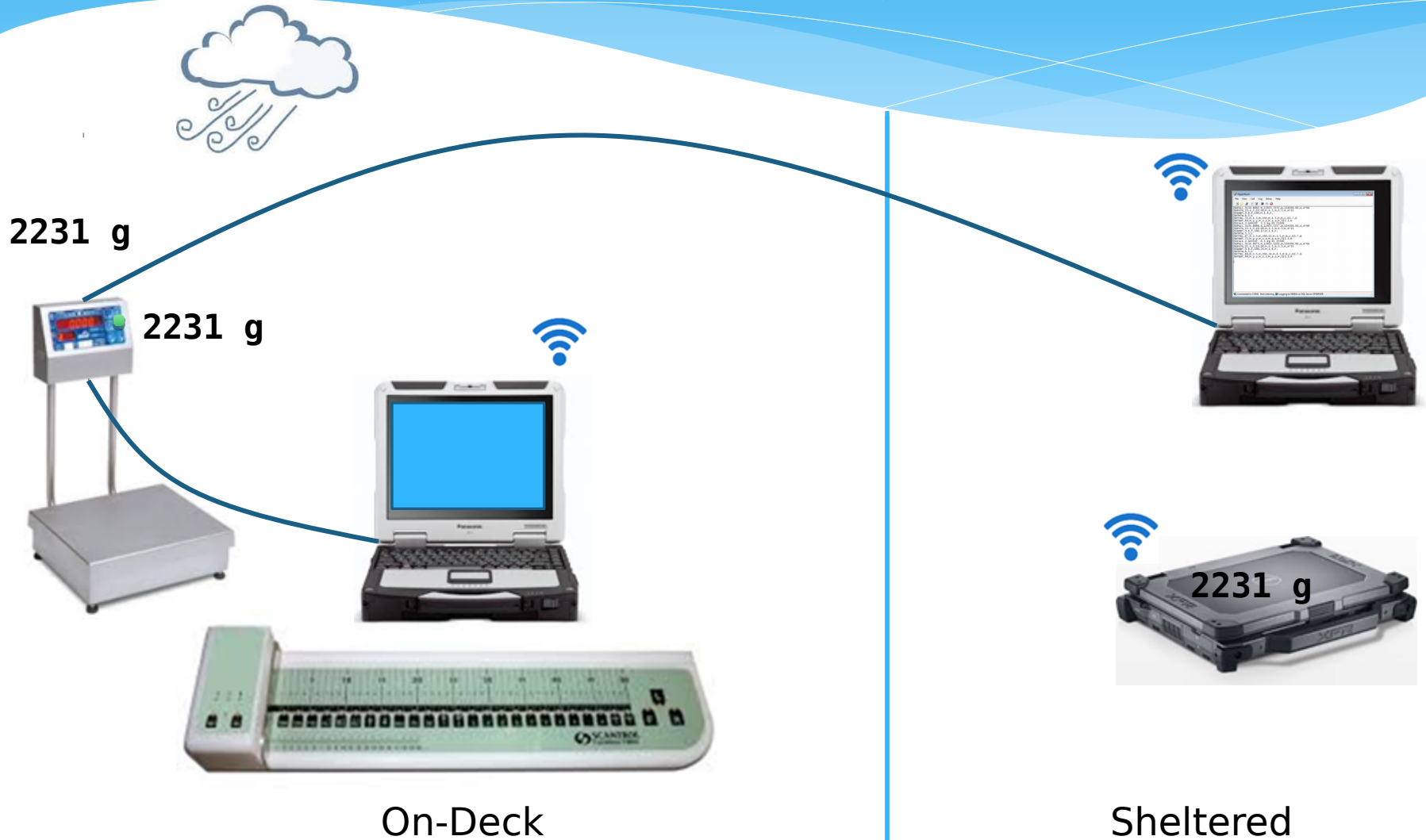
- * Takes place in October and November.
- * Big seas, but the bigger problem is WIND!
- * Marine scales are motion-compensated but can't cope with wind.
- * Difficult to press the "print" button when the green "steady" light flashes.



Remote Scale

- * Discovered that you could configure a Marel scale to continually output data, instead of just when you press the print button.
- * Why not use our existing NMEA solution to capture scale weights?
- * We can query the database for our weight, instead of using the scale print button.
- * E.g. Give me the most recent steady weight from the last two seconds.

Remote Scale

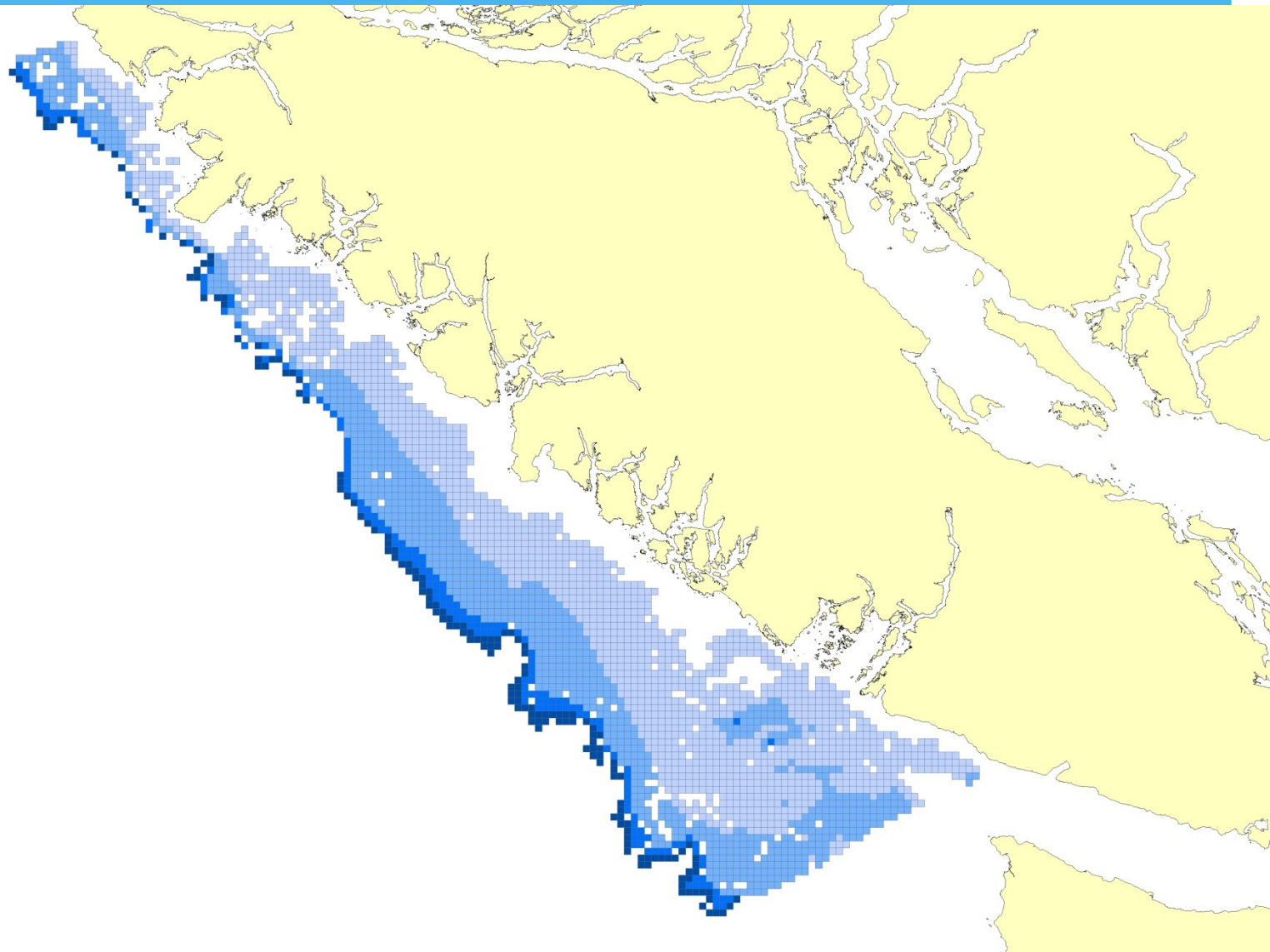


Survey Block Management

Survey Blocks

- * All of our trawl surveys employ a random stratified design.
- * Fishing locations for each survey year are randomly selected from a grid of 2x2 km blocks prior to the survey.

WCVI Survey Blocks



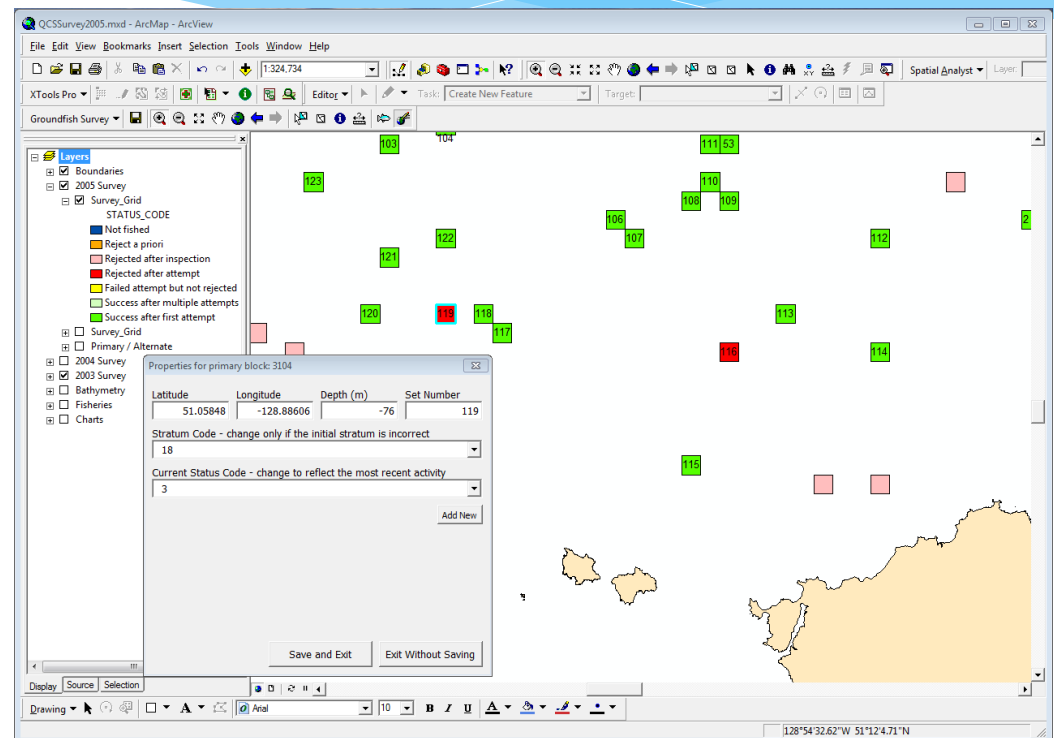
Survey Block Management

Keeping Track of:

- * The blocks selected for each year of a survey.
- * What happens to each block during a survey:
 - * Blocks rejected based on fisher knowledge.
 - * Blocks rejected after inspection.
 - * Blocks rejected after a failed tow.
 - * Blocks successfully fished.
- * Also various ad-hoc comments about each block:
 - * Bottom type.
 - * Explanatory notes about why a block was rejected.

ArcMap GIS

- * ArcMap GIS project with custom forms and VBA code.
- * Track block status.
- * Add/remove blocks.
- * Attach comments to blocks.
- * Export blocks to Nobeltec.
- * Worked well, but ...
- * **Totally separate from GFBioField so fishing activity not linked to block management.**

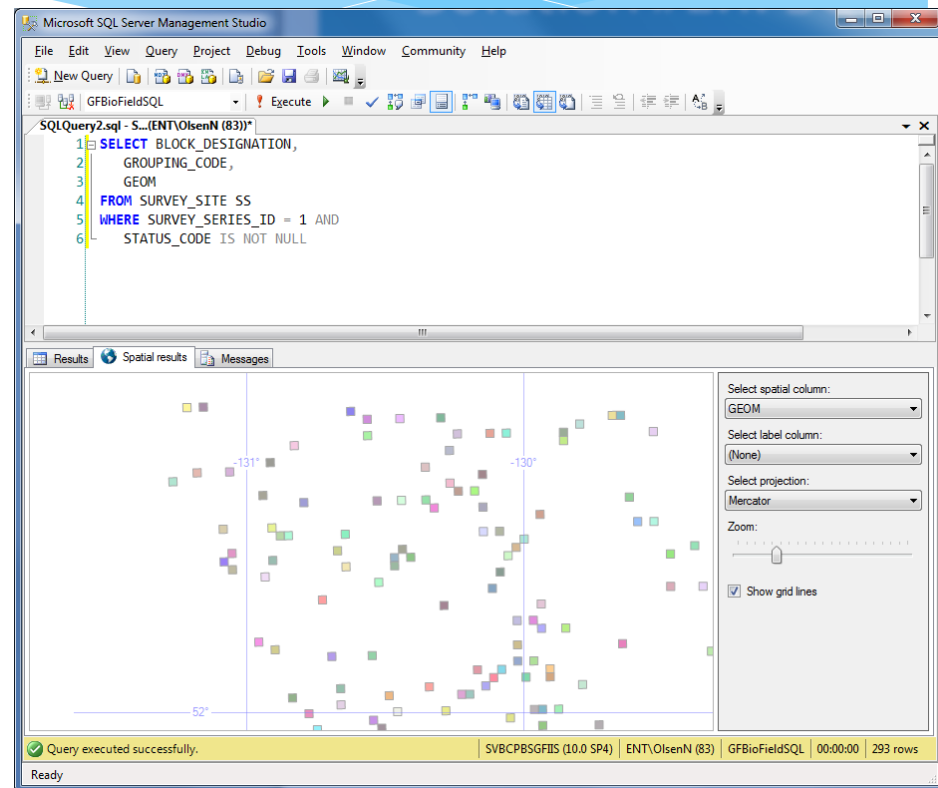


SQL Server Spatial Data Types

- * SQL Server 2008 includes spatial data types for storing geographic and geometric objects (like survey blocks!).
- * We created a set of related tables to store and manage survey blocks.
- * Blocks can then be directly referenced in queries.

SQL Server Spatial Data Types

- * So now we have our survey blocks integrated into the same database that holds the rest of our survey data.
- * **We still need a GIS tool to view and edit our survey blocks and other spatial data.**



MapWindow ActiveX Control

- * Free, Open Source GIS component that can be embedded into MS Access forms (and other Windows applications).
- * Fully programmable via Visual Basic for Applications.
- * Now we can create a GIS form in our GFBioField application to view and manage our survey blocks.
- * Except ...
- * **MapWindow doesn't know about SQL Server spatial data types.**

MapWindow Serialized String

- * MapWindow can read specially formatted strings as spatial data.
- * For example, the following string represents one of our survey blocks:
 - * `5;0;-129.2702|50.8694|-129.2418|50.8694|-129.2419|50.8874|-129.2703|50.8874|-129.2702|50.8694|`
- * So we wrote some SQL code to convert SQL Server spatial data to MapWindow Serialized Strings.

Other Stuff

GFPhotoView

Species Search

Search Phrase: Search

Search By

Common Name Science Name

Limit Results To

All Species Fish Rockfish Flatfish Roundfish

Cartilaginous Invertebrates Survey Fish Survey Inverts

Genus Family Order Class

Results: Number of Records = 7683 Photos

| Code | Name | Taxon | Level | Photo | Info |
|------|--|-----------------------------|--------------|--------------------------|--------------------------|
| PFI | Aaptos (Genus) | Aaptos | Genus | <input type="checkbox"/> | <input type="checkbox"/> |
| 18K | Abalone Barleysnail | Barleeia Haliotiphila | Species | <input type="checkbox"/> | <input type="checkbox"/> |
| 84S | Abalone Piddock | Penitella Conradi | Species | <input type="checkbox"/> | <input type="checkbox"/> |
| 14A | Abalones (Family) | Haliotidae | Family | <input type="checkbox"/> | <input type="checkbox"/> |
| PQC | Abarenicola (Genus) | Abarenicola | Genus | <input type="checkbox"/> | <input type="checkbox"/> |
| FH7 | Abarenicola claparedi | Abarenicola claparedi | Species | <input type="checkbox"/> | <input type="checkbox"/> |
| FH8 | Abarenicola claparedi oceanica (Sub S... | Abarenicola claparedi oc... | Sub Speci... | <input type="checkbox"/> | <input type="checkbox"/> |
| F11 | Abarenicola claparedi vagabunda (Sub ... | Abarenicola claparedi va... | Sub Speci... | <input type="checkbox"/> | <input type="checkbox"/> |
| FH9 | Abarenicola pacifica | Abarenicola pacifica | Species | <input type="checkbox"/> | <input type="checkbox"/> |

Close

rockfish

418 yellowtail rf_0850.jpg

428 vermilion rf 2.JPG

431 china rf_0844.jpg

Sharpchin Rockfish (Sebastes Zacentrus)

Image 1 Information

Distribution: Aleutian Islands to southern California

Depth Range: 25-660 m, usually 100-350 m

Size: 45 cm TL

ID Notes: Subopercular spines usually absent. Short ridge on lachrymal forming shelf under nostrils. Anal fin spine 2 longer than 3.

Colouration: Light red with vague dark brown blotches extending into dorsal fin and below lateral line; dark forked bar from eye to operculum; lateral line in area same colour as background or only slightly darker.

References: Fishes of Alaska, p. 379

Update!

Sharpchin rockfish Sebastes variegatus

Sharpchin rf_0971.jpg

Openfire and Spark

- * Open Source instant message/chat server and client
- * Openfire server software runs on our database server
- * Spark chat clients on all GFBioField client computers
- * Convenient communications between bridge and deck/sampling areas