# GFBioField: A Brief History of Problems and Solutions

(now with extra problems!)

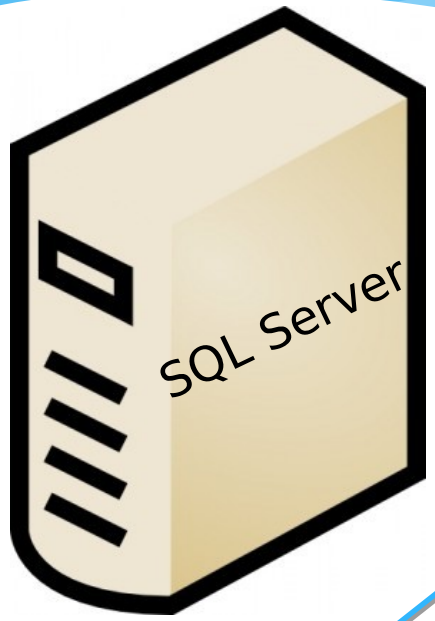
# Topics

* 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”




Server

Clients

Data Processing and Storage

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

# Hardware

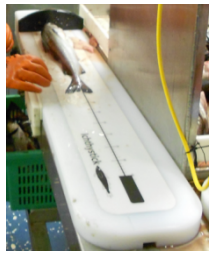
* Semi-ruggedized server laptops
* Ruggedized laptops and tablets
* Marel marine scales
* Fish measuring board
* Wi-Fi router
* RAID storage
* Webcams
* Bluetooth headphones
* Barcode scanners










# Typical Configuration

Server

Router

CS Laptop

RAID

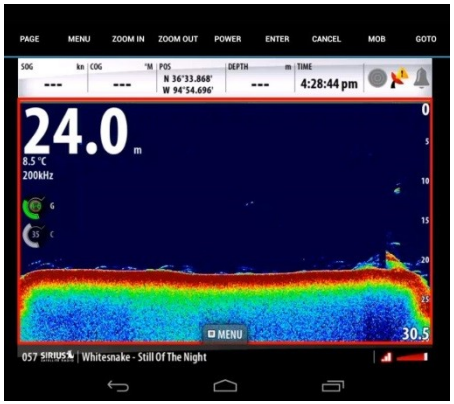
Dry Lab or Bridge

Wet Lab or On-Deck

Biosample Station (x3)

Haul Card Station

# Sensor Data Capture and Processing

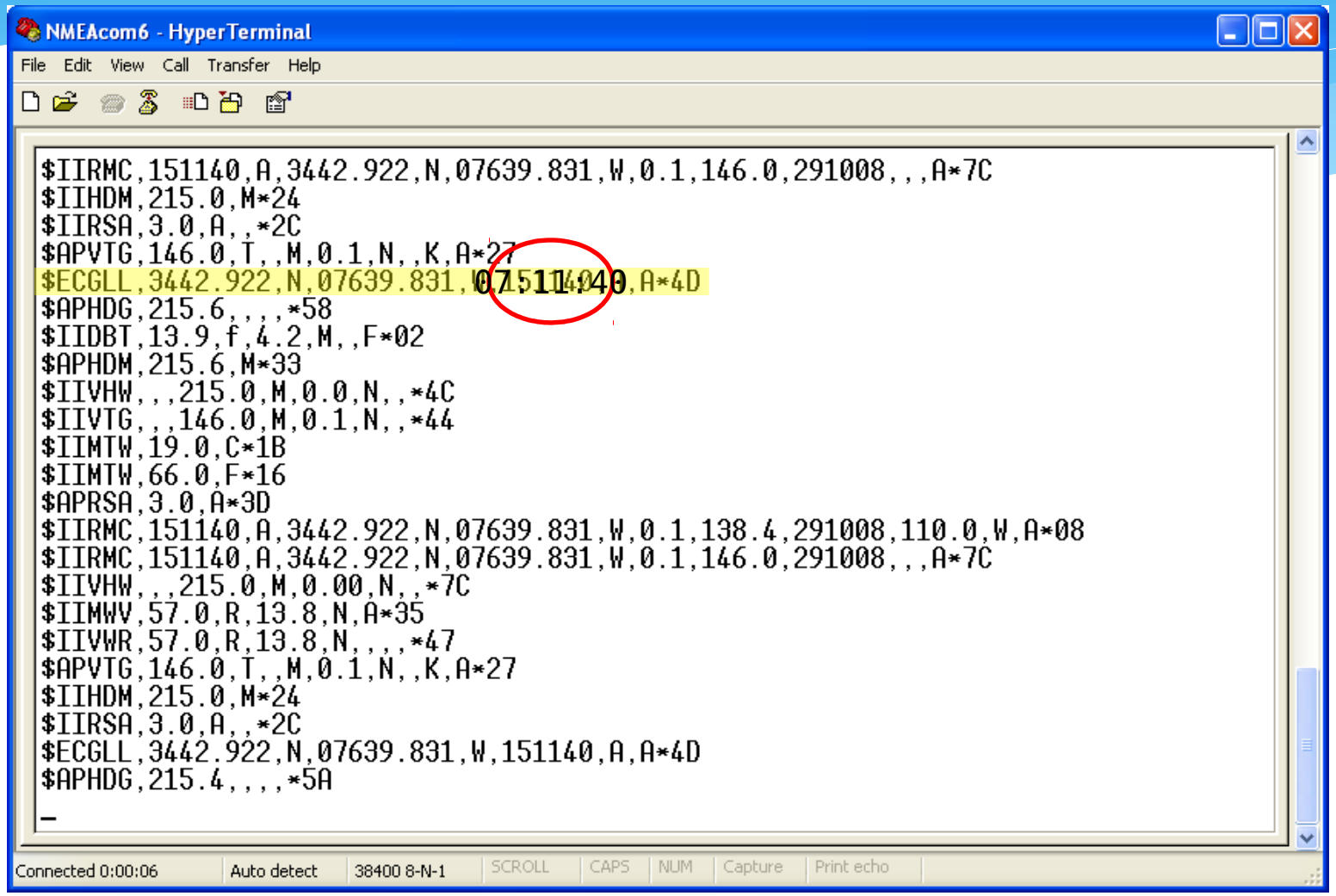



# Sensor Data

* 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
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$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,W,151140,A,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
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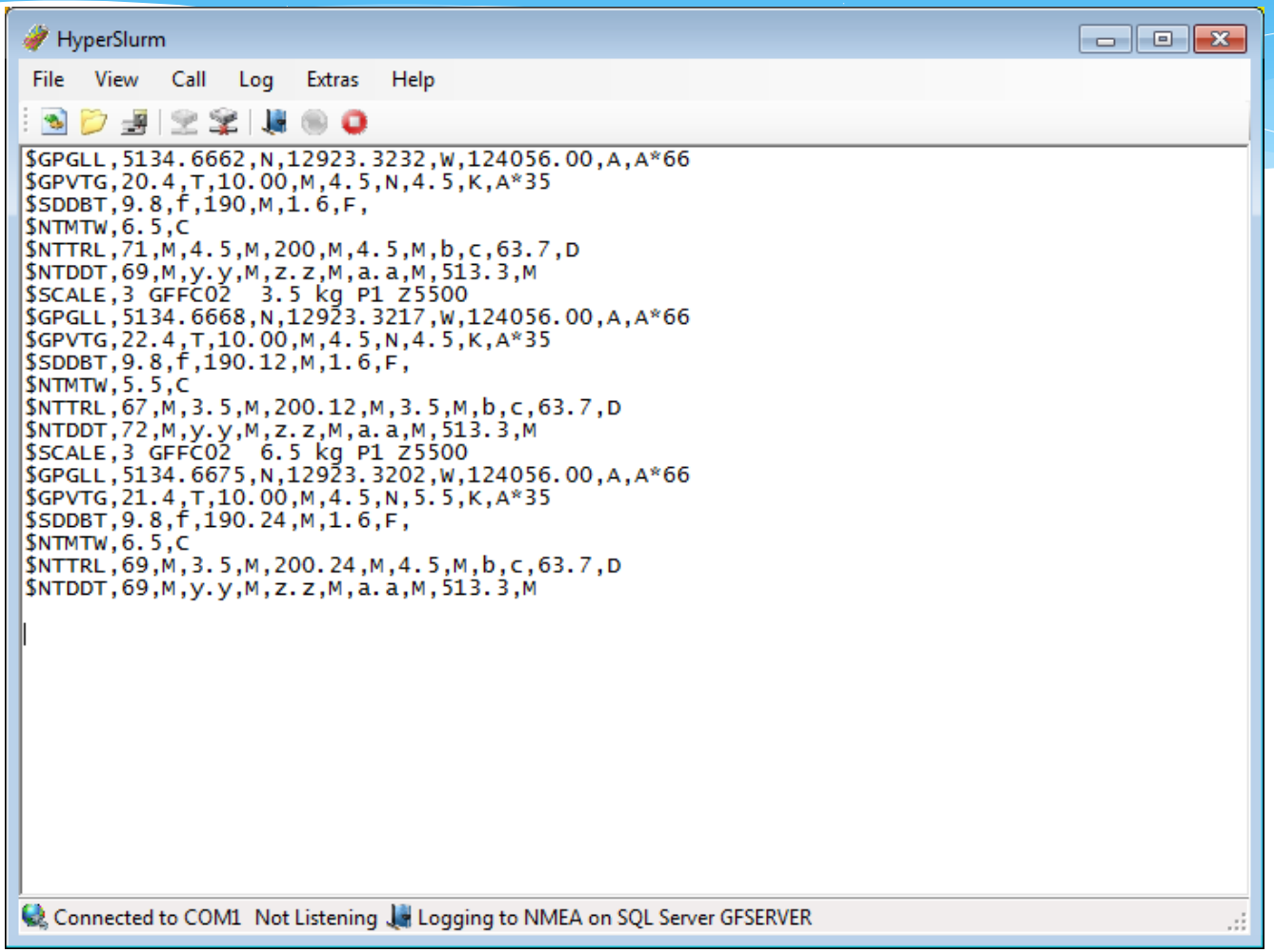
$IIVWR,57.0,R,13.8,N,,,,*47
$APVTG,146.0,T,,M,0.1,N,,K,A*27
$IIHDM,215.0,M*24
$IIRSA,3.0,A,,*2C
$ECGLL,3442.922,N,07639.831,W,151140,A,A*4D
$APHDG,215.4,,,,*5A
Connected 0:00:06
Auto detect
38400 8-N-1
SCROLL
CAPS
NUM
Capture
Print echo

# HyperSlurm


HyperSlurm
File View Call Log Extras Help
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$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
$GPGLL,5134.6668,N,12923.3217,W,124056.00,A,A*66
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$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
$SCALE,3 GFFC02 6.5 kg P1 Z5500
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$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|$SDDBT,9.8,f,190,M,1.6,F,
01/13/2016 08:02:06|$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|$SDDBT,9.8,f,190.12,M,1.6,F,
01/13/2016 08:02:10|$NTMTW,6.5,C
```

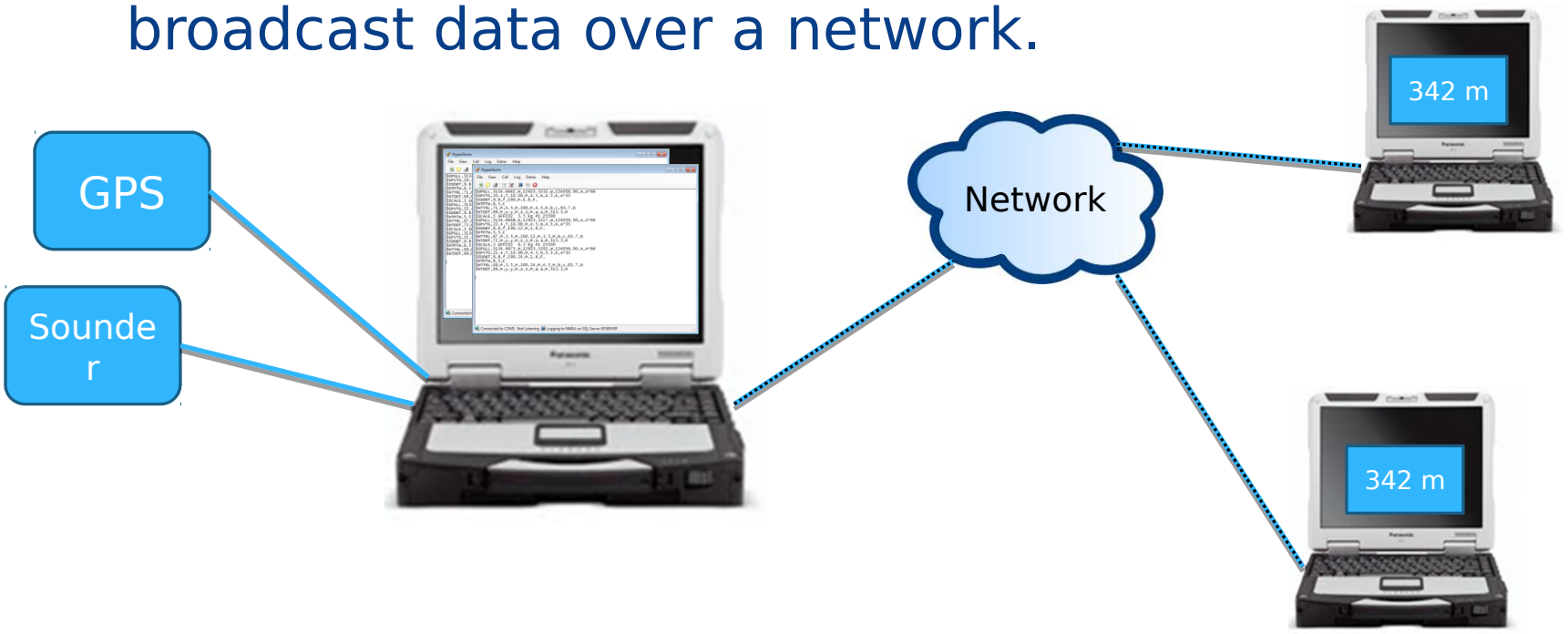
# Then Came GFBioField

* 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 |

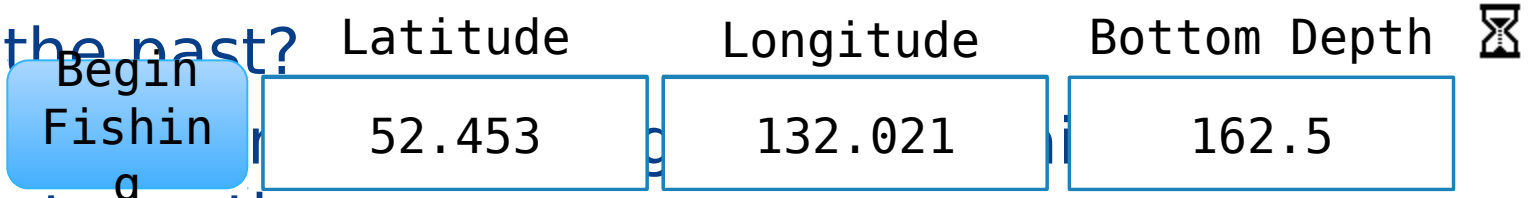
# HyperSlurm (again)

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



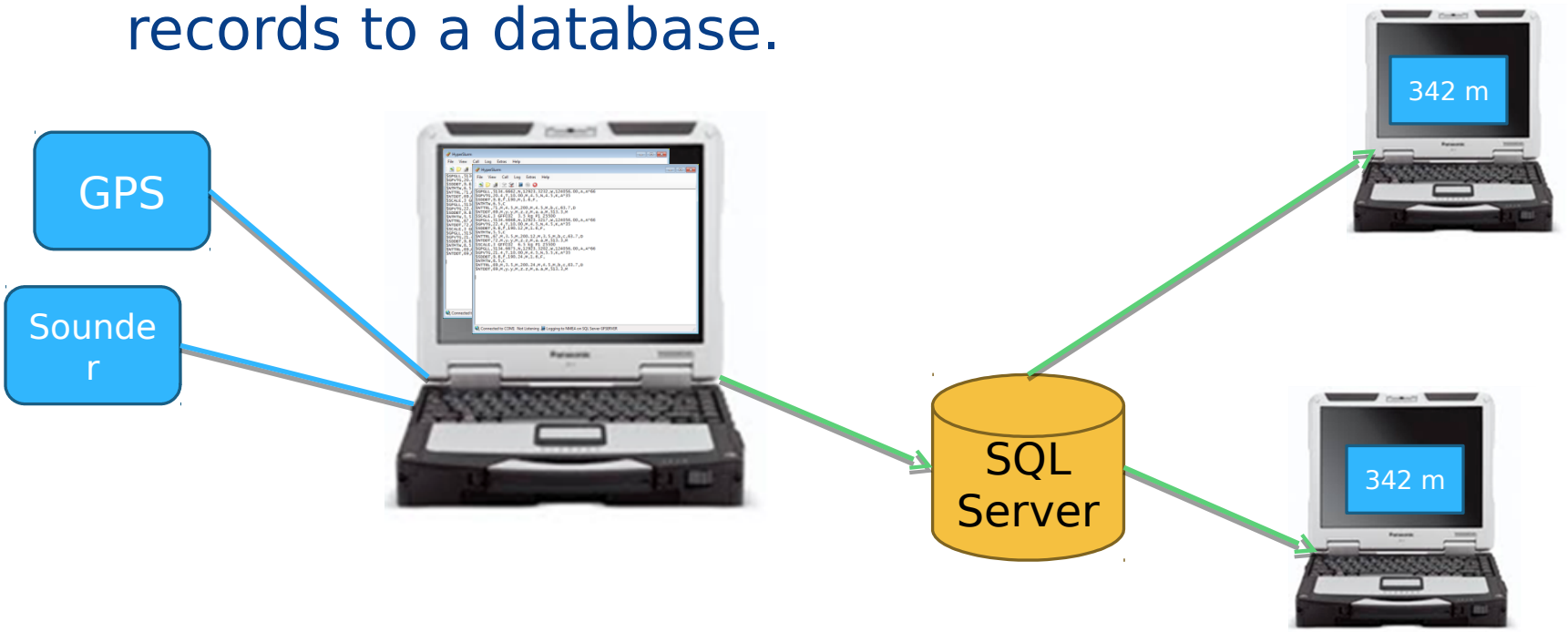
# Room for Improvement

* 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?
* [illegible] at any time.



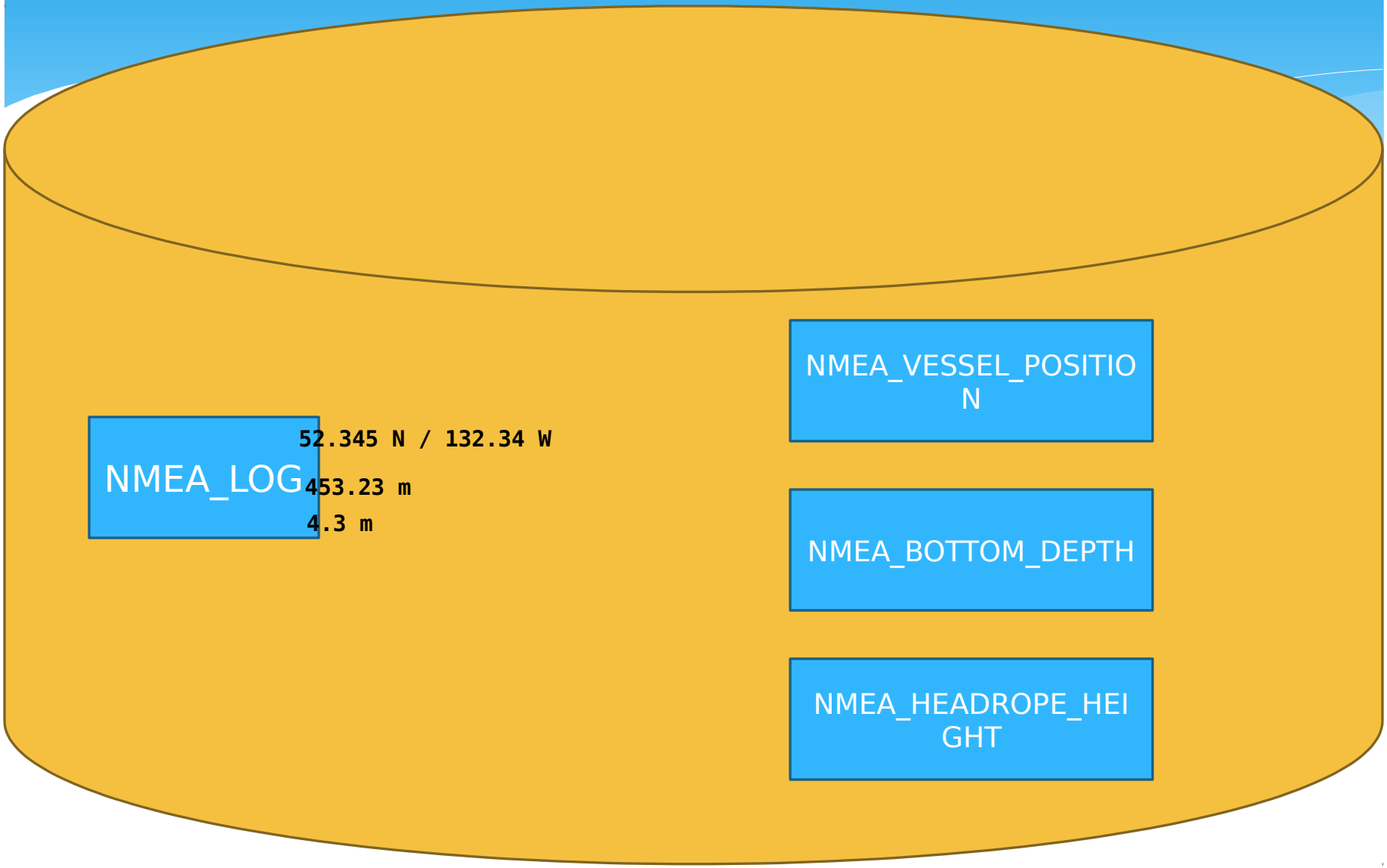
# HyperSlurm (again) + SQL Server

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



$ABCD,nn,yy,zz*E

# NMEA Database



# NMEA_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

2231 g

2231 g

On-Deck

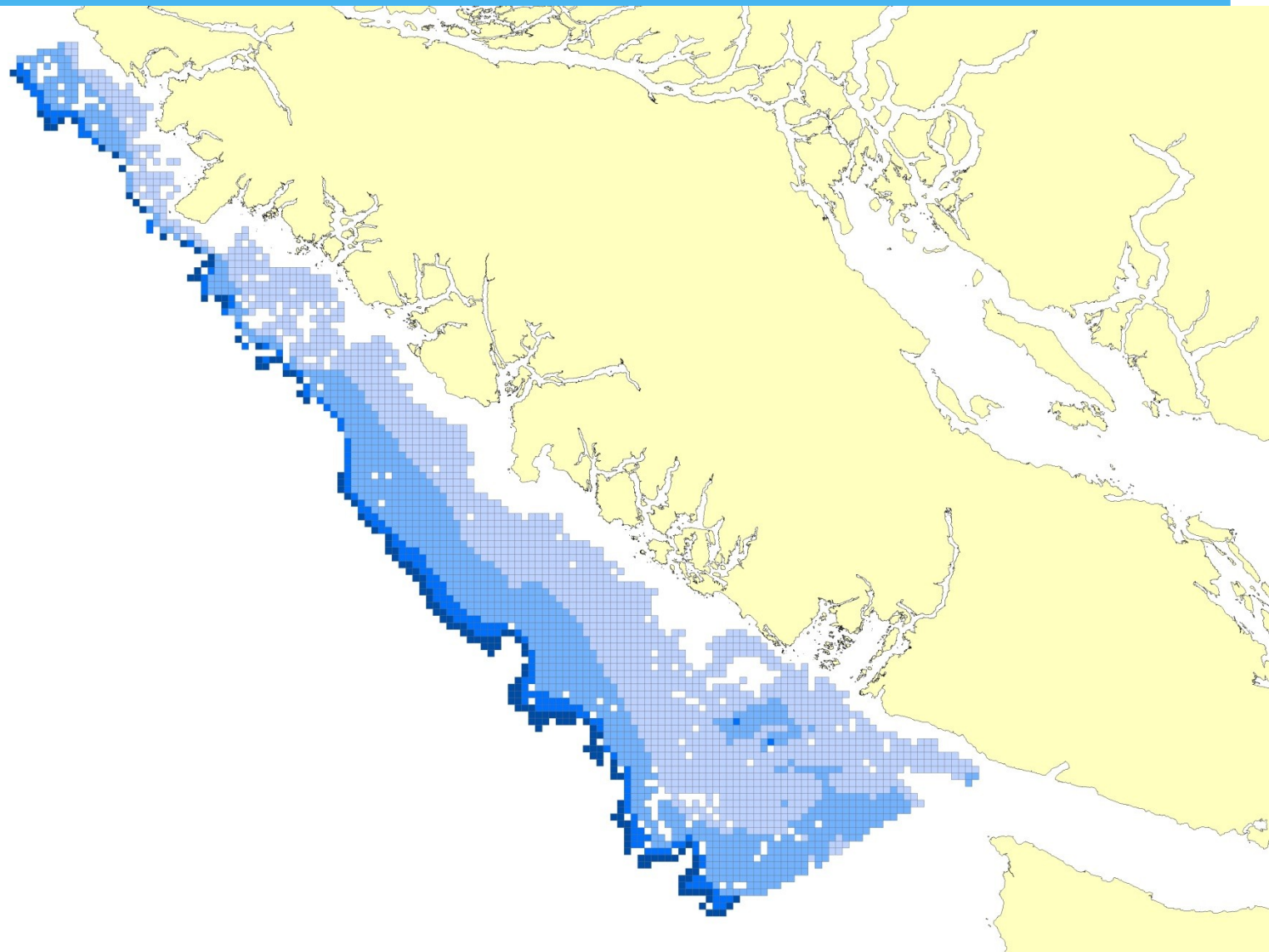

Sheltered

# 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

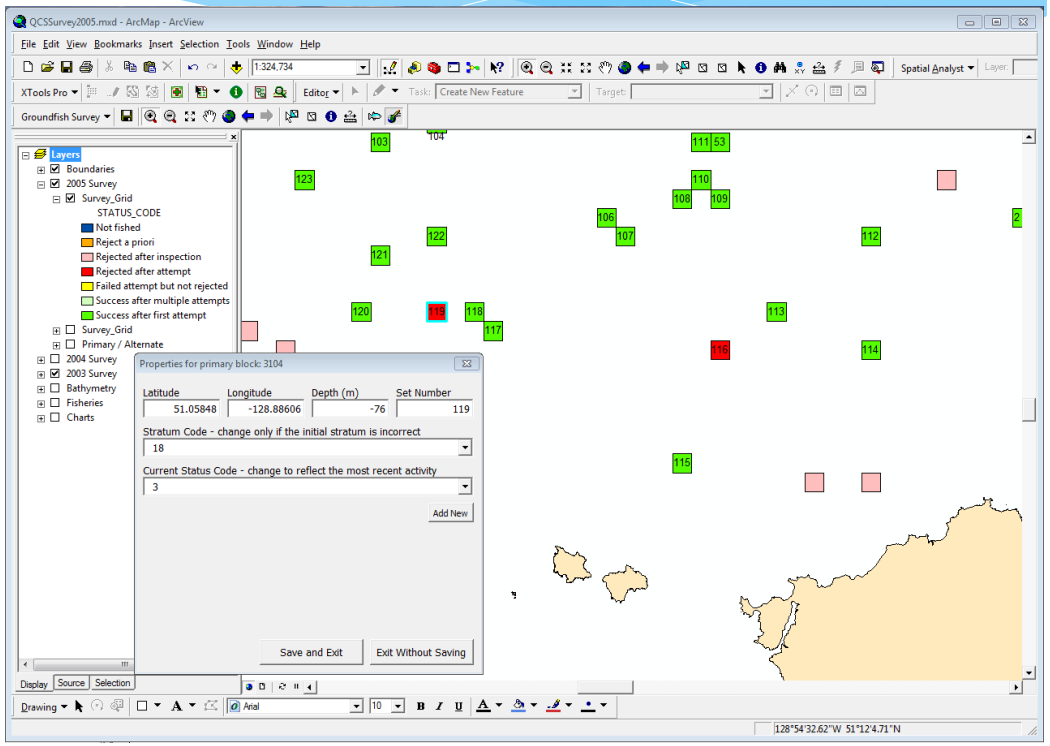


# Survey Block Management Keeping Track of:

* 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.**

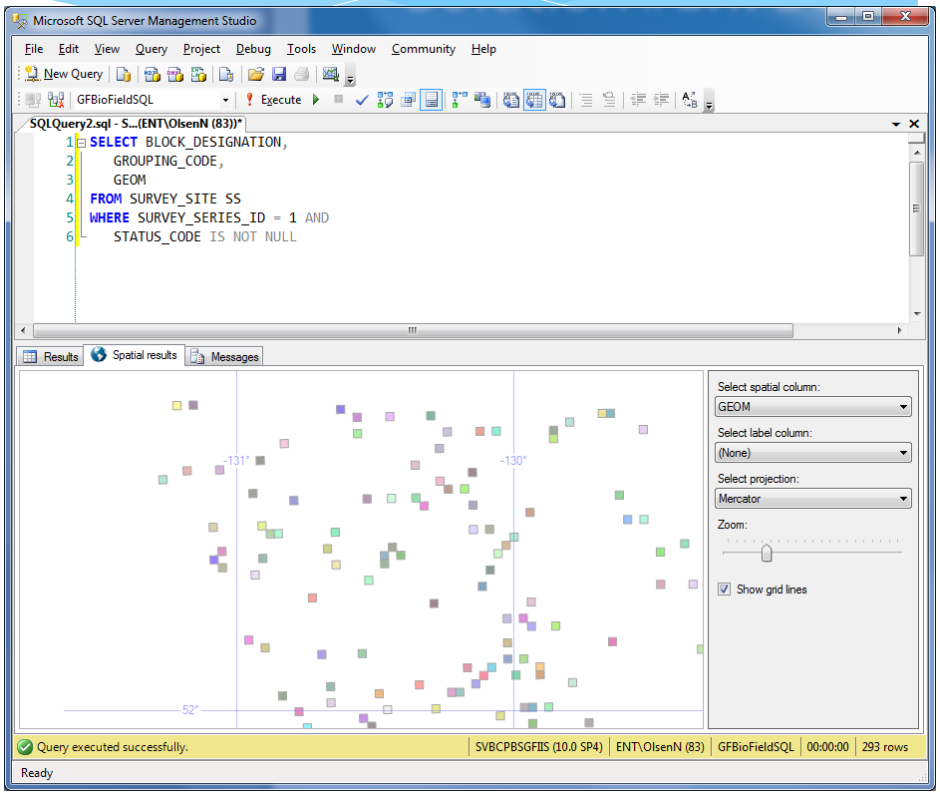


# SQL Server Spatial Data Types

* 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

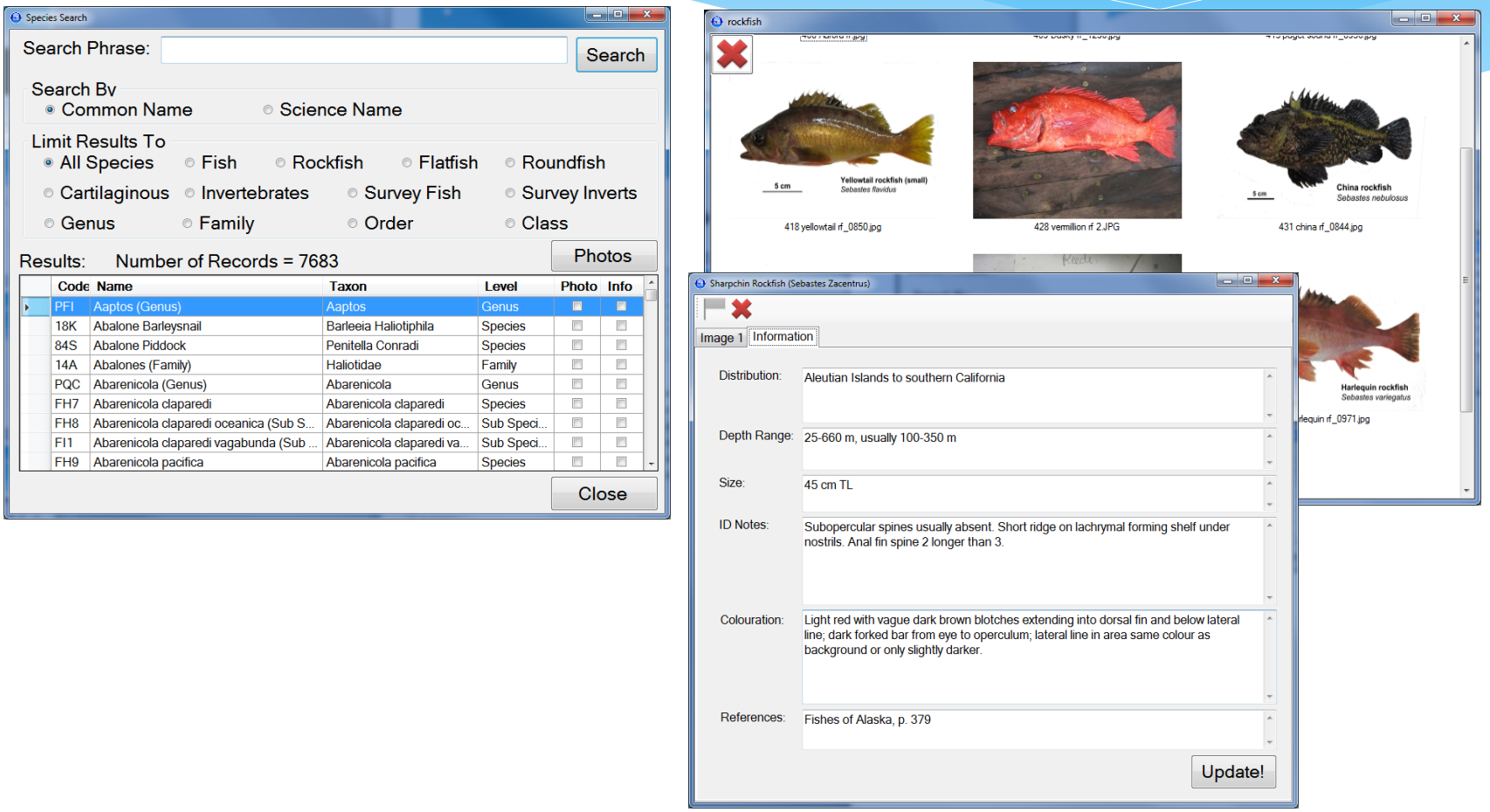
* Free, Open Source GIS component that can be embedded into MS Access forms (and other Windows applications).
* Fully programmable via Visual Basic for Applications.
* Now we can create a GIS form in our GFBioField application to view and manage our survey blocks.
* Except …
* **MapWindow doesn’t know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



# 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