

MYSTICETUS LLC

<http://mysticetus.com>

Mysticetus System Users Guide

MYSTICETUS LLC

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1 Introduction

Mysticetus is a powerful – yet easy to use and configure - system for planning surveys, recording observations, integrating real-time GPS data and maps, and creating detailed GIS-oriented reports

Welcome to Mysticetus. With Mysticetus you can easily define your own data entry requirements and formats via our template model, hook your system to a GPS and have Mysticetus automatically incorporate geo-position and bathymetric (and derived) data into your observations, easily and quickly record data entries, and create professional reports. Along the way, Mysticetus is also a full-featured real-time navigation system, including maps, route planning, GPS tracking, heads-up nav center, and complete display of detailed bathymetric/topographic information. Support is provided for Aerial surveys, land based theodolite usage, at sea data capture, passive acoustical monitoring, infrared monitoring, and any combination of the above.

For seismic (and other energy-related) surveys, Mysticetus provides powerful tools for mitigation decision support, end-of-day/week/month/survey reporting and sighting localization between multiple observation platforms (land, aerial, vessel). Real-time upload and integration with cloud (internet) storage is automatic, as is internet-based survey monitoring.

Mysticetus is a complex system - it has to be since every scientist on the planet wants everything completely different from every other scientist. Thus - Mysticetus does everything under the sun, but requires time to set it up to specify exactly what you want from it. Proper setup is key to your success.

This introduction section will (lightly) walk you through a few of the fundamentals of using Mysticetus. Each of these topics is discussed in greater detail in later chapters.

For more current information and scenario examples see our blog pages at: <http://mysticetus.blogspot.com/>

1.1 Basic Steps of Using Mysticetus

In general, from first use of Mysticetus to having a fully operational system your steps are:

1. Install and first run to update your software to the latest version and obtain an updated license
2. Downloading bathymetry map data and configuring your data collection template(s)
3. Configure for your spotting environment. EG – boat, land, aerial, combination?
4. Define and test your data sheets for completeness and configuration of fields
5. Collect your data
6. Generate reports

1.2 Minimum System requirements

- Windows 7 Current Service pack
 - o NOTE: Windows 10 is preferred!
- Machine administrative rights (see your IT admin if this is unfamiliar)
- Touch screen preferred
- 50 gigs free disc space (mostly for maps plus a little for Mysticetus)
- GPS connection
- Internet connectivity (not necessarily full time, but that is optimal if possible)
- Up to date version of Mysticetus (check for update within the program)

2 First Time Use

For first time users this is the place to start reading. We will walk you through the basics of what you are seeing, basic UI use, what steps you'll need to take, and some other stuff. What's important is a little patience here will go a long way to keeping your hair on your scalp and productivity high. Keep in mind that Mysticetus is pretty evolved now and there is a lot here.

Mysticetus is designed to be run in one of two modes: Data Collection, and Data Editing/QA which includes template Configuration.

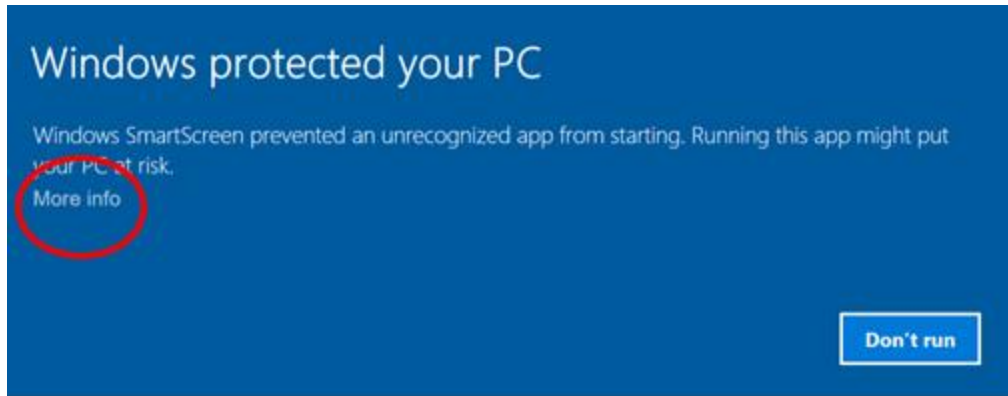
Interesting to note as you work with Mysticetus that it is touch screen enabled if your computer supports it. Maps can be pinched or expanded with two finger gestures similar as you might see with any map. Entries can be managed via your finger or a touch pen. For field work the touch functionality can be very useful.

First, let's tackle the basics. This should be quick and valuable in the long run.

2.1 A Note on Installing Mysticetus

We aren't currently code signing Mysticetus so depending on your version of Windows 10, you will get prompts challenging your desire to install it. You will have to keep telling it that you do want to install the product. There is one point where it's a little weird so here is a few of those moments in windows where we will help out just in case you haven't seen this before installing other products such as Office.

You are going to hit this prompt and need to click on the bit 'More info' circled below:



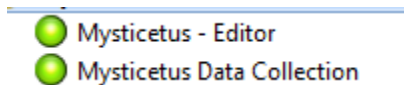
Windows will come back with yet another dialog. One option will be 'Run Anyway'. Click that one and Mysticetus will install. These dialogs are current as of January 2017, Microsoft may change them over time. We can't stop that, changing stuff is what they think is important.

Windows 10 has changed behavior with the above dialog in recent updates. The point of bringing this to you stands. Windows will double check with you to verify if you truly want to install it. The answer in short is yes.

We'll explore the necessary steps in the future to get these blocking prompts removed.

2.2 Edit Mode vs. Data Collection Mode

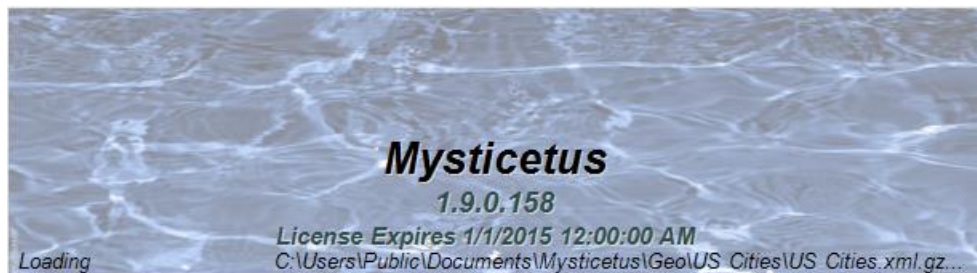
Edit mode vs. Data collection mode – Mysticetus runs in two distinct modes:



First time use should leverage Edit Mode as per the below. Read on!

2.3 First Use and Splash Screen

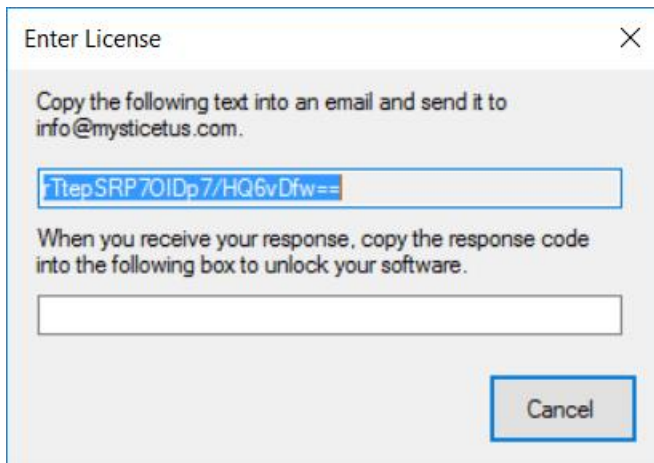
The first thing that shows is a splash screen that looks something like this:



Pro Tip: Version and License information is also available at any time from the About menu

This screen shows you – for a couple seconds – some useful information.

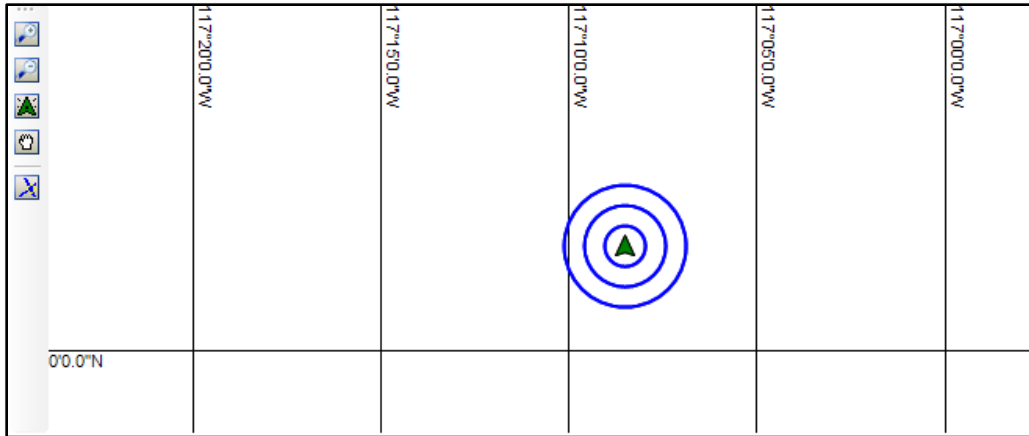
- Version of Mysticetus you currently have installed. This could be important if you need tech support or have questions.
- License expiration date. Mysticetus is licensed for your use by time – you are allowed to use Mysticetus for a certain period of time and when that time runs out you need to insert more quarters into your CD drive...just kidding – instead, email info@mysticetus.com to obtain a new license key for more time per the below.
- If this is your first use you likely will be prompted to enter a valid license per the below. You will be prompted with a key value. Copy the value into an email and send it to info@mysticetus.com for an updated license as appropriate. You will also get prompted if your license has expired.



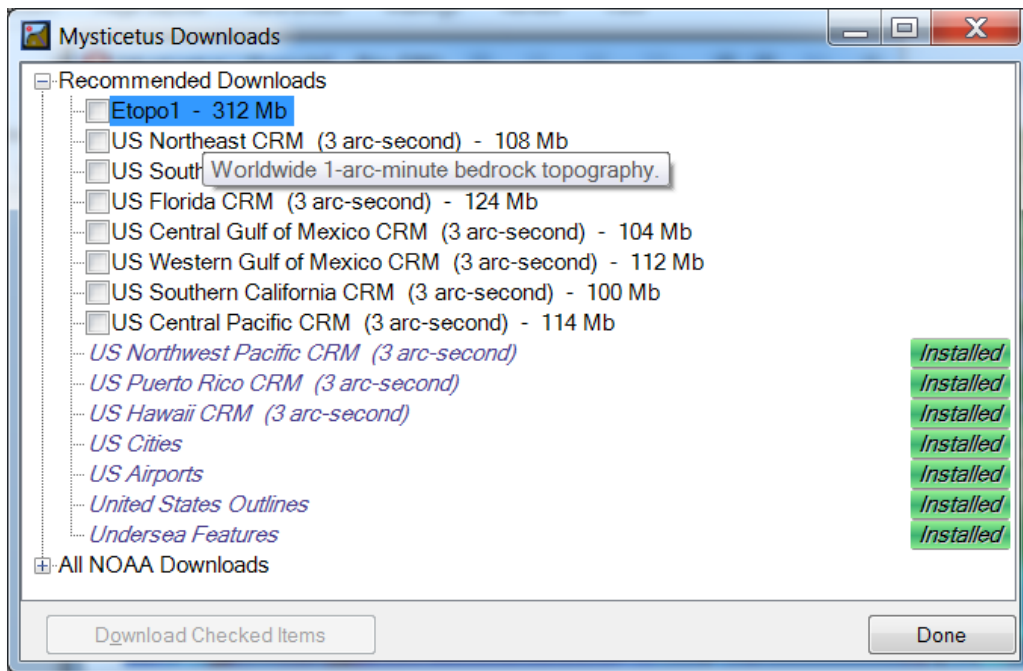
2.4 Download Bathymetry Data

These are your map files. After you've installed Mysticetus and restarted with the new license key Mysticetus will prompt you to download map data.

A little more detail on your map view never hurts right? If you haven't downloaded any cartographic or bathymetric data yet, your map will actually look like a simple grid with latitude and longitude lines.

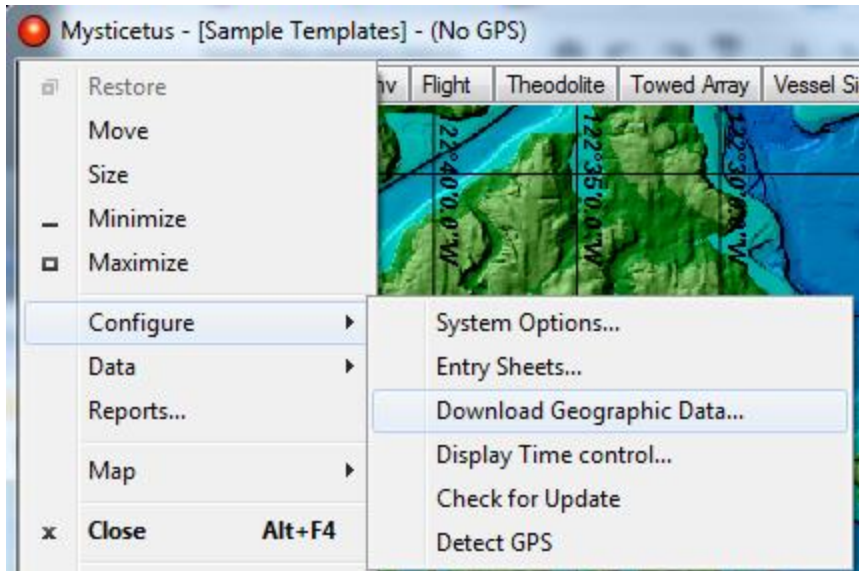


To get a detailed map, choose **Configure->Download Geographic Data**.

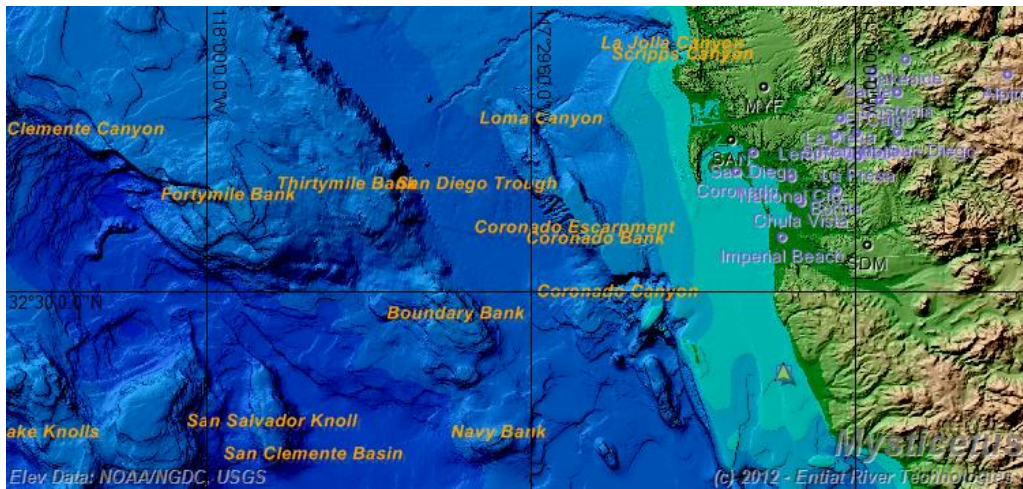


At a minimum, download Etopo1 – this contains a base set of bathymetry for the entire world. Hover your mouse over an entry to get more information about the download, including how detailed the data are. Etopo1 is rather coarse (1 arc minute), but NOAA provides datasets of certain coastal regions down to 1/9th of an arc-second (a few meters of accuracy). Download the areas you need.

Don't worry if you don't get all the data you need the first time. To download more click on the globe -> Configure -> Download Geographic Data to get more per the below image:



Once data is downloaded and installed, your map will look more like this:

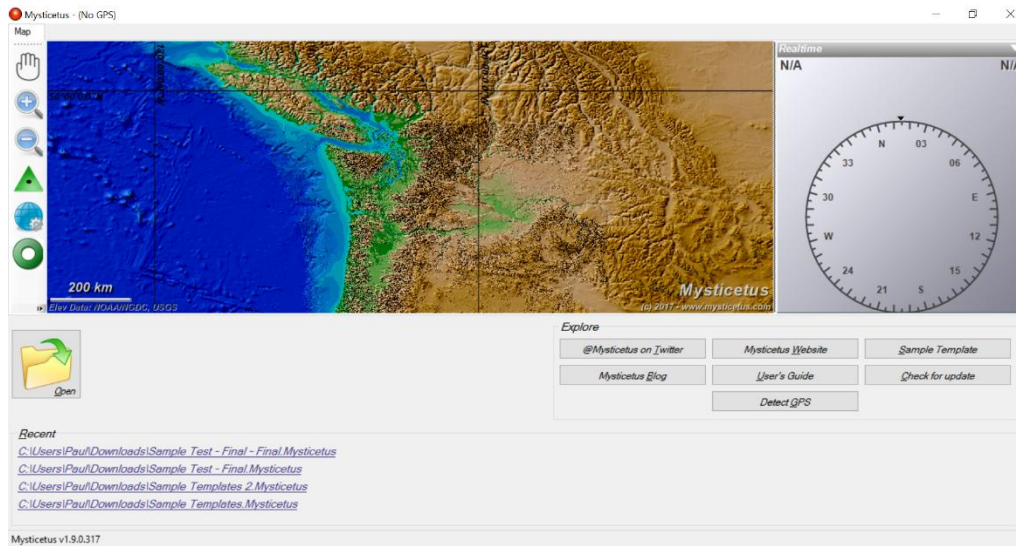


Note that this includes downloading and installing Undersea Features – go ahead and download and install various things that might be of interest to you (such as Cities and Airports, etc.)

We know of great high resolution data for the United States territorial waters but for the rest of the world data has been eluding us. Any insights to other resources would be greatly appreciated! Email us at info@mysticetus.com or directly to one of us if you know that email.

2.5 Overview

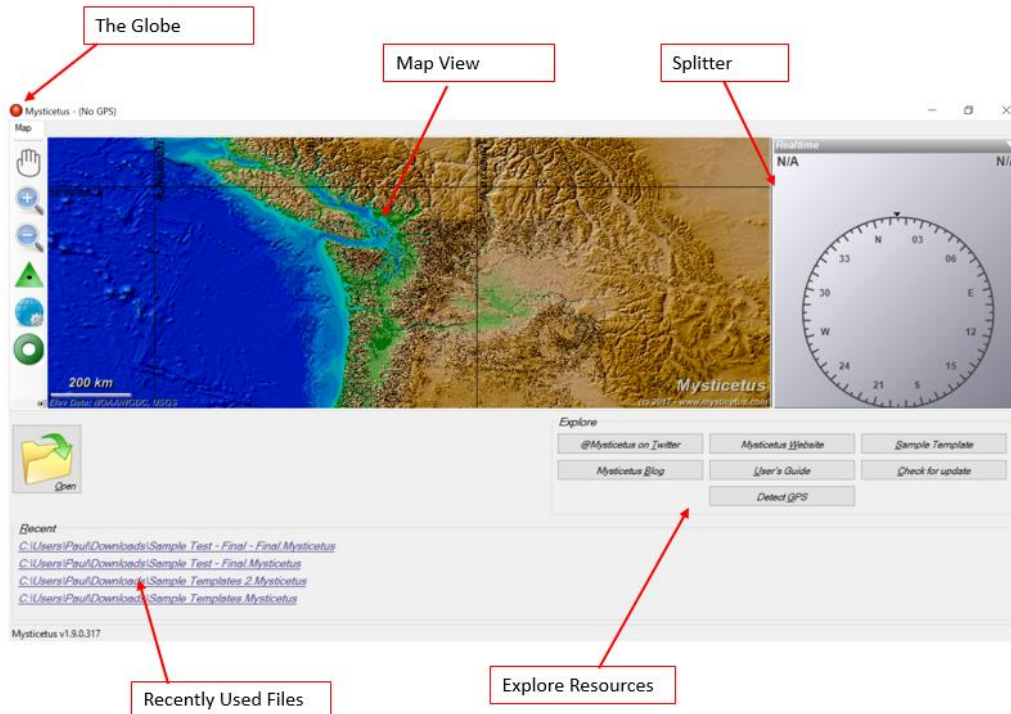
After Mysticetus loads, you will see something like the following



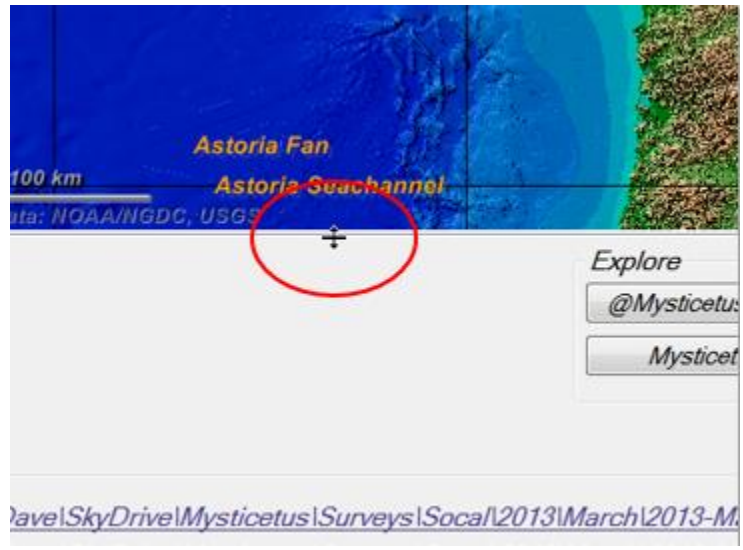
Whoa. That’s a lot of information. Let’s walk through some of the basics of the screen just to get rolling. Note: you won’t necessarily see the recent files as you have no recent files yet! We’ll get there shortly.

2.6 Views and Splitters

First of all, note that every section of Mysticetus is configurable, first and foremost its size. Hold your mouse over the area in between any two sections (this small in-between area is called a “splitter”) and your cursor will change to indicate the splitter can be dragged to change the size of the areas.



There are horizontal and vertical splitters appropriately placed between main components. For example, here we are dragging the primary horizontal splitter down so there is more map window displayed. It is a little hard to see in this screenshot, but note the mouse cursor in the middle – it is dragging the splitter:



Move your mouse over the various regions – if the cursor changes to a Splitter cursor, you can drag it and change the overall layout.

2.7 Globe and Main Menu Functions

As you can see in the above image, in the upper left corner, we have a little globe. Remember that – it is important. It is currently red because we have no GPS hooked up. If a GPS is connected the globe will be green. If something goes wrong with a GPS hookup (say, you tripped over the wire or spilled coffee on your brand-new, expensive GPS unit), it will go yellow for a while – indicating no signal has been seen recently - before turning red again after another minute.

GPS data is critical during data collection. It must be enabled either via a USB GPS device connected to your laptop. Mysticetus will remind you that it does not detect a GPS in this case. You must have a GPS source; your PC clock needs to be sync'd with GPS time daily. Alternate forms of GPS data collection are discouraged other than a form of backup to this data. We typically use a low-cost handheld GPS for backup. Either you have a handheld GPS device being relied on for data via a later import or another source.

=====

Mysticetus Wait for GPS feature

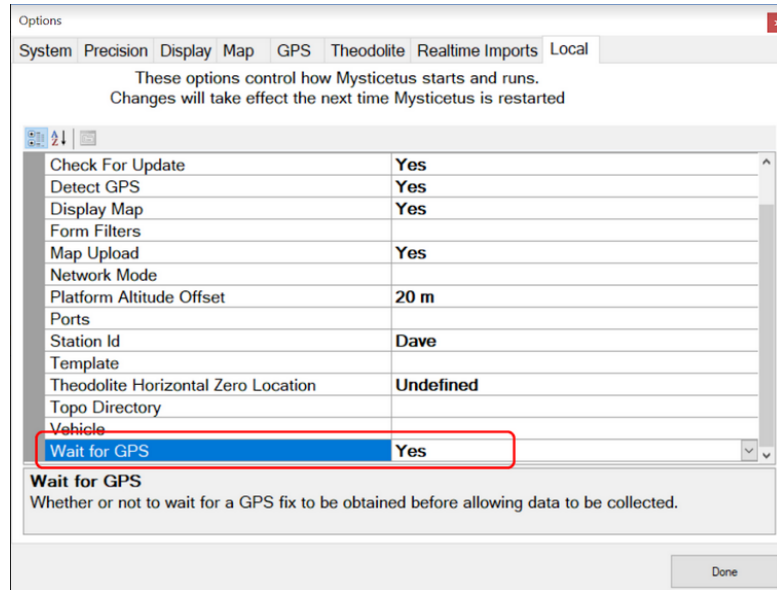
=====

The new version of Mysticetus (415) has a new feature: Wait for GPS.

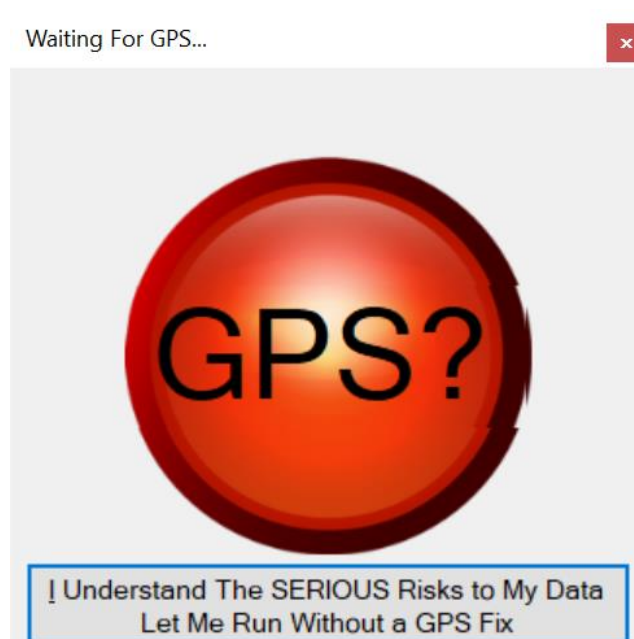
This is a Local Setting - that is, it is set per-device, not in the template.

- Open Mysticetus-Editor on the machine in question

- Go to Settings -> Local
- Change Wait For GPS to Yes



Mysticetus will now encourage GPS use when in data collection mode:



Connected USB type GPS's will not show a signal unless a minimum of three "good" satellites are connected:

GPS Satellites					
Id	Signal	Name	Azimuth	Elevation	Last Sig
15	37 dB (Good)	GPS 2R-17	WNW	27	4 secon
24	21 dB (Moderate)	Navstar 2A-02	NW	2	4 secon
30	39 dB (Good)	Navstar 2A-18	ESE	51	4 secon
11	37 dB (Good)	Navstar 46	ENE	29	4 secon
28	44 dB (Excellent)	Navstar 48	NE	68	4 secon
18	38 dB (Good)	Navstar 50	NE	17	4 secon
19	40 dB (Good)	Navstar 54	SSW	27	4 secon
17	38 dB (Good)	Navstar 57	S	55	4 secon
7	33 dB (Good)	Navstar 62	SE	20	4 secon

If you use Garmin handheld devices it is advised not to plug them into Mac computers.

PCs, Linux, Chromebooks and Androids are rather agnostic, they all work with any other systems just fine, live and let live.

However, both Garmin and Apple deny the existence of any other systems. If you plug a Garmin into an Apple Mac, your Mac will try to convert any non-Apple device it touches: thumb drives, hard drives, gps's, Android phones, etc.

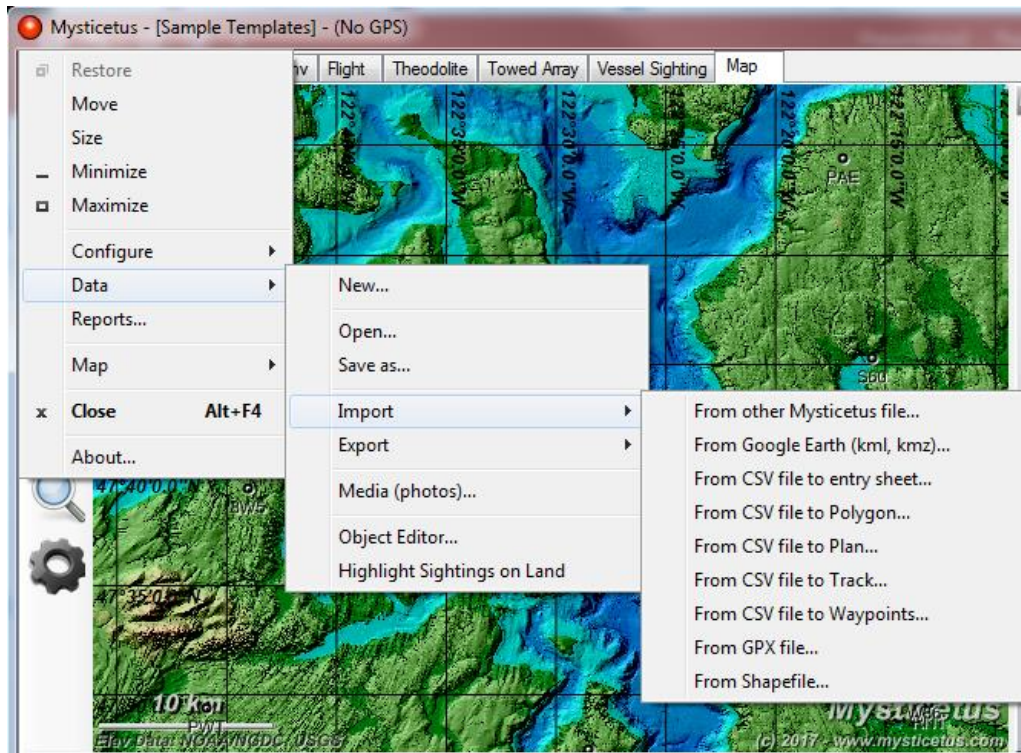
Likewise, Garmin doesn't believe anything exists outside the Garmin space. Unfortunately, the handheld GPS has a teeny little, easily modified store. Get the two together and the Mac goes into full belief retraining mode on the poor little Garmin. The horror. The horror.

If this has happened, you will need to reset your Garmin to Factory conditions to remove all Apple data such as Spotlight indexes and trash cans which can result in corrupted data on the Garmin ruining your backup model.

To Sum Up: Only plug your Garmin handheld devices into Windows or Linux machines.

Clicking on the globe (of whatever color) will produce the following drop down menu. With this menu, you control almost everything in Mysticetus. We'll often refer to it as clicking on the 'Globe'. Duh, right?

Pro Tip: you can also access this menu at any time by pressing Alt+Space – it is the Windows system menu for the Mysticetus application.





We will go into each of these menu items in later chapters, but for now just remember this is how you can configure everything, load or save data, import or export information, print reports, send GIS data to Google Earth, etc.

Mysticetus puts all the controls in this menu so as to remove as many toolbars and menus from the default screen as possible. As you know, in the field we are frequently running on small computers and, even on larger computers, every bit of screen real estate is precious.

2.8 Normal Startup (after installing the software stuff above)

Mysticetus now starts in one of two modes:

-  Mysticetus - Editor
-  Mysticetus Data Collection

Data Collection (default)– This is the more likely event and thus the default. It's action is self-evident, you or your observers/interns are in data gathering mode. Use this, it restricts Mysticetus down to... yup, data collection only. Data collection mode runs an assortment of tests on startup to assure everything is in place and working. More on this shortly. We advise putting a short cut or pinning the Data Collection ball to the desktop or task bar on your computer. This encourages observers to use the right mode of operation.

Data collection mode only allows for testing an attached GPS or theodolite. The other thing that happens in this mode is data saves are handled automatically except for the need of the observer to indicate if the save is the last save of the day. Last save of the day means – Yup, today's data collection effort is completed!

Settings in Data Collection mode are simplified:

Options

GPS Theodolite

Theodolite

Type: Sokkia Query (such as DT510)

Theodolite	
Horizon Distance	
Theodolite Altitude	
Theodolite Eye Height	0 m
Theodolite Location	Undefined
Theodolite Name	Theodolite

Theodolite Name
Name of the theodolite. This is use to display t...

Reference (Horizontal Zero) Point

Reference Point	
Bearing	N/A
Location	Undefined
Name	
Range	

Tides

	Time	Height
*		

Pos Wizard Alt Wizard Test Theo

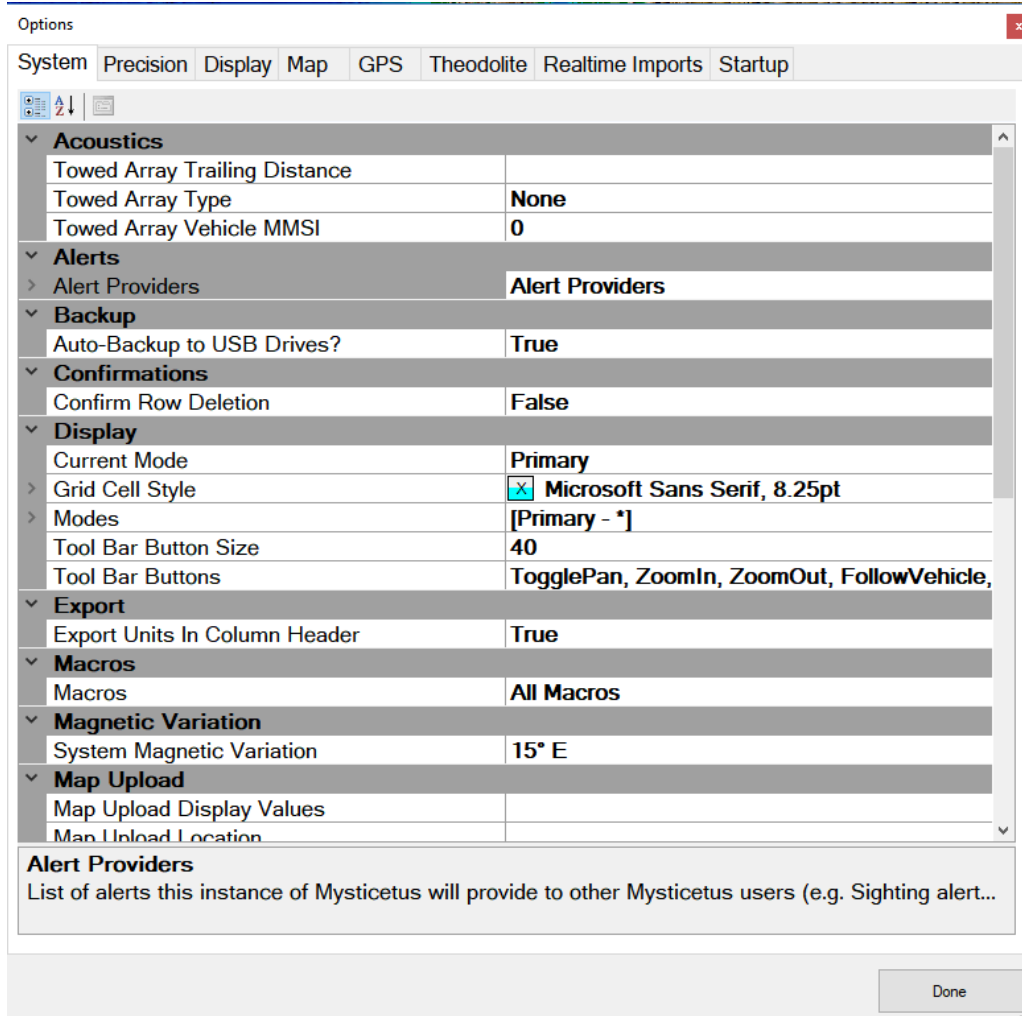
Done

Editing/QA – This is for the analyst who needs to generate reports of all and any kind. This opens up all options available to the user including data edit, reporting, etc... The settings menu is expanded to the full set of options too. For setting up your project start up parameters and template creation/modification.

Edit mode exposes full feature functionality of Mysticetus. It should only be used when you are editing the core features of Mysticetus such as designing the template, default operations for the local machine (see below section on local settings), adding unique use data such as theodolite location, observers, observer eye heights, etc and for running reports. Many of these features are turned off when running in Data Collection mode. Collecting data in edit mode can result in data loss, template size bloat, template corruption, and other bad things.

DO NOT COLLECT DATA IN EDIT MODE

Settings in Editing/QA mode are more comprehensive:



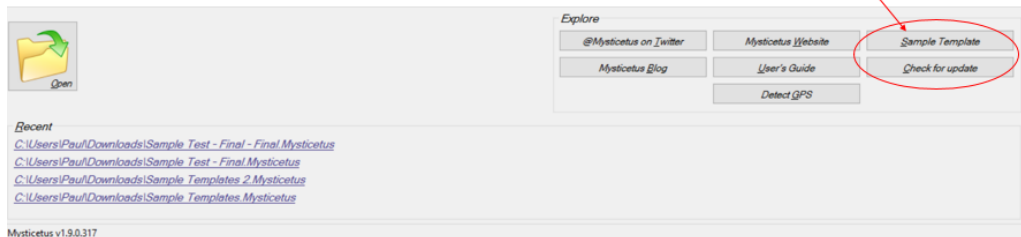
Note the tab labeled “Startup”. This too is important, more below.

Run Data Collection mode to collect data. This is how all observers whose job it is to collect data should run Mysticetus. Mysticetus will run a variety of start up checks to make sure data will be collected and stored properly. Again, If any of these safety checks fail Mysticetus show a diagnostic error will not run in Data Collection mode. You must return to edit mode to figure out what’s missing as indicated in the error dialog. See section on Startup failures.

2.9 Start Screen and Startup Options

In the bottom half of the window is the Start Screen. This contains some quick links to common tasks.

Mysticetus maintains a list of recently opened files – simply click on one to reload it. You can also click the big **Open** button to open any other file. Of course, if this is your first use this area will be empty.



In the **Explore** area, you can look up Mysticetus on Twitter, the Web or read the Mysticetus Blog – which is where new developments are posted.

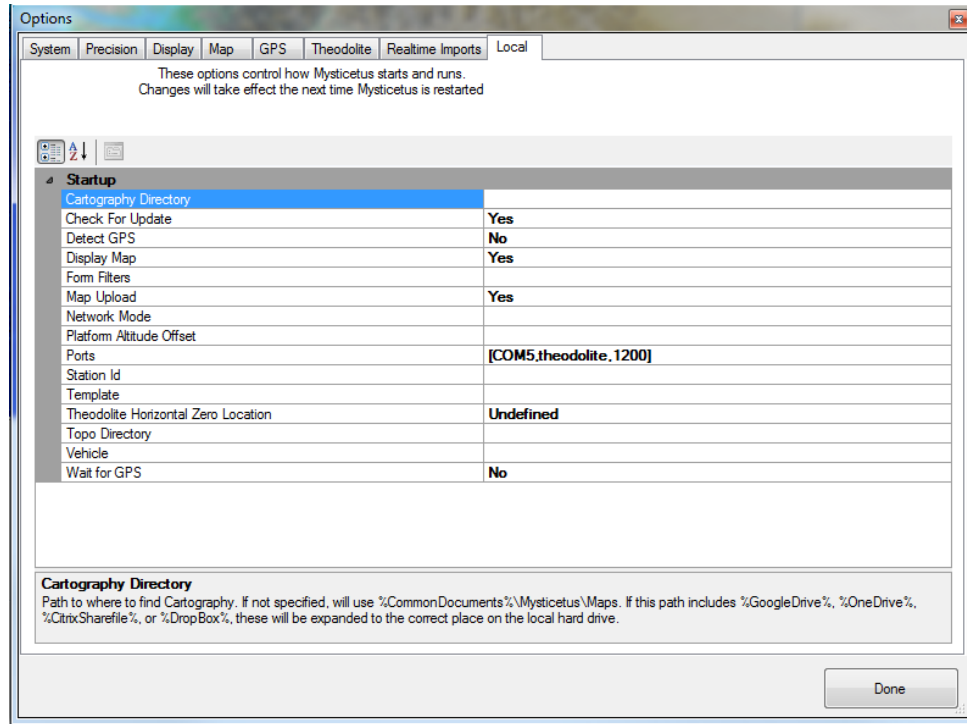
What is important here in getting started are two things:

- 1) Check for software updates. Click that puppy and check. But don't ever do it in the middle of a shift if you are on station collecting data!
- 2) Download that sample template for new operations. That's your jumping off point to customizing Mysticetus for your project. Often this will be provided by your project manager or lead researcher. IF this is YOUR project then you are the project manager, right?

⇒ **NOTE: Your project must have a template, it tells Mysticetus how to behave for your specific project. This will take effort to get right, but once it is you are good to go!**

2.10 Startup Options

Mysticetus has added a tab that (as of build 2.0.0.364) sets startup default parameters. This change allows your set up to not rely on your observers using the right shortcut key that contains the right startup command line parameters. There still are cases where command line parameters are the better option such as specifying observer locations or other items that might vary on startup. The Startup options menu can be seen below. The startup options are set on an individual machine by machine basis in multi-station environments. These settings are local to the machine (laptop) they are set on.



Cartography Directory – Points to cartography data, not setting this Mysticetus defaults to a Mysticetus common path.

Check for update – Setting this to ‘no’ prevents Mysticetus from automatically updating during your project. No is often used for active projects.

Detect GPS – this should be set to ‘No’ when a USB or other connected USB device is connected to the laptop computer that Mysticetus is running on. If you’re survey is leveraging a connected theodolite, this should be set to zero due to weird interaction problems that can force you to restart your theodolite. It is very unusual to need a USB GPS for theodolite operations.

Display map – Typically is Yes and assures a map display is shown to the observers.

Form Filters – This sets forms to display. These are comma separated forms and can include trailing wildcard.

Network Mode – Allows for setting read, write, and read/write mode. This setting determines. Read is set for central computers in the command center observing an operation and by definition nothing to write. Write is for observers, in situations where you don’t want them to see what other observers are writing. Read/write is for observers that are not only writing, but viewing data entered by other observers. Other observers are ones located at other observation platforms.

Ports – Sets all ports that are in use for for Mysticetus to read from, such as theodolites, temperature sensors, etc. entry is in form of [Port,Type,Baud]. See section on serial ports.

Run Mode – Set to collection for observers, editing for those doing data editing/reporting and QA work.

Station ID – Is the networking id set for the particular station. Typically, this is the same as the vehicle name. This name should be kept short and **no spaces** in the station Id.

Template – This sets the path to your template. Typically, you’d have this on either a Google drive, OneDrive, DropBox, or Citrix share for all to use.

Topo Directory – Path to find topography data. Not specifying one will default to Mysticetus standard path as shown in the hint at bottom of the window.

Vehicle - This is the active vehicle name. Set this to the same as the Station ID.

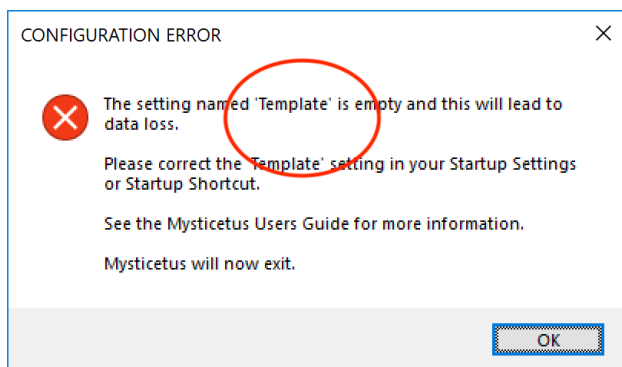
Wait for GPS – setting this to ‘yes’ forces a USB GPS device to be available before data collection mode can begin. This is further discussed in chapter 2.

2.11 Startup failures

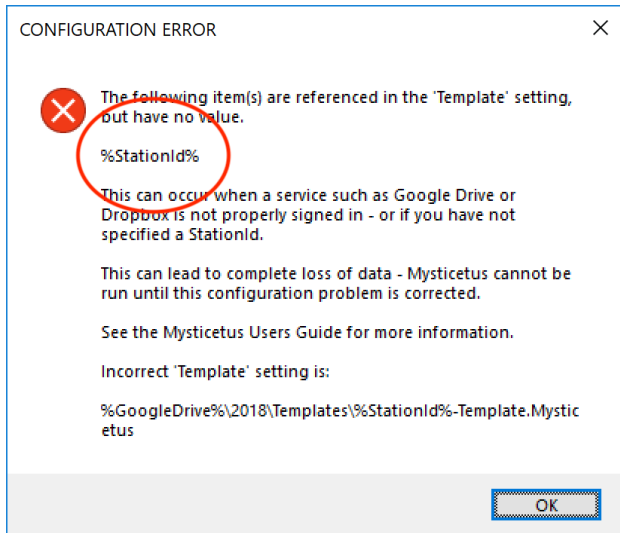
Mysticetus has been updated to provide more robust checking of the startup options will it begins operation in ‘collection’ mode. Collection mode, as you will see, has been defined to keep your observers contained in the process of collecting data and nothing else. Experience has shown that there is little, if any, reason for an observer to be in ‘edit’ mode.

On startup Mysticetus checks to make sure that collection mode is correctly configured. It checks things like the existence of a template, template parameters required are there, and that template parameters are correct. If a test fails Mysticetus will throw a warning dialog and quit operation. The problem must be solved before Mysticetus can run in collection mode. The work around SHOULD NEVER be to simply run Mysticetus in edit mode.

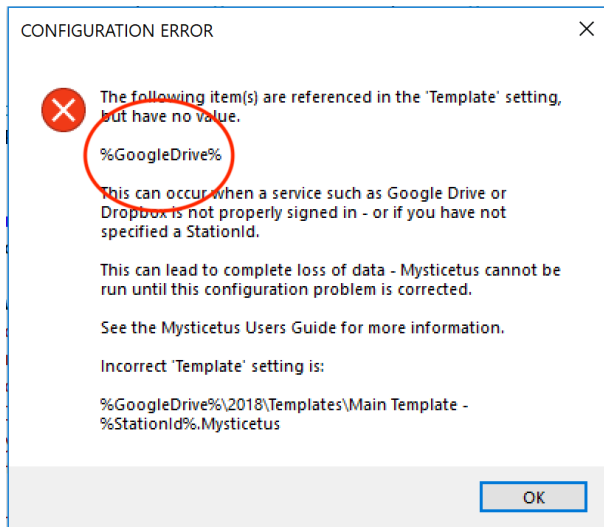
Dialog 1, below indicates that a startup setting is missing or incorrect. The fix here, as indicated is to verify your startup parameters are correct and nothing is missing.



This next warning, again a configuration error, indicates that a startup parameter is missing. In this example the data save path is missing or broken. Here the save path should contain the value 'StationId' called for in the template, but 'StationId' was not correctly set (or missing) in the startup options.



Another great example we've seen is where your data save path has disappeared altogether. In a recent case this occurred after operations started (everything was going fine – a clue, btw) and an observer decided to shut down Google Drive on the laptop resulting in Mysticetus unable save any longer. The below dialog shows you %GoogleDrive% instead of %StationID% identified.



These rigorous checks have been put in place to protect your operation from these data loss causing events during data collection. Experience has taught us they are required. Maybe a pain too, but better pain than data loss is what customers have told us.

2.12 Templates

A template (defined as any .Mysticetus file with the word "Template" somewhere in its name) is for defining fields, formulas and other configuration.

For example: "My Project Template.Mysticetus"

NOTE: The template file is not for storing data.

This is why Mysticetus does not allow you to randomly and inadvertently save a (or to it) template file. The Control key must be held down when saving. The Control key is your way to tell Mysticetus, "I know what I'm doing, I'm not saving Data just a template, Trust Me".

If you do store data in your template (by using the Control key and forcing Mysticetus to save data in the template), you will most likely lose that data, because the template is the file that is launched at the start of the day and filled in with everything else for the day. The template is never intended for collected data. Chances are very good your observers will overwrite the pre-existing data in the template if they do this.

Data should be stored in other Mysticetus files. If you want to do that manually, you can (but see next point about automatic saving). A common filename people use is something like

SurveyName - 2017-08-02 - 1432.Mysticetus

This encodes the survey name, date and time of save. If you configure Mysticetus correctly, it will also put the word "Final" at the end of your Final daily save. For example

SurveyName - 2017-08-02 - 1432 - Final.Mysticetus

After editing, we recommend appending the word "Edited" and their initials. For example:

SurveyName - 2017-08-02 - 1432 - Final - Edited - RA.Mysticetus

Again - the word Template in the filename marks that file as special. It tells Mysticetus it is a blank canvas (chock full of configuration options, field names and formulas specific to your survey).

The Sample Template, which contains many pre-defined fields and entry sheets, ready for customization and use. We work to keep it up to date, but don't always succeed. Don't be afraid to reach out to your community or us for maybe better examples that have been created.

The reader is advised that starting with the sample template, customizing it while deleting the data sheets you don't need then saving it off as your sheet (not over writing the sample template – we'll block that) is the better way to go!

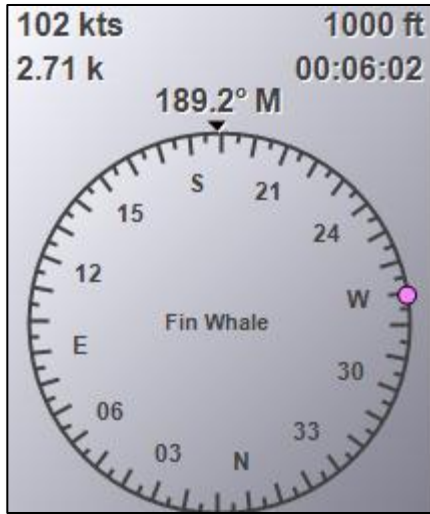
More on templates is located deeper in this document.

2.13 Data Panel

Over on the right side of the map is your real-time flight/vessel display. In flight or on a moving vessel it will look something like this:

Pro Tip: Mysticetus can be configured to display distances, speeds, altitudes, etc. using a variety of different units – metric, nautical, statute, etc.

See the *Configure->System Options->Display* page.



This display includes your speed, heading, altitude, range and time to go to your active sighting (explained later). It also provides a nifty little dot showing the exact direction to your active sighting – useful for re-acquiring a hard-to-spot critter in higher Beauforts.

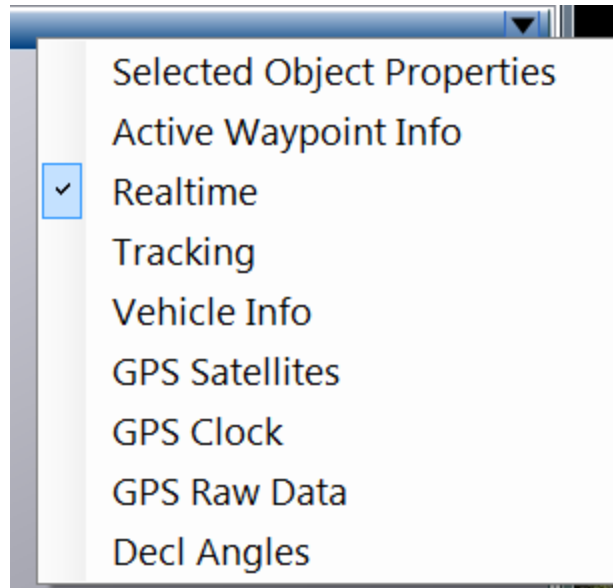
Pro Tip: Mysticetus can be configured to override GPS Altitude with a fixed value (say, the height of the observation platform on a vessel).

See *Configure->System Options>System*

This panel can also be used to display a few other items by pulling down the little triangle in the upper right corner – we'll explain more later, but if you want to try it out now, feel free.



And you will get this drop down:



From here, you can display detailed information about mapping objects, synchronize your PC clock with the GPS clock (not a bad thing to do btw), and so on.

2.14 Data Collection Mode

To run Mysticetus in Data Collection mode, you specify `/save` on the command line (for a description of what command lines are, and how to create shortcuts in Windows, please see:

<http://mysticetus.blogspot.com/2014/09/mysticetus-command-line-switches.html>).

Generally, we create (and recommend you do too) a shortcut on the desktop named Mysticetus, and assign it the command:

```
"C:\Program Files (x86)\Mysticetus\Mysticetus.exe" /save "c:\PathToYourTemplate.Mysticetus"
```

Of course, change `C:\PathToYourTemplate` to the actual path to your template.

Double clicking on this desktop icon opens Mysticetus in Data Collection mode (because of the `/save` parameter), and launches `YourTemplate`.

This causes Mysticetus to use the `AutoSave` setting (Configure -> System Options -> `AutoSave Path`) and will save your file as often as specified in the "`AutoSave Time interval`". (I like every 30 minutes for boat work)

Example of an `AutoSave` path would be something like:

```
C:\users\whatever\Daily Saves\%Date%\MySurveyNameWhatever - %Date%-%Time%.Mysticetus
```

If our `AutoSave Time` is set to 30 minutes, Mysticetus will save a new file every 30 minutes and they will look something like:

```
MySurveyNameWhatever - 2017-08-02 - 1332.Mysticetus
```

```
MySurveyNameWhatever - 2017-08-02 - 1402.Mysticetus
```

```
MySurveyNameWhatever - 2017-08-02 - 1432.Mysticetus
```

.

And these will be placed in the appropriate dated folder (note use of %Date% for both folder name and as part of file name in the AutoSave Path example above)

In addition to %Date% and %Time%, you can use macros like %DropBox%, %GoogleDrive%, %StationId% (specified in Configure -> System Options -> Station Id) as part of your path. Station id can also be specified on the command line as /stationid:MyBoatWhatever

When running in data collection mode, closing Mysticetus will cause it to ask you if you are doing a Final save. If you respond Yes, Mysticetus will append "Final" to the file name, ala

MySurveyNameWhatever - 2017-08-02 - 1532 - Final.Mysticetus

If you respond No to the question, Mysticetus will not add Final, and will be setup to be restarted later that day (say, you're hiding out from weather and you think you may get back out there today)

If you do not specify /save on the command line (via, say, a shortcut on your desktop), Mysticetus opens in Data Editing / Template Creation mode. If you load a template, you are editing the template. This works just like Word or Excel - you load a file, change it, and save a file by hand. (it doesn't auto-save).

Ball -> Data -> Open
Ball -> Data -> Save As

Moving on, here is the real-time data entry system. Once you have loaded or configured a template (see the Sample Template download button a few sections above), it might look something like this (except without the data):

Behavior	Effort/Env	Flight	Sighting	Vessels	Sgt Id	Time	Decl Angle	Bearing Angle	Sgt Dist	Obs	Init Spec	Certainty	Init Grp Beh	Init Grp Hdg	Min Disj
					9	2012-03-13T11:39:17	24°	33.4°	0.75 k	Marit S...	Risso's Dolphin	100	slow travel	270°	1
					10	2012-03-13T11:39:17	24°	33.4°	0.78 k	Marit S...	Common Bottlenose D...	100	slow travel	270°	1
					11	2012-03-13T12:03:04	51°	147.4°	0.38 k	Marit S...	California Sea Lion	100	Medium Travel	160°	0.25
					12	2012-03-13T12:03:31	20°	328.3°	0.82 k	Mark C...	capensis	100	Medium Travel	130°	1
					13	2012-03-13T12:03:31	20°	328.3°	0.39 k	Mark C...	cbw	100	Medium Travel	120°	1
					14	2012-03-13T12:23:33	80°	326.8°	0.3 k	Mark C...	cd	100	Slow Travel	180°	2
					15	2012-03-13T12:25:11	49°	146.2°	0.37 k	Marit S...	common	100			1
					16	2012-03-13T12:27:46	28°	145°	0.61 k	Marit S...	Common Bottlenose	10	Rest/Slow Tra...		1
					17	2012-03-13T12:28:32	30°	299.5°	0.6 k	Marit S...	common dolphin	100	Slow Travel	180°	1

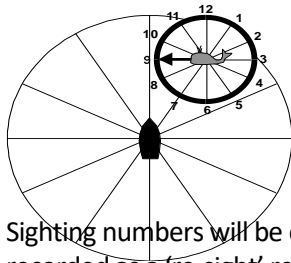
This is where you enter your observations. There is a lot of functionality here, only some of which we will touch on in this introduction. One very, important thing to note: you control what goes here via your template. Remember from above where you can download sample templates? From the sample templates or anyone else's that you may start with (don't start from scratch) you can add or remove fields. You can change things such as species and observer lists. You control the order of data in the entry tables. If you want an automatic timestamp in the 17th column, sweet – put one there. If you want the position of the sighting automatically calculated (based on, say, reticle and your current GPS position) and stamped in the 18th column,

no sweat – tell Mysticetus to do that and it will. You can also control things like how many digits of precision, how to display sightings on the map (or not), how to calculate whether you are on-effort or not, and so on.

In general, in Mysticetus, choices for each variable are found in a dropdown list, are to be hand entered (e.g., notes), or are automatically filled by Mysticetus as indicated in the Appendix. Additional information is provided in this section. Basic instructions for starting Mysticetus and entering data are provided in the Appendix herein.

Visual sighting data might be recorded for every marine mammal and sea turtle group (i.e., sighting) encountered, and as possible, for any other marine species of note (e.g., seabirds, sharks, mola molas, fish schools, NOT individual fish). If species or genus, etc., are known for these latter species, put that information in the notes column.

Of particular note, see the figure below demonstrating how the visual sighting variables “Sighting Bearing” and “Where To” should be collected.



- Sighting Bearing: magnetic bearing to the sighting from the observer
- Where To: (1) While in transit: Clock-face based estimate of which direction the sighting is headed relative to the vessel heading assuming the bow is positioned at the 12 o'clock position can be used; (2) If vessel is stationary: indicate the magnetic bearing the sighting is headed.

Sighting numbers will be cumulative throughout the cruise. Sequential sightings of the same group should be recorded as a ‘re-sight’ record (new line) with the same sighting ID number (you will need to edit the ID number to be the same in Mysticetus). Re-sights are also used:

- To denote when the animal’s location relative to the vessel changes,
- The number of animals in a group changes, or
- When the group is observed closer to the vessel than during the initial sighting (the Closest Point of Approach, CPA).

NOTE: You always need a sighting ID record for every sighting. Make it your first column. Yes, first column or you will be calling us. Don’t change that in the template.

For example, a new sighting record is entered after the Initial Sighting if an animal swims closer to the vessel, or dives and surfaces nearer to the vessel – in both cases the closest distance to the vessel changes. In many cases, it is not clear whether the marine mammal sighted is the same animal or not. If you are not absolutely sure that it is the same animal, record the observation as a new sighting and make a note that it could be a repeat animal.

The sample template (back to that) provides a great starting point. They contain a few sheets for reference. You can start from there and modify, or you can create your own protocol from scratch. We will discuss this in more detail later, but here’s a preview of creating your own entry sheets from scratch.

2.15 Mode Switching

Quickly choose which data sheets you want displayed by configuring Mysticetus Modes. A simple switch changes from one set of sheets to another (or to yet another). No need to re-load templates, just click a button and a totally different set of sheets is displayed to the MMO/PSO.

For example, you have a certain set of fields you want to record as you Transit to the operations/survey area – select your Transit mode sheets for that. When you arrive on site, select your Operations setup with the push of a single button. As with everything Mysticetus, this is 100% configurable by you. Go into the template settings and setup the Modes you want.

To use, select the Filter toolbar icon, and select the mode you want. In this example, we created two modes, but you can create any number of modes.

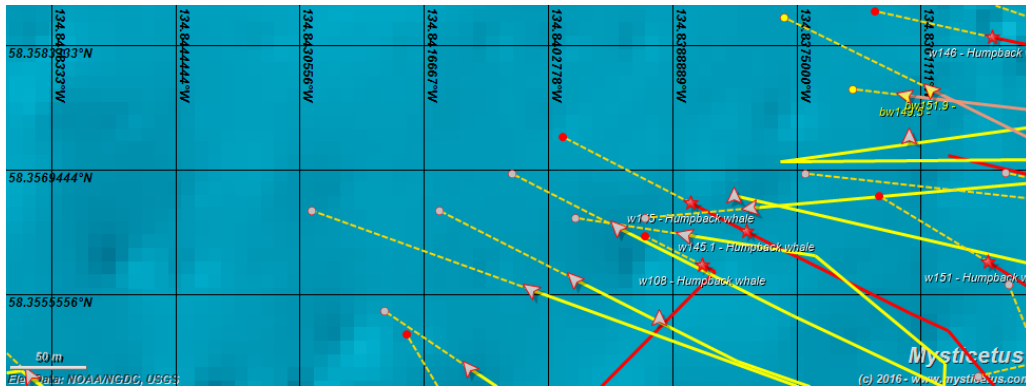


2.16 Prediction Points on Vehicles and Sightings

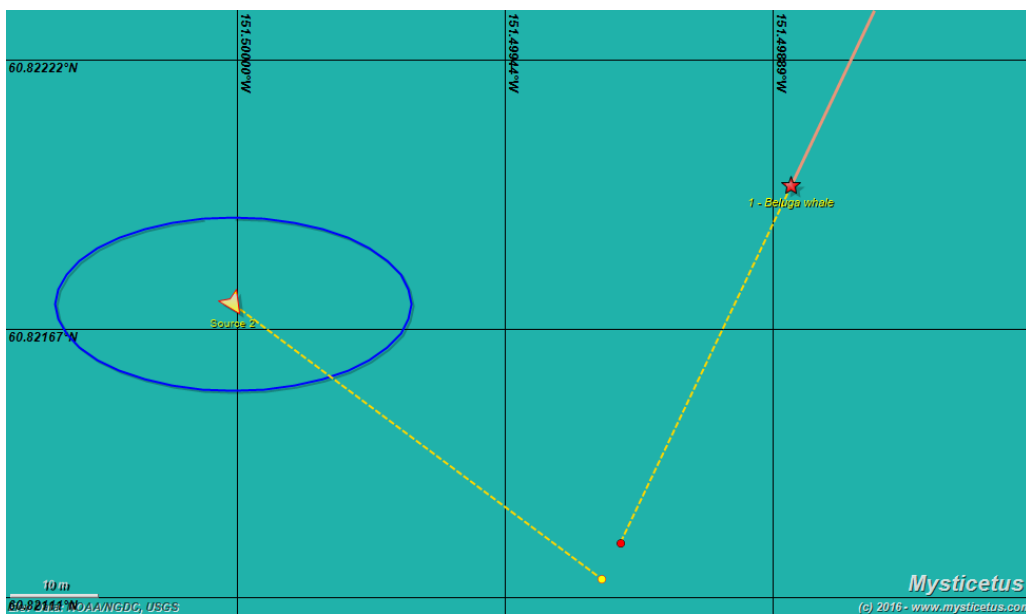
Based on a vehicle's or sighting's velocity, Mysticetus predicts where that vehicle or animal will be in the future.

In addition to the provision of QA qualities (where maybe a Steller sea lion is shown as predicted to fly around the world due to incorrect data entry), this prediction comes in handy when analyzing large scale movement data.

Below are whale watch boats and whale sightings from a summer-long theodolite systematic study in Alaska. Mysticetus puts predictors on everything (whale watch boats in yellow, whales in red).



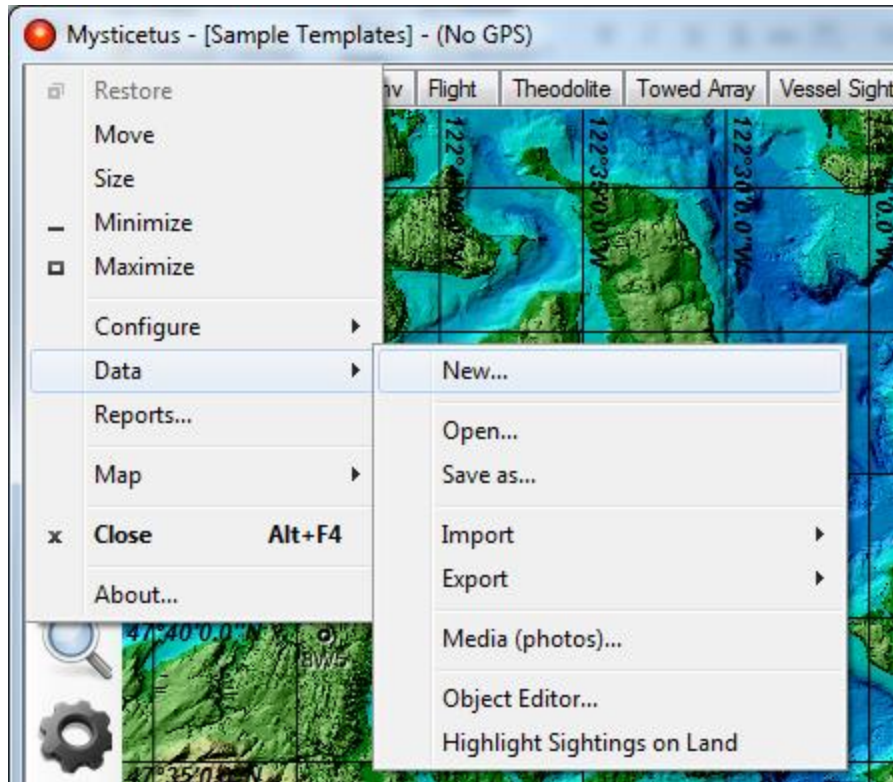
This also comes in extremely handy when running environmental mitigation projects. This next example predicts where a seismic vessel (circled by legally mandated exclusion zone) will be relative to a Beluga in a short while. If this trend continues, a shutdown will obviously be necessary. This information helps crews prepare and manage the project by providing the boat crew increased situational awareness.



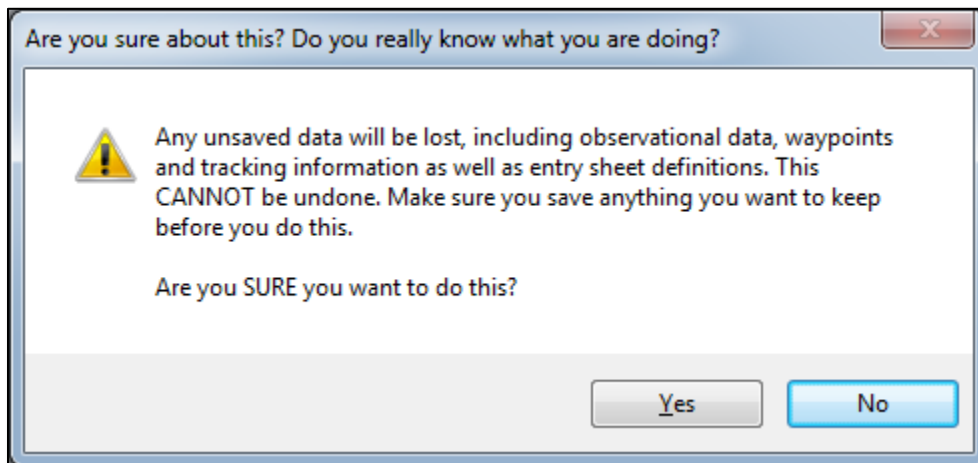
2.17 Entry Configuration

This section discusses how to create a custom data entry sheet from scratch. The reader is cautioned that it is likely a far simpler task to work with the sample template we make available as outlined in the section above. Starting with the template, customizing it, deleting the data sheets you don't need then saving it off as your sheet (not over writing – we'll block that) is the better way to go!

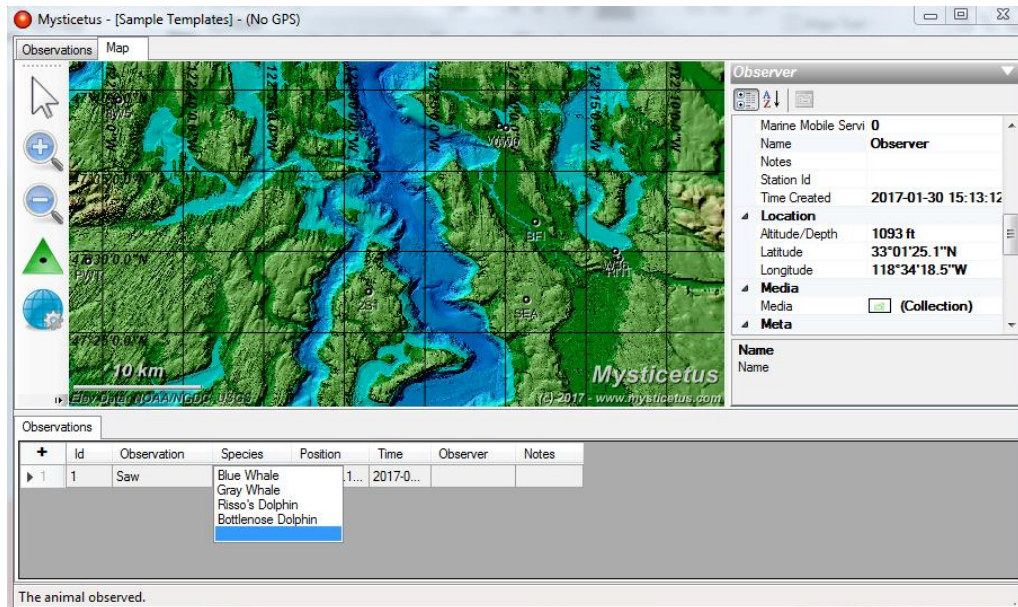
Click the ball, and choose **Data->New**.



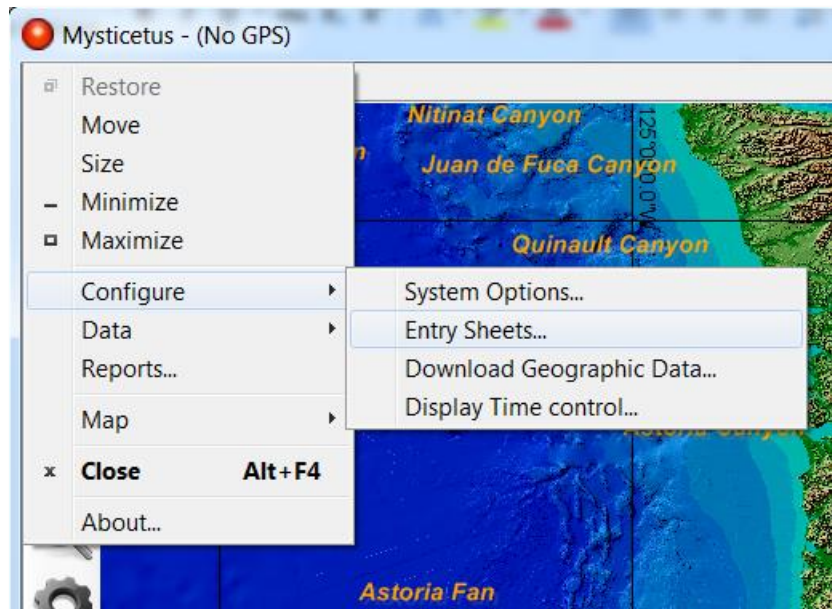
A scary warning will appear, reminding you that choosing “New” will overwrite any unsaved data.



Since you don't have any unsaved data at this point in time, choose “Yes”. This will create a new “set” of a single very simple entry sheet. This simple sheet contains an auto-incrementing Id, a basic text field for entering an observation, automatically stamped position and time fields, and basic text field for entering observer name and notes. None of these fields have any real complex behavior defined...yet.

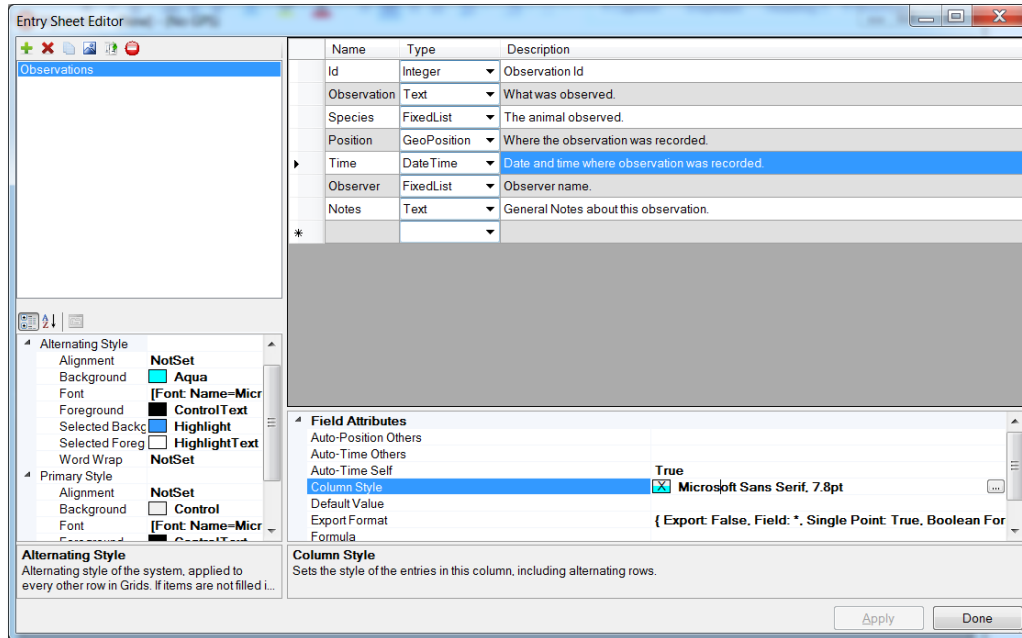


Click the ball, choose **Configure->Entry Sheets**



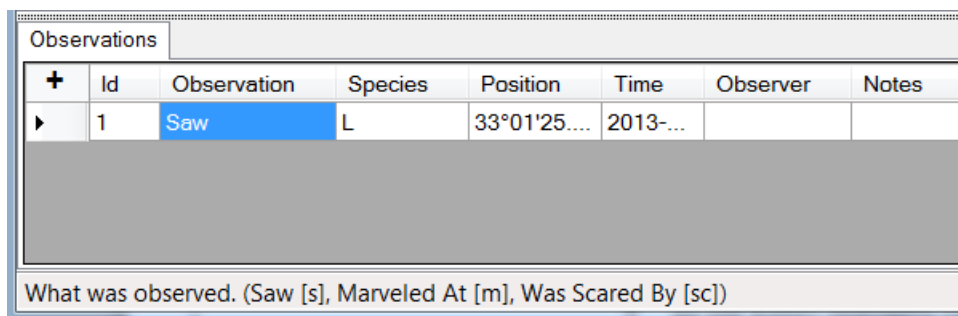
The Entry Sheet Editor will appear. This is where you can create new sheets and add them to your pages, you can edit existing sheets, delete or rename sheets and fields. Adding auto-complete data to cells is also accomplished in this editor.

Go ahead, play around in here. The chapter on Entry Sheet management will explain things in detail, but for now just poke at it and get orientated some.



A final couple “Intro” things to note in here:

- The Description for an active field will be displayed in the status bar when the user starts typing in a field in the entry sheets. For example, here’s what the status bar looks like when the Observation field is selected. This can be incredibly useful to give your observers hints about things they might not otherwise remember, such as definitions of Beaufort levels, glare levels, etc. Any shortcuts will be displayed, too. In this case, the default – somewhat whimsical - shortcuts include ‘s’ for “Saw”, ‘m’ for “Marveled At”, and so on. You can (and should) change shortcuts to something more applicable for your protocol.



- Back in the Entry Manager, clicking on a field will show the field’s properties below. Clicking in the properties will provide a nice description of what that property controls. In the above picture, we’ve clicked in the Column Style field, and it tells us what that means. Don’t forget to look down there for helpful hints about things you can do with a field.
- An ‘undo’ functionality now exists (since build 1.9.318). Ctl-z will allow you to undo any deletions (GPS tracks, rows in data sheets, etc.) thus restoring them.

Try it, create a sighting, delete it, then use `ctl-z`. This will allow you to quickly recover should you accidentally delete the wrong thing.

2.18 Saving your data and Automatic Backups

Mysticetus provides the following safeguards for your data. There are two different components: Auto-Backup and Auto-Save.

1. Auto-backup on hard drive. Like Word or Excel, Mysticetus keeps an auto backup on your hard disk every 3 minutes. However, (also like Word and Excel) if you successfully exit, this auto-backup is deleted - the assumption is everything is going how you want it to go, so we delete that particular backup.

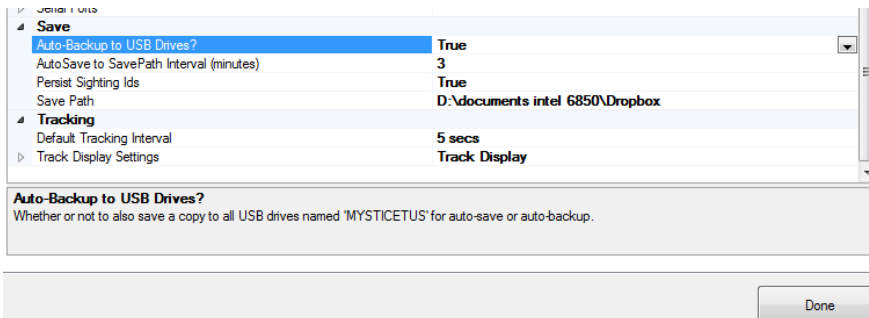
2. Auto-backup to USB drive. Every three minutes Mysticetus saves all your data to a file on any attached USB drive named "MYSTICETUS". It saves this in the Mysticetus\Autobackup folder on the USB drive. This feature recovers data on abnormal failures of your computer or Mysticetus. During data collection Mysticetus adds a new file day over day if the data file name is unique day over day.

3. Auto-save. This is enabled when you have set the Auto Save path to something and you have used the `/save` command line parameter in your short cut. In this case, Mysticetus automatically saves to the Auto Save path every Auto Save Minutes. Most people run this way, and if you include the `%TIME%` parameter in the Auto Save Path, Mysticetus will save a number of different files, all appropriately timestamped in their file names. This is a great way to look back at data as it was entered over the course of the day. More on this below.

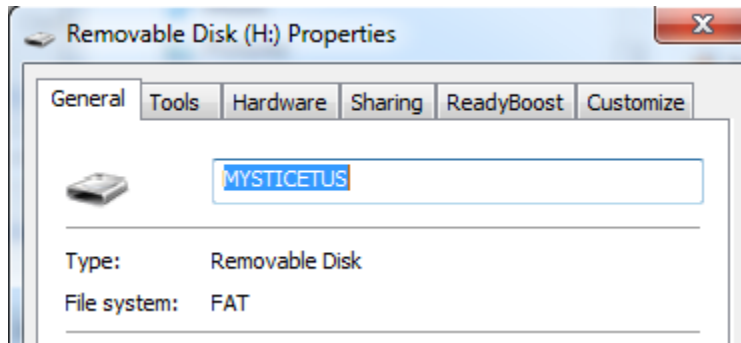
Beyond these three safety nets, Mysticetus assumes you are doing what you want with your data. That is, when you exit and Mysticetus asks, "Do you want to save your data?", and your answer is "No"...like Word or Excel, Mysticetus does what you tell it to do.

Saving your data can be done a number of ways:

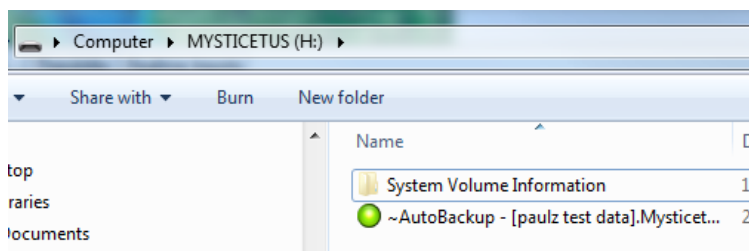
- Manually
 - o When you quit Mysticetus you will be prompted to save your file
- Auto Back-up to USB drives (this too is pretty important and recommended)
 - o Choose **Configure->System Options** and scroll down to '**Save**' set 'Auto-Backup to 'True'.



NOTE: the USB drive must be named 'MYSTICETUS' or **saves will not occur.**



You can view your back up on the USB drive:



- Auto Back-up to a save path. Mysticetus must be launched with the /Save command line parameter to enable this feature. See discussion on command line switch usage in this document.

Autosave, too, is really really important. It'll potentially save you from hours of tears. To summarize again:

As a summary for Auto-Save, there are Three (3) things you need to do to make it work:

1. Set the Auto-Save Path to something. As an example, we typically set them up as:

`%GoogleDrive%\location\project\year\Saves\%Date%\%Date%-%Time%.Mysticetus`

This saves all data to the local Google Drive folder in a structured format that includes date and time.

In this example above files would be seen as:

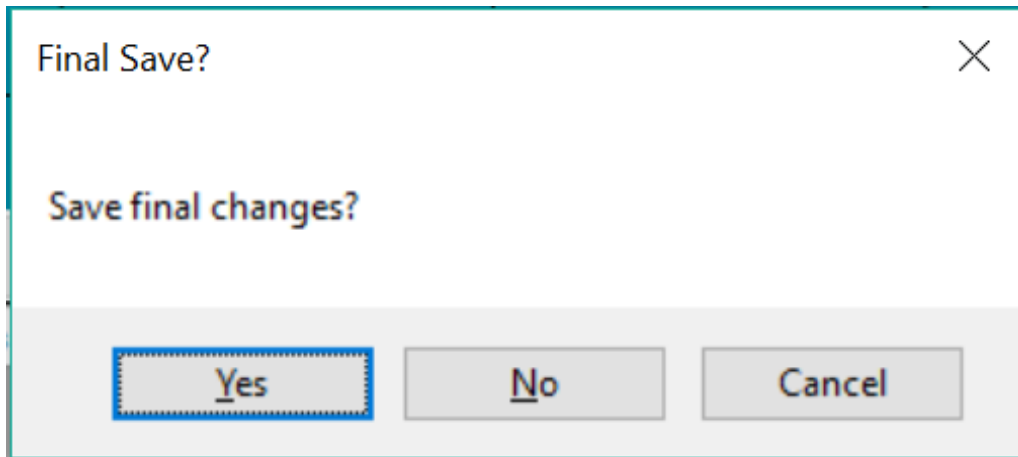
`%GoogleDrive%\location\project\year\saves\2017-09-21\2017-09-21-2201.Mysticetus`

Where:

- **location** is a folder you've defined
- **project** is your project name (keep it simple)
- **year** is the current year defined by you, use the current year

- **saves** is the final folder in the defined path being written to
- **2017-09-21-2201.Mysticetus** is the name of the saved file (assuming it's 2017 and the PC time is 2201. Yes, it uses the 24-hour clock notation).

Final save of the day notes:



When you quit Mysticetus it will ask you if it's your final save. The answer is yes at the end of the day. Mysticetus will then write the final save file and will append 'final' to the file name.

If you indicate no Mysticetus will prompt you to save to a new file name (or you can overwrite a current save – not recommended). We suggest you typically use the same file naming format as your auto save files. This might be the case if you're shutting down for weather or other operational delays for a few hours.

When connected to the internet, data is automatically backed up to Google Drive in this case.

We also like to use backups with low profile USB hard drives per the above. You can also use %OneDrive% or %DropBox% instead of %GoogleDrive%.

2. Set the Auto-Save time interval to something. We like 15 minutes but you can try 30 or 20 or whatever. This is done in the Mysticetus 'options' settings.

3. Create a shortcut, per the chapter on command line switches for startup, (We strongly suggest putting the shortcut on the desktop) that includes the /Save command line parameter. This tells Mysticetus: Do the Auto-Save Thing without anybody having to remember to do so!

Remember: Auto-Save is completely different from Auto-Backup. Unless all heck breaks loose, you should not even know your Auto Backup files exist. You should only use them in case of emergency.

Auto-Save is triggered by both /save on the command line, as well as use of the AutoSave Time and AutoSave Path settings in your template (Configure -> System Options -> Auto Save)

Thus, Auto Save only happens when running in Data Gathering mode. These are the files you actually do stuff with (as opposed to Auto-Backup files).

Auto-Backup, on the other hand, runs every three minutes. It saves a copy of your current data into two (or more) locations:

1. AppData\Local\Mysticetus\AutoSave
2. USB Drives named "MYSTICETUS". Mysticetus scans your system for every attached drive named "MYSTICETUS", and writes a copy of your latest data there.

Auto-Backup is your **Last Ditch** backup system when heck breaks loose. In general, you can ignore it...but the data will be on your thumb drive if, say, your PC's hard disk completely crashes.

Note that your AppData\Local\Mysticetus\AutoSave folder **only** contains a single file - all other auto-backups are deleted after the latest one is saved.

Your USB drive, though, will contain all copies of your data as long as the file name changes - which is why its recommended to be using the %Time% macro in your Auto-Save path (to change the file name with time when running in Data Gathering mode). Your thumb drive will contain a copy of every file you've worked with.

Again, these are **not** the files you typically use for **anything**. They just sit there on the USB drive until the zombie apocalypse happens and the zombies have eaten your computer's (other) brains. Auto-Backup is your backup-backup system for seriously bad news end-times.

After your survey, once you are certain your data has all been nicely backed up to your servers - you can delete the AutoBackup folder on your USB drive(s).

NOTE: LPT - Something to consider when gathering/working with your data – always back up your raw data. Back up your Template file. Back up your collected daily data. Back up your reports. Always. Copy all that precious information into a separate folder appropriately named: 'Backups'.

That's it for the introduction – the following chapters go into a lot more detail about the above concepts, and more.

3 Startup Command Line Switches and Startup Options

The Entry Manager is where you define what data is collected, how data is collected and what data is automatically updated. There are no restrictions on data types or names or amounts – everything is at YOUR discretion and determination.

3.1 Startup settings cascade order

1. Command Lines (in Shortcuts) override anything
2. Startup Settings (which are per-machine) override the Template
3. If not there, then Settings are retrieved from the Template when it is loaded.

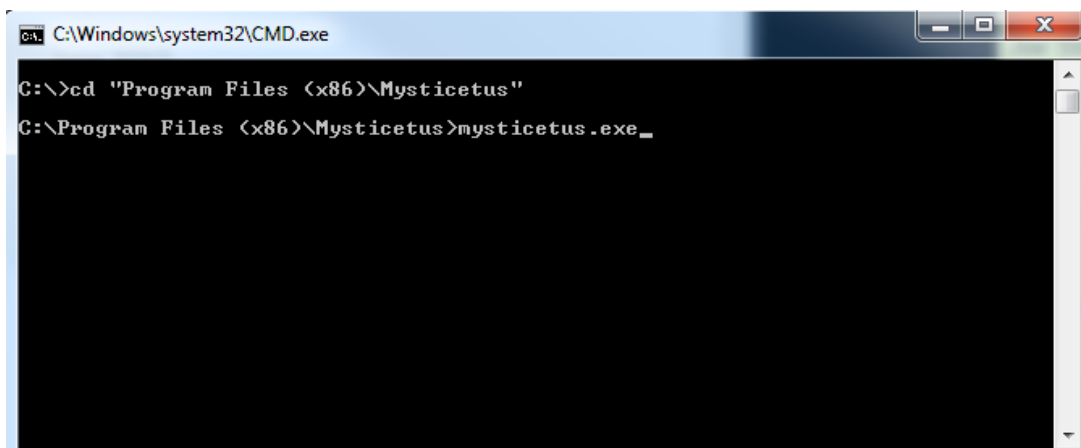
3.2 What is a Command Line?

A little computer history (aka “what the heck is a ‘command line’?”). If you already know what a command line is and just want to see which ones Mysticetus supports, skip this reading this section and scroll towards the bottom of it to get the available switches. Otherwise, step into the way back machine....

Back in the old(er) days, PC screens – and other systems too, of course...but we’re talking PCs now – only displayed a set of characters. The computer would prompt you for input and you would tell it what to do by typing in a “Command Line” and (generally) pressing the Enter (or Return) key.

Newer operating systems built Graphical User Interfaces to use instead of these Command Line interfaces (because clicking a mouse and using touch gestures is generally easier to learn and remember for non-nerds), but these Command Line systems are still present, if somewhat hidden. You can go find the Windows command line system by opening the Cmd.Exe app. In Windows 8, go to the tiles, type “cmd.exe” and press Enter (there are command line systems on your Mac too, with similar commands available).

The phrase “C:\>” is the prompt. It is telling you where you are and asking for a command. From here you can do one of two things: enter a command or run a program. In this case, we’ll tell the command processor we want to Change Directory (cd) to where the Mysticetus app lives. Windows apps end with “.exe”. To run the Mysticetus app the all you need to do is enter Mysticetus.exe and press enter.

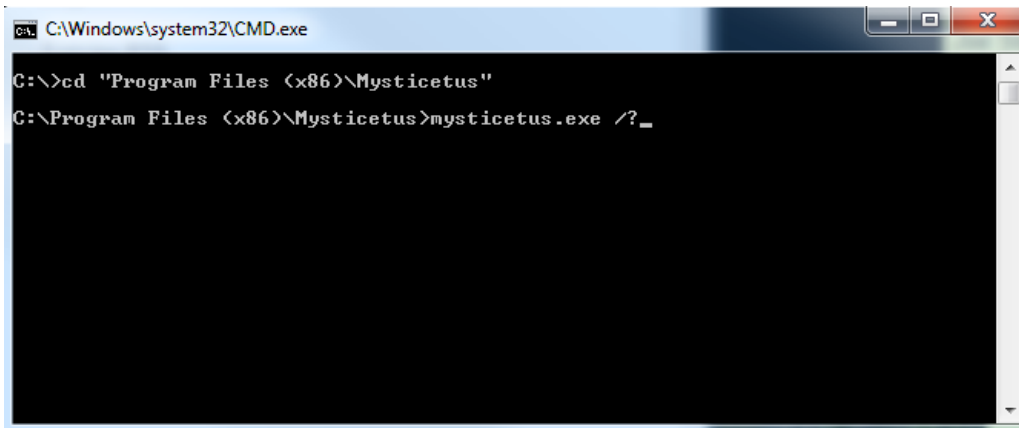


```
C:\Windows\system32\CMD.exe
C:\>cd "Program Files <x86>\Mysticetus"
C:\Program Files <x86>\Mysticetus>mysticetus.exe_
```

3.3 Command Line Usage

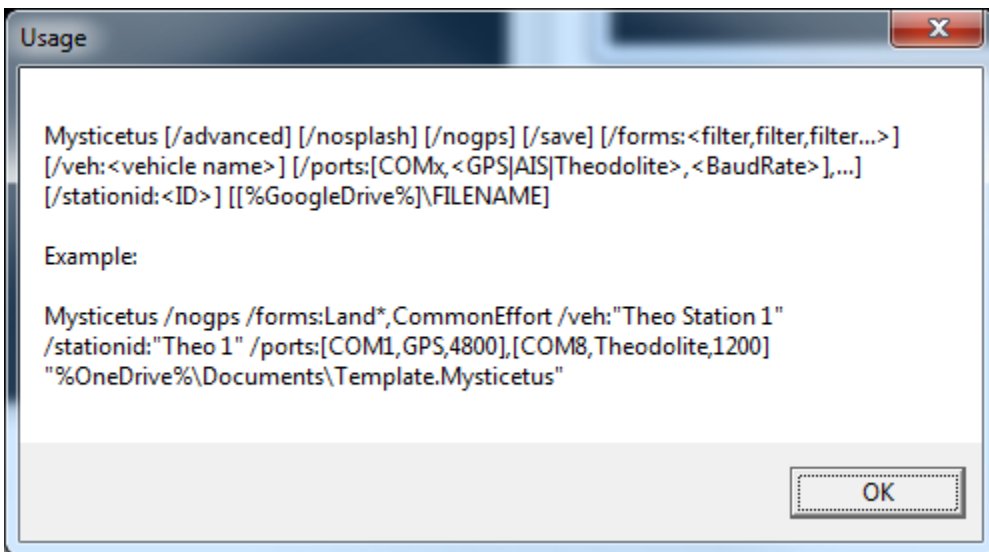
But wait, there’s more.

Most apps support some set of “Command Line Options”. These are typically appended to the end of the app’s name. For example, if you start Mysticetus with a slash followed by a question mark /?



```
C:\Windows\system32\CMD.exe
C:\>cd "Program Files (x86)\Mysticetus"
C:\Program Files (x86)\Mysticetus>mysticetus.exe /?_
```

Mysticetus will display information about all the possible command line options:



```
Usage

Mysticetus [/advanced] [/nosplash] [/nogps] [/save] [/forms:<filter,filter,filter...>]
[/veh:<vehicle name>] [/ports:[COMx,<GPS|AIS|Theodolite>,<BaudRate>],...]
[/stationid:<ID>] [[%GoogleDrive%]\FILENAME]

Example:

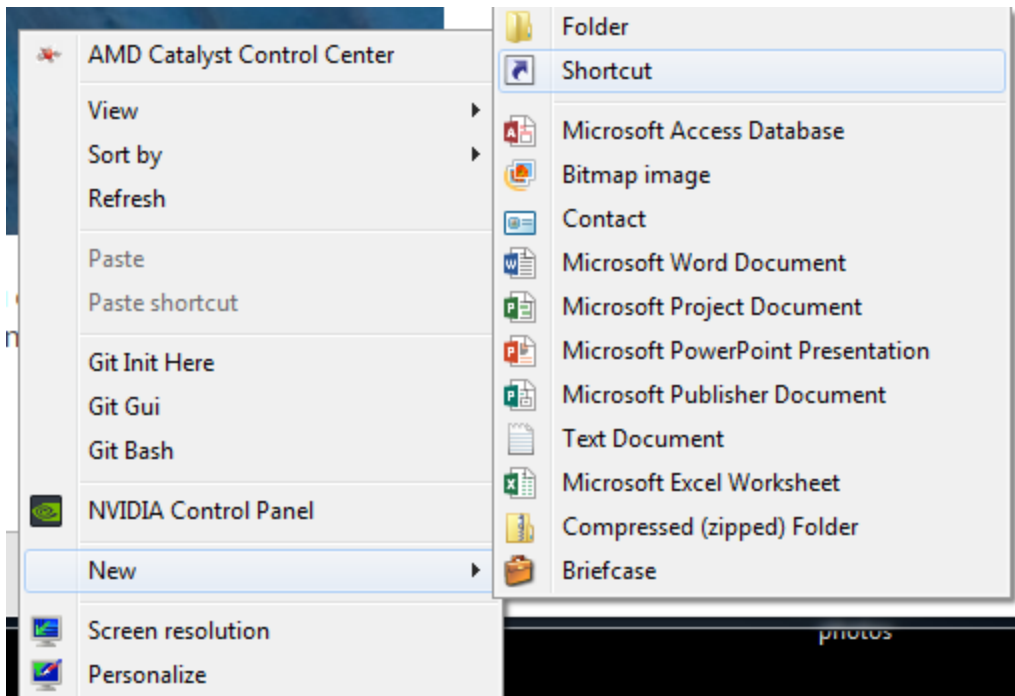
Mysticetus /nogps /forms:Land*,CommonEffort /veh:"Theo Station 1"
/stationid:"Theo 1" /ports:[COM1,GPS,4800],[COM8,Theodolite,1200]
"%OneDrive%\Documents\Template.Mysticetus"
```

Here's where things get powerful. You can configure, and in some cases override configuration, in Mysticetus by passing a set of command line options to the program when it starts.

3.4 Command Line Usage and Shortcuts

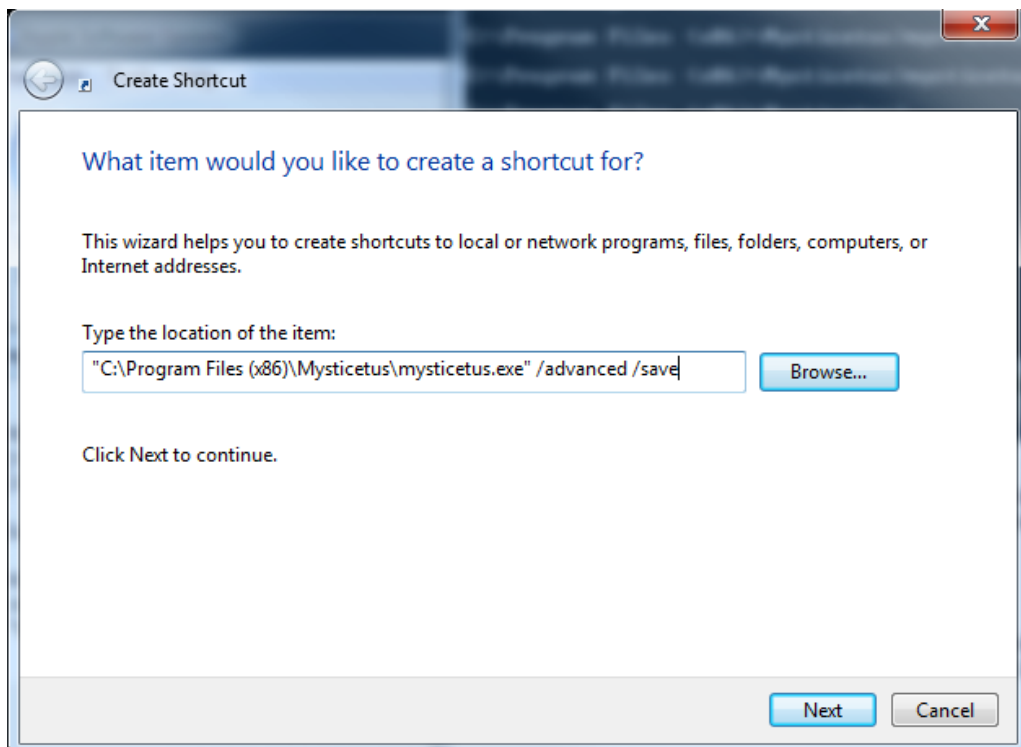
The beauty of all this is your ability to essentially dictate or pre-configure how Mysticetus will launch and run via a short cut. Now your researchers or employees will always run Mysticetus as you want them to via the shortcut you leave on the desktop.

Right click on your desktop and create a new shortcut to run Mysticetus.

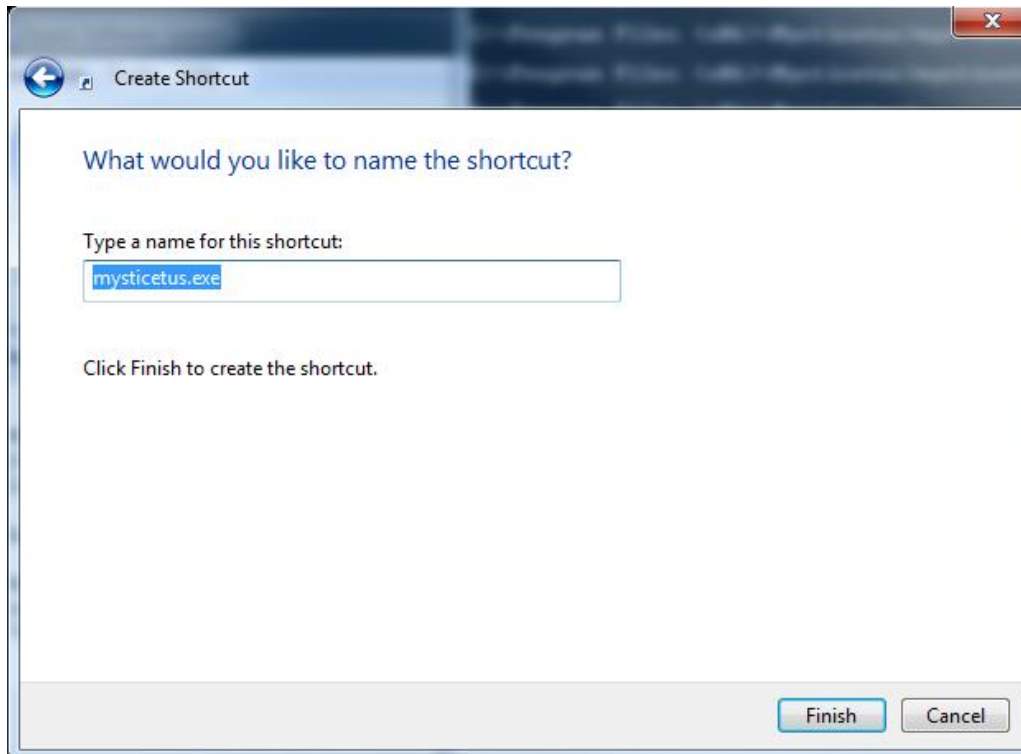


This pops up a window that asks you for a (tada!) Command Line to run when you click that shortcut. In our case, we're going to enter the following, exactly (don't forget the quotes...if you have spaces in a command line argument you need to enclose the entire command in quotes – not the command line arguments though):

`"C:\Program Files (x86)\Mysticetus\Mysticetus.exe" /advanced /save`



Click next and then save your shortcut by naming it:



And there on the desktop will be the Mysticetus shortcut:



How do you change the shortcut? Right click on the shortcut and choose Properties. You can change the shortcut to include whatever options you prefer.

Shortcut target examples:

```
"C:\Program Files (x86)\Mysticetus\mysticetus.exe" /save %GoogleDrive%\pathway\Projectname  
Template.Mysticetus"
```

Or

```
"C:\Program Files (x86)\Mysticetus\mysticetus.exe" /forms:Visual* /nosplash /save  
"%GoogleDrive%\pathway\ %Date%\MySurveyNameWhatever - %Date%-%Time%.Mysticeus"
```

3.5 Mysticetus Command Line Options

`/? or -?`

Pops up a simple usage box to help you remember the available switches.

`/cartodir:<cartographydatapath>`

Specifies a path to all cartography data. Sometimes it is advantageous to have your cartography data on a separate path or drive. For example you may want to point to a google drive path on your machine to assure Mysticetus loads the most recent data.

`/nosplash`

Launches Mysticetus without displaying the splash screen while starting up.

`/nogps`

As soon as you load any file, Mysticetus normally goes and looks at every instrument attached to the computer and determines if it is a GPS (or AIS or Theodolite) device. This switch instructs Mysticetus to not do that. This is an important option because some theodolites (looking at you, Nokia!) freak out and die (need restarting) if you ask them if they are a GPS. This switch tells Mysticetus it shouldn't ask attached devices what they are. If you use this switch, you probably also want to use the `/ports` option to tell Mysticetus exactly where the GPS actually is.

`/ports`

This switch is used to tell Mysticetus which ports are attached to which devices. Normally you don't need to do this – Mysticetus will figure it out by asking each device what it is and GPS's tend to handle this with aplomb. Certain theodolites, however, get all insulted when Mysticetus asks, and they subsequently shutdown. Note that the `/ports` switch should be used in conjunction with the `/nogps` switch. Here is an example of the use of this switch:

```
/ports:[COM2,AIS,2400],[COM5,Theodolite,1200],[COM6,GPS,4800]
```

In this case, we've told Mysticetus there are three devices attached to the PC:

An AIS receiver on COM2 running at 2400 baud

A theodolite on COM5 running at 1200 baud

A GPS on COM6 running at 4800 baud

Again, this switch is generally important to use only if you are connecting certain types of theodolites that...frankly...are broken (cough cough...Nokia). Most of the time you can plug in any old GPS's and AIS receivers and Theodolites and Mysticetus will find them automatically.

`/veh`

This switch (along with the /forms, /env and /stationid switches) is designed so you can create a single template file that contains all the entry sheets, vessels, land stations, aircraft and networking ids for a complex multi-station observation system. For example, if you had two vessels (V1 and V2), you might create vehicle objects for both of them in your Mysticetus template. By telling Mysticetus

```
/veh:V1
```

You are saying that this system is running on board V1 and all GPS tracking (and all sightings) should be related to vessel V1 (as opposed to V2).

```
/forms
```

The forms switch (along with /veh, /env and /stationid) allow you to embed forms for a multi-vehicle setup...but only display certain forms. For example, if you have a vessel (V1) and an aircraft (A1), you might create two forms named "A1 – Sightings" and "V1 – Sightings". Passing, for example,

```
/forms:A1*
```

In the Mysticetus command line instructs Mysticetus to only load the aerial forms (i.e. forms that start with A1. You can use a comma to separate multiple forms to load, for example

```
/forms:A1*,"Common Form"
```

Which will load forms that start with A1 as well as the form named, "Common Form" (which would, in theory, be the form common to all vehicles/stations).

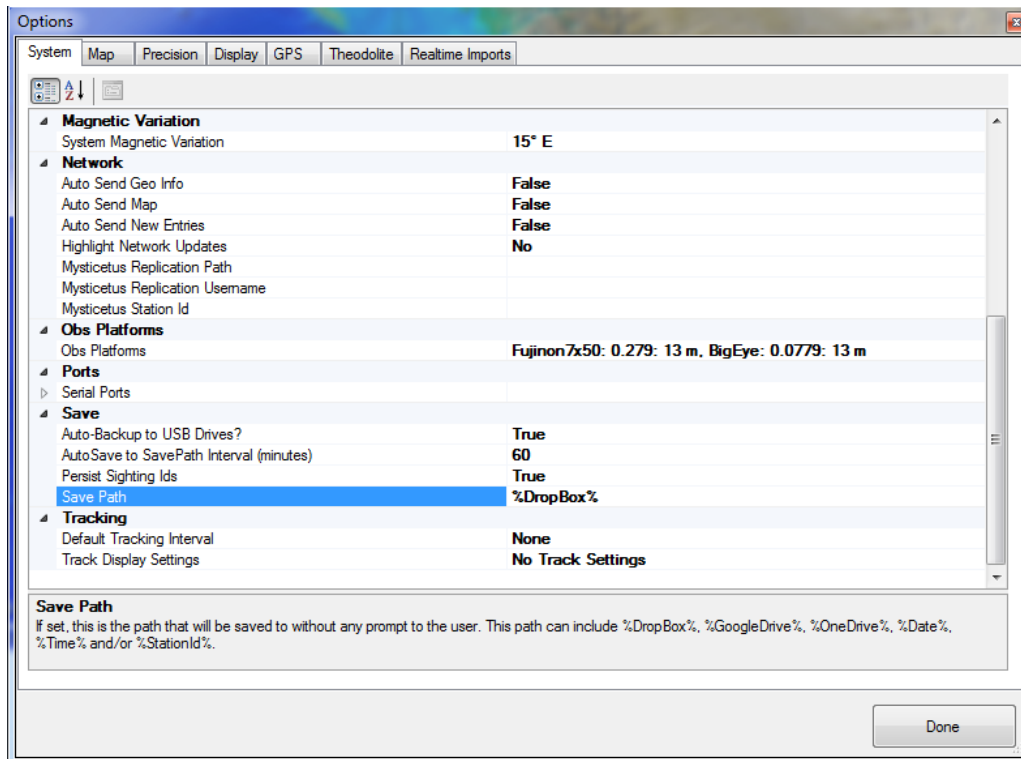
```
/env
```

This switch tells Mysticetus with form is the effort form for this vehicle or station. This tells Mysticetus which sheet to look for data for things such as the calculation of effort reports and coloring of tracklines (based on effort state, sea state, etc.). For example:

```
/env:"My Effort Sheet"
```

```
/save
```

Switch enables autobackup to a file path you've specified. This is outlined in section 2 on saving. Setting the filepath is done through the dialog: options->system->save path



If you're using a cloud based storage such as Google drive or Dropbox (as seen in the above screen shot) then use %DropBox%\path or %GoogleDrive%\path. OneDrive is also supported. See chapter 9 for more information.

/stationid

When using Mysticetus networking – which keeps multiple stations in sync over an internet connection so everyone can see everyone else's position and sightings on the map in real-time – this switch tells Mysticetus what the Id for this station should be. Typically this would be something like "Vessel 1" or "Theo Station 17". For example:

`/stationid:"Theo Station 17"`

/topodir:<topodirectorypath>

Specifies a path to all topo data. Sometimes it is advantageous to have your cartography data on a separate path or drive. For example you may want to point to a google drive path on your machine to assure Mysticetus loads the most recent data.

/advanced

Displays the Advanced menu under the Data menu. Be careful – using this menu makes it easy to shoot yourself in the foot, lose data, etc. This menu also contains parts of the system that are not well documented or are super complex (such as the seismic control center, which helps me estimate things like ensonified regions and harassment takes for permit writing and related tasks, all via complex geo-polygon interactions,

shapefile importing and so on...). You probably shouldn't go in here unless you talk to me first about what you really want to do.

[File Name]

If you include a command line switch that does not start with a forward slash, Mysticetus will attempt to load that file at startup. For example

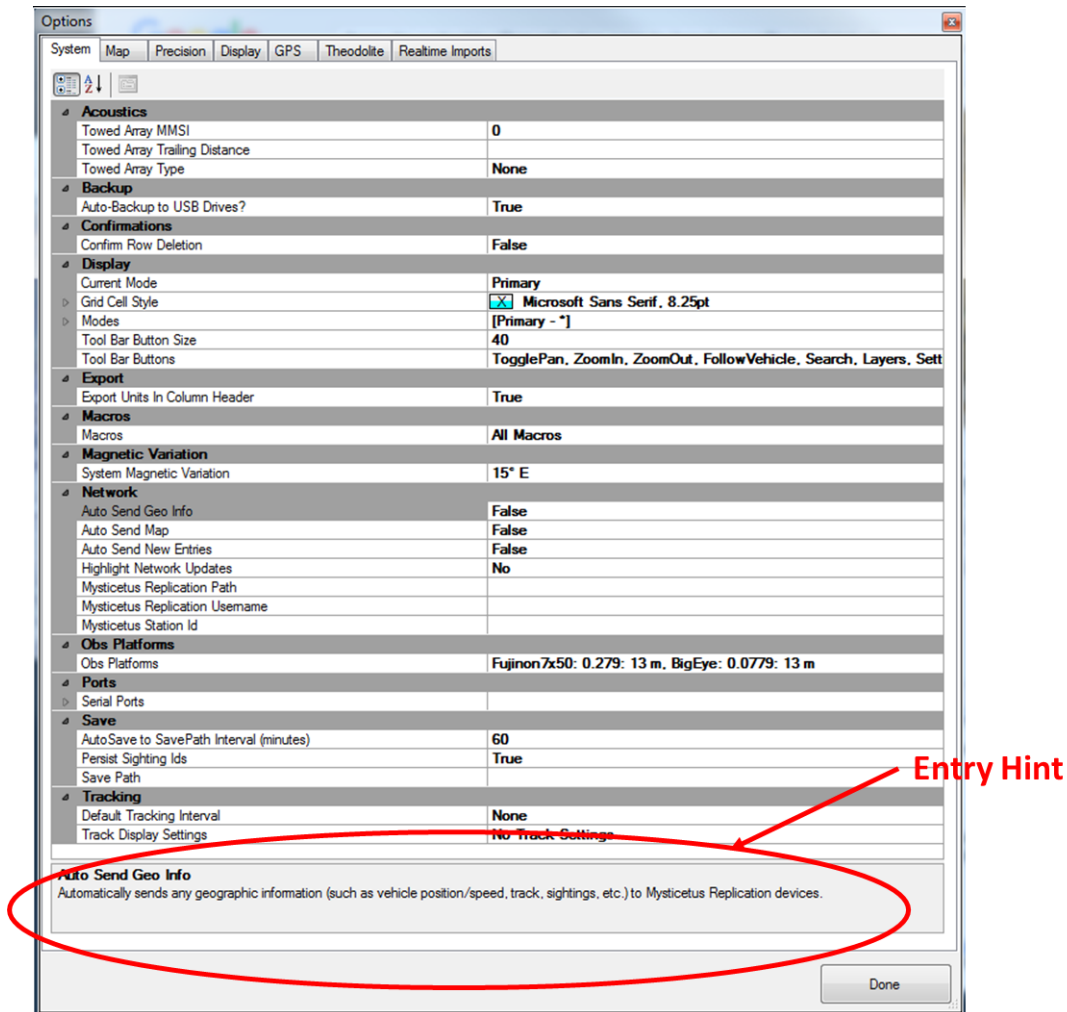
“C:\users\Mysticetus\Documents\My Survey Template.Mysticetus”

4 System Options

Here is where we provide some fine grain control over a host of things ranging from display settings, GPS interfaces and simulators, reticle settings and so on. This is important. Read this section.

The System Options dialog configures just about everything in Mysticetus. It is composed of a number of tabs, each of which controls a different aspect of the Mysticetus system. This chapter discusses the options you have to control your version of Mysticetus from system settings and inputs to map displays and icons.

4.1 System



The System tab controls a number of fairly disparate options. These either apply to the system at-large, or simply didn't have another good place to live (i.e. they could be filed under "Miscellaneous Options"). The settings here are in logical groups.

Each option has a hint on it's use when you highlight the option.

4.1.1 Acoustics - Towed Array MMSI

Specifies the MMSI (Maritime Mobile Service Identity or AIS identifier) of the vessel that has the towed array.

4.1.2 Acoustics - Towed Array Trailing Distance

Distance behind the vessel a towed array is located. As with any field in Mysticetus, this can be specified using any units ("300 m", "0.3 k", etc.). See *Chapter 14 - Acoustics* for more information on acoustics.

4.1.3 Acoustics - Towed Array Type

Type of array being towed, None indicates no array. This impacts the map information automatically entered when a TowedArrayBearing formula is invoked as the result of an acoustic bearing received or entered. For example, whether a single bearing line or dual bearing line (in the case of directional ambiguity) is created on the map.

See *Section 7.1.46 - TowedArrayBearing* for more information on how the formula interacts with acoustics bearing information. See *Chapter 14 - Acoustics* for more information on acoustics in Mysticetus, including how to set up automatic reception of bearing information from programs such as *Ishmael*.

4.1.4 Backup – Auto-Backup to USB drives

Set to true if you have an USB memory stick plugged into the PC USB slot. The volume must be named: Mysticetus. Your data will automatically be backed up to the thumb drive at regular intervals.

NOTE: It is highly recommended that this feature is used. Use a low profile USB thumb drive to minimize chances of it being disturbed during operation.

4.1.5 Confirmation – Confirm Row Deletion

Prompts user to confirm any row deletions. Suggested to keep this set to True to prevent accidental deletions.

4.1.6 Display – Current Mode

Defines which mode is current. Modes allow you to show and hide sets of entry sheets with the click of a single button (the Mode Selector) in the toolbar.

Note in Tool Bar Buttons, you can turn on a Mode button. When you click the Mode button, it presents a list of Modes to switch into (if you have more than one mode). This shows and hides entry sheets.

See modes option below.

4.1.7 Display – Grid Cell Styles

Defines display of data:

- 1) Alternating – applied to every other row in grids the below style options. These options should be obvious to the user after experimentation.

Alternating Style	
Alignment	Not Set
Background	Aqua
Font	[Font: Name=Microsoft Sans Serif, Size=8.25, Units=3, GdiCharS
Foreground	Control Text
Selected Background	Highlight
Selected Foreground	Highlight Text
Word Wrap	Not Set

- 2) Primary Style – is the primary style of the system. Items not filled in will result to system defaults. These options should be obvious to the user after some experimentation.

Primary Style	
Alignment	Not Set
Background	<input type="checkbox"/> Control
Font	[Font: Name=Microsoft Sans Serif, Size=8.25, Units=3, GdiCharS
Foreground	Control Text
Selected Background	Highlight
Selected Foreground	<input type="checkbox"/> Highlight Text
Word Wrap	Not Set

4.1.8 Display – Modes

Selects which entry sheet to display in each mode. To set this click on the ellipse.

Word Wrap	Not Set	
Modes	[Primary - *]	
Tool Bar Button Size	40	

4.1.9 Display – Tool Bar Button Size

Size in pixels of the toolbar buttons.

4.1.10 Display – Tool Bar Buttons

Selects the tool bar buttons to use. This option is accessed by clicking on the ellipse here too.

4.1.11 Export – Export Units in Column Header

When true the unit type will be exported (excel XML, CSV) in the column header instead of the cell value. If False the units value will be exported in each cell.

4.1.12 Macros - Macros

Macros provide a useful way to reduce the number of keystrokes it takes to enter data. “Hot Keys” can be assigned to a sequence of events (such as data entry) and Mysticetus will repeat the sequence of events every time you press the Hot Key.

Macros are important enough to warrant their own chapter and are discussed in much more detail in *Chapter 12 - Macros*.

Remember that hot keys in windows can affect global use. No, hot keys cannot be muted. That's intentional - when you're off doing something else and a whale pops up you want to be able to record that instantly.

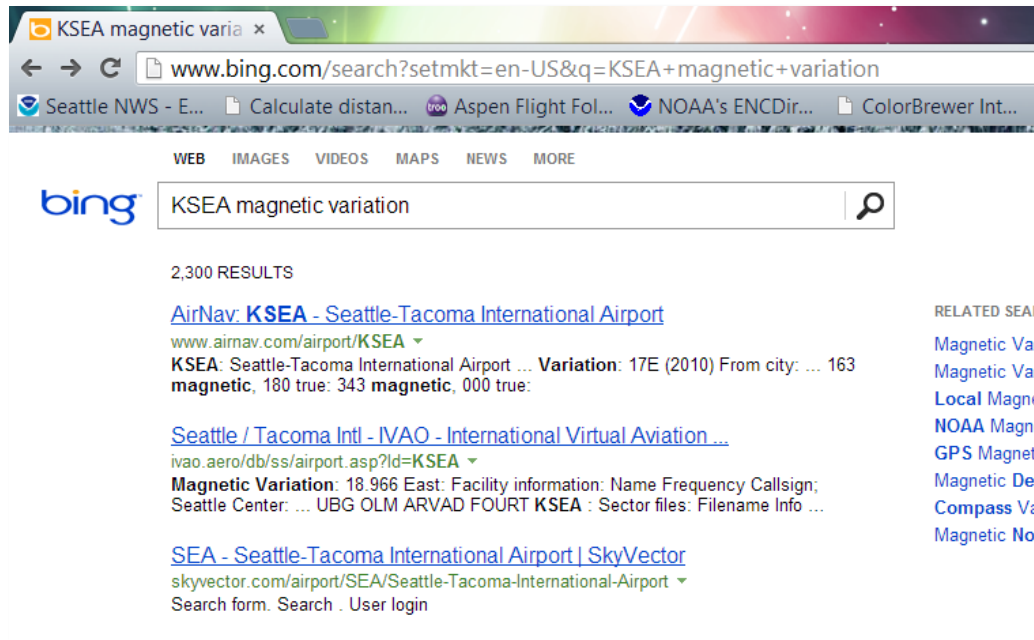
It is strongly recommended against using hot keys that may have global use, such as CTRL+C (copy), CTRL+V (paste), etc.

4.1.13 Magnetic Variation – System Magnetic Variation

Pro Tip: It is critically IMPORTANT to set your magnetic variation here if your GPS does not output magnetic variation information.

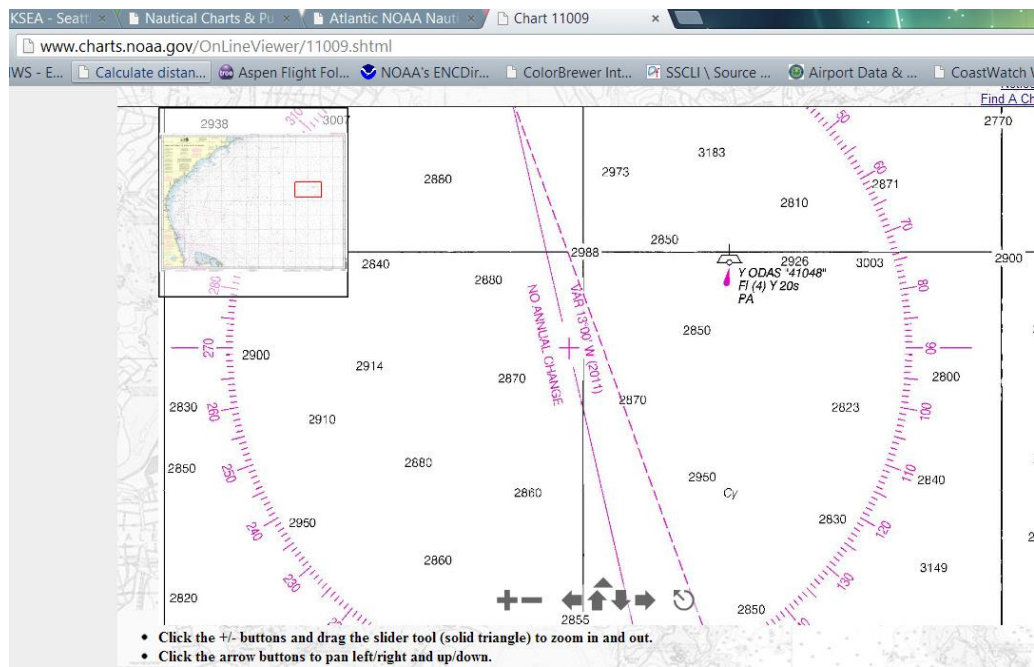
This sets the magnetic variation used throughout the system. While all internal calculations are performed using True values, Mysticetus can display bearings and headings in either True or Magnetic. This setting controls the Magnetic Variation in your area. It is of critical import to set this if your GPS does not communicate this to Mysticetus (most GPS's don't send this information, but check your GPS manual to be sure).

This value can be obtained from a number of different sources. One of the easiest ways is to do a web search (Google, Bing, etc.) for the variation at an airport near your survey area. For example, to learn the Magnetic Variation near Seattle, issue a web search such as “KSEA Magnetic Variation”:



Right there in the first search result you can see the variation is 17E. That is, the magnetic north pole is 17 degrees to the east of true north at Sea-Tac airport.

You can also obtain magnetic variations from aviation maps or nautical navigation charts. For example, most NOAA nautical charts can be downloaded as images (“raster”), and they contain magnetic information. See <http://www.charts.noaa.gov/OnlineViewer>. Open a nautical chart of your area and look for the variation information in a compass rose. For example,



This shows a magnetic variation of 13.00 W for this locale.

4.1.19 Network – Mysticetus Replication Username

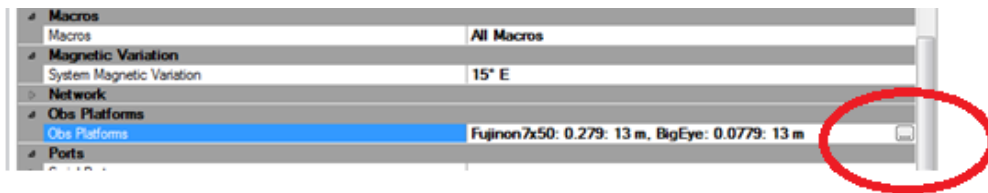
This is the username of the project – we always have all replicated PC's logging into the same login ID. The login ID style we like to use is typically an email name such as 'projectname@gmail.com'. This allows all machines to write/use the same cloud environment – dropbox, googledrive, or onedrive typically.

4.1.20 Network – Mysticetus Station ID

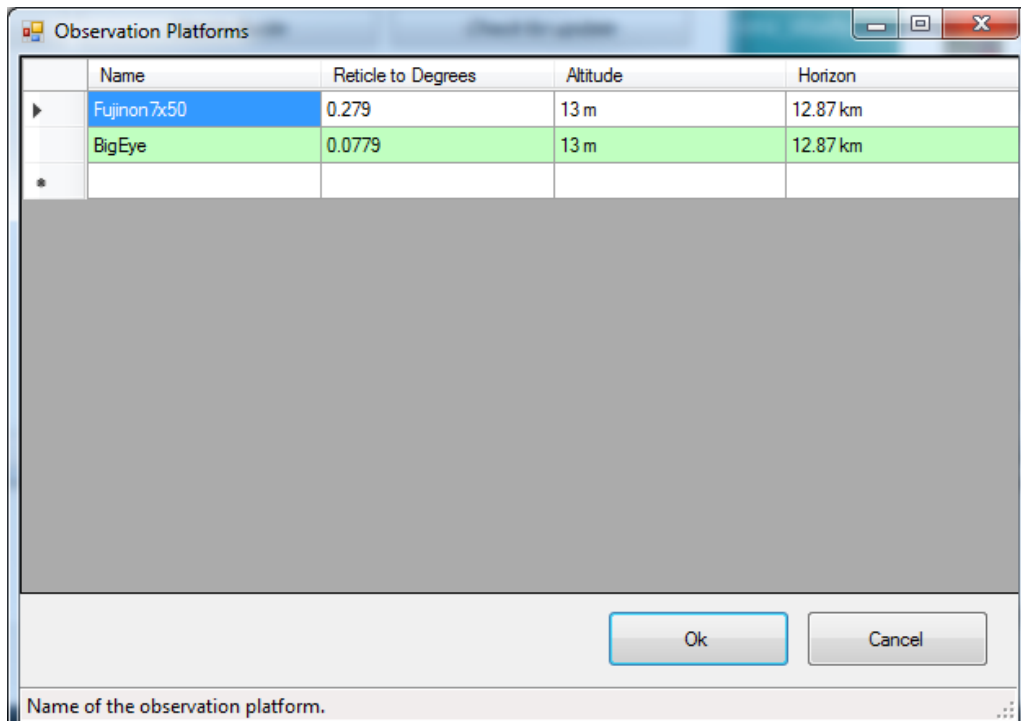
Name of the station, e.g. "Land Station" or "Vessel 1". Maybe overridden via command line on the start up short cut you created. You did create one, right?

4.1.21 Obs Platforms - Observation Platform

This provides information about the observation platform including optics type, its altitude above sea level including eye height and reticle to degree conversion factors. Eye height is typically the average of the observer crew. The user can set up a platform for each observer with their unique eye height.



Selecting the ellipse allows you to add multiple observation platforms to reference with your formula.



To set multiple different observation heights (as part of the Observation Platform setting) you should use Observation platforms and DistMultiOptics (see chapter on formulas). Then specify which one you are using by use of an "Obs Platform" field. If you have only one Obs platform, you can create an Obs Platform field and have its Default Value be the one platform you care about.

This control is used to specify overrides of any GPS information. You can specify a position override, a height override, or both.

The position override is useful for fixed location surveys (such as theodolite). The Altitude/Height override is useful for not only fixed location surveys, but also vessel surveys where the observation platform height above water is known (GPS altitude at those levels can be unreliable).

In the example above, Mysticetus will use the GPS position for its calculations, but will use 13 meters as the base observer's altitude. The use of DistMultiOptics formula will modify that height.

4.1.22 Ports – Serial Ports

Defines which serial ports (COM) are used for which devices such as theodolites, AIS receivers, etc. Devices marked as theodolite and aIS will not be queried when searching for GPS. Specifying the /Ports command line argument takes precedence over this setting.

4.1.23 Save - Auto-Save to SavePath Interval (minutes)

Sets the interval at which Mysticetus will auto-save a copy of the current data. This only applies if the /Save option is specified on the command line and Save Path setting is not empty.

NOTE: It is highly recommended that this feature is used.

4.1.24 Save - Persist Sighting Ids

If set, the last used sighting ids for each sheet will be remembered for the next time Mysticetus is run.

4.1.25 Save - Save Path

Determines to Auto-Save save path for data. As a summary for Auto-Save, there are three (3) things you need to do to make it work:

1. Set the Auto-Save Path to something. As an example, we have aerial surveys going on in that use this format:

```
%GoogleDrive%\projectname\moreinfo\year\Saves\%Date%\%Date%-%Time%.Mysticetus
```

This saves all their data to the local Google Drive folder in a structured format that includes date and time. When connected to the internet, data is automatically backed up to Google Drive for them. (they also have additional manual backup protocols for USB hard drives in the office, their own internal Sharepoint server, etc.). You can also use %OneDrive% or %DropBox%.

2. Set the Auto-Save time interval to something. We like 15 minutes but you can try 30 or 60 or whatever.

3. Create a shortcut (I like putting it on the desktop) that includes the /Save command line parameter. This tells Mysticetus: Hey, we're Flying Now! Do the Auto-Save Thing!

Of all of these, (3) is the one that trips non-computer-nerds up the most. You may want to seek help there if you're not familiar.

This serves as another layer of data protection – you quite literally never know when a computer's hard drive will fail, it could happen *now...or now...or next week...*

This option allows you to recover your data from the thumb drive when this happens. Use of a low form factor thumb drive is highly recommended. Name the thumb drive volume: Mysticetus. This is outlined in the introduction chapters at the beginning of this document.

. In your template settings, make sure the Auto-Save Path is set to something. I like things that make use of %Date% and %Time%. For example:

```
%GoogleDrive%\Saves\2017\%Date%\Project - %Date%-%Time%.Mysticetus
```

This will do a bunch of things, including finding your Google Drive folder (i.e. even more backups to the cloud when you connect to the internet - you can never have enough backups!), and then organizes your saves by Date. This also names the files with Date and Time. An example set of Auto-Save filenames for the above will be something like:

```
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1342.Mysticetus  
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1357.Mysticetus  
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1412.Mysticetus  
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1427.Mysticetus
```

[note every 15 minutes in this example...]

```
=====
```

When you are using Auto-Save, there is no need to save the file. EVER. Mysticetus just does it automatically. In addition, when you exit Mysticetus (our perfect storm!) Mysticetus **will** ask you if you want to save the FINAL or not. If you choose YES, Mysticetus will save a file named (per the example)

```
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1431 - Final.Mysticetus
```

If you choose NO, Mysticetus will save a file without the word "Final" in it before exiting. Either way, it saves on exit because, hey, it is "Auto" :-)

```
C:\Users\Mysticetus\Google Drive\Saves\2017\2017-04-02\Project - 2017-04-02-1431.Mysticetus
```

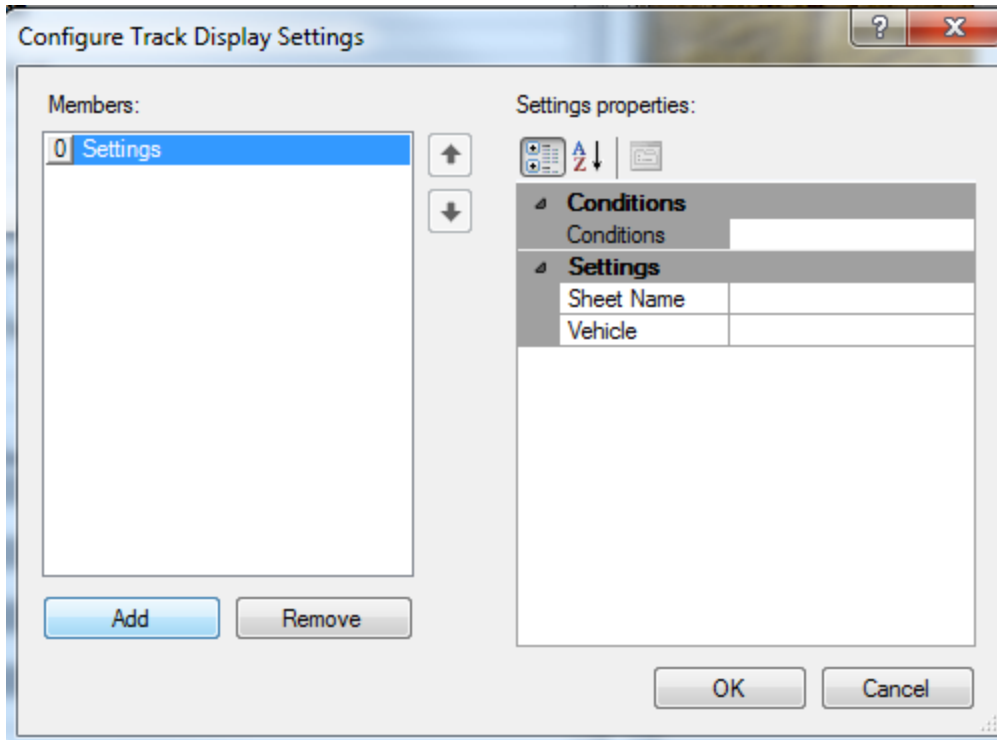
4.1.26 Tracking – Default Tracking Interval

If enabled, specifies the default tracking interval applied whenever a GPS fix is obtained. Frequency of sampling is up to the user. Typically, 5 seconds for boats and 1 second for an airplane.

4.1.27 Tracking – Track Display Settings

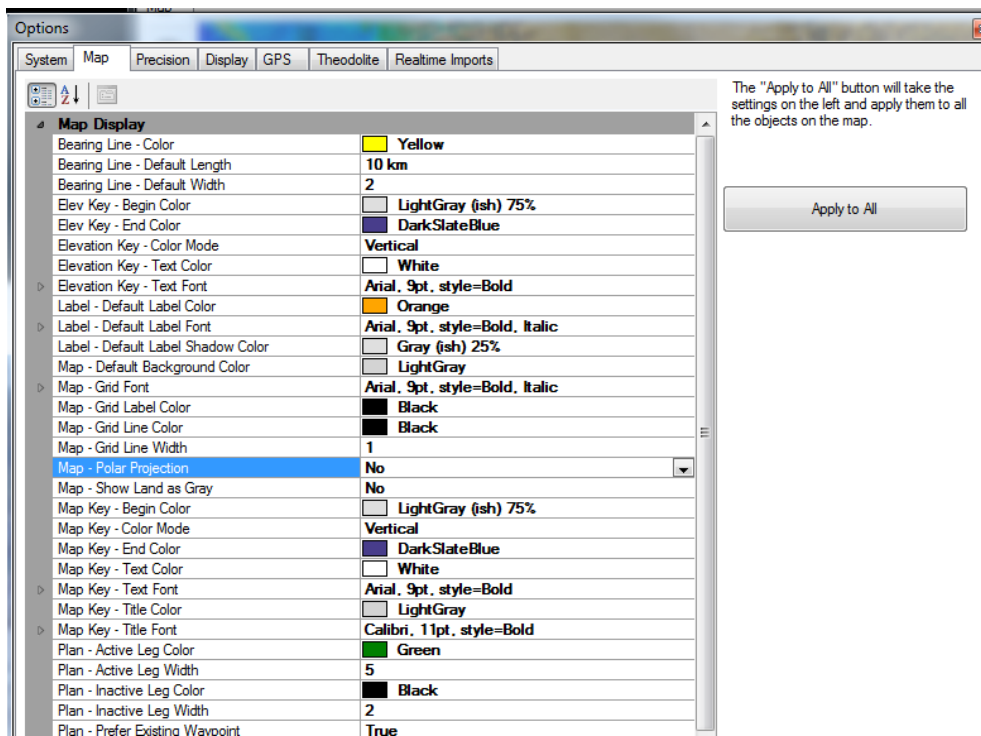
These options control GPS Track line coloring based on entry sheet data, especially targeted to Environmental conditions, but this can actually be based on any Timestamped entry sheet data.

This is discussed in detail in *section 8.3.10 - Track line Coloring.*



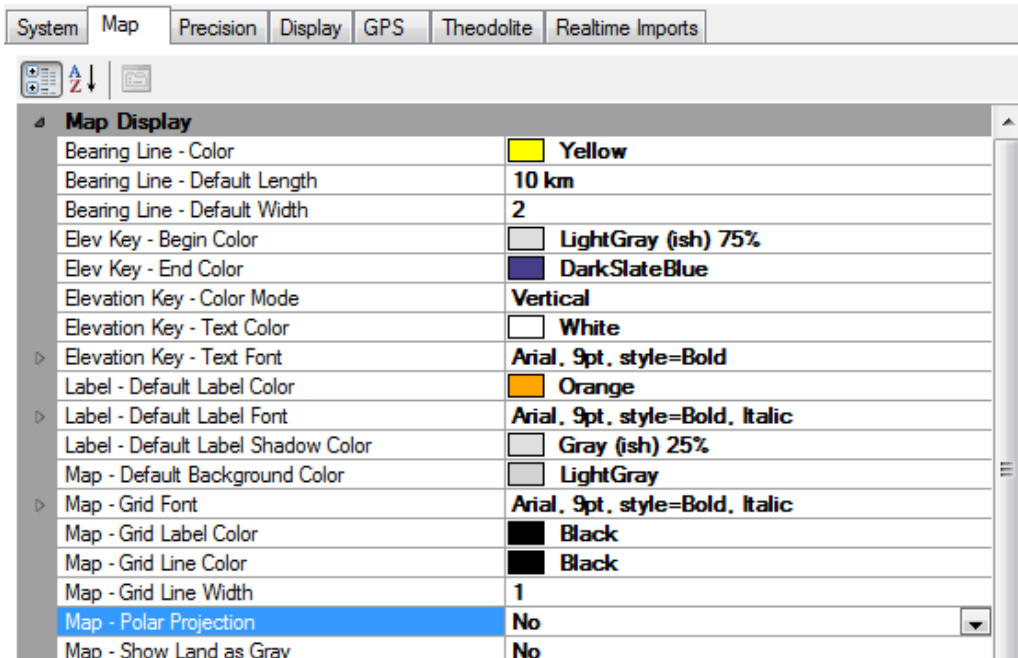
4.2 Map

Map settings control how geo-spatial objects are displayed on the map. There are many many options here. They are generally intuitive in nature, the reader is left to experiment (and email us!) to determine how they want their visual objects (bearing lines, prediction lines, labels, etc) to be displayed.

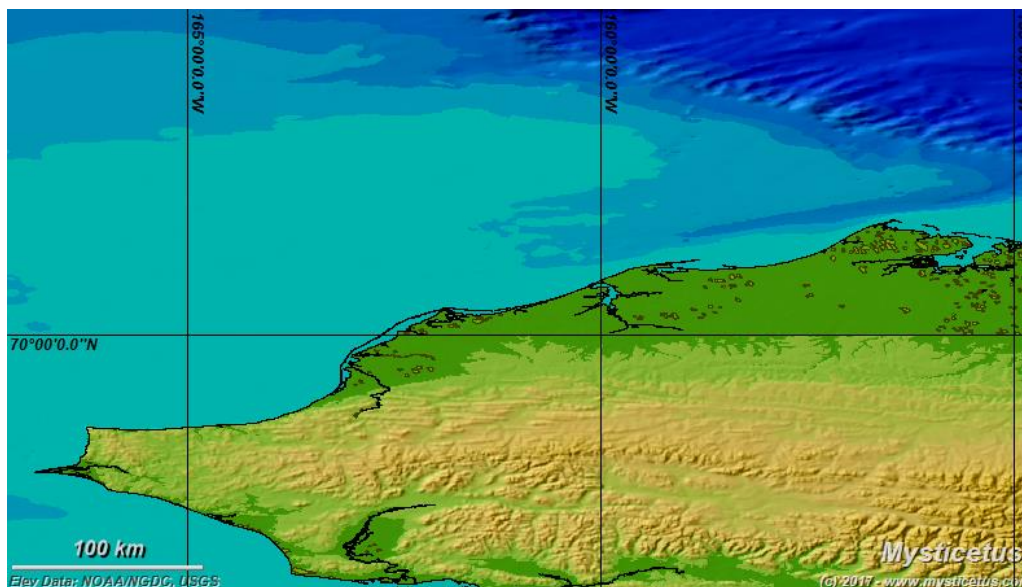


Note that individual objects can be configured separately from the system settings here (by right clicking on them in the map window and choosing "Properties..."). If you press Apply to All, these individual settings will be replaced with the global system settings from this page.

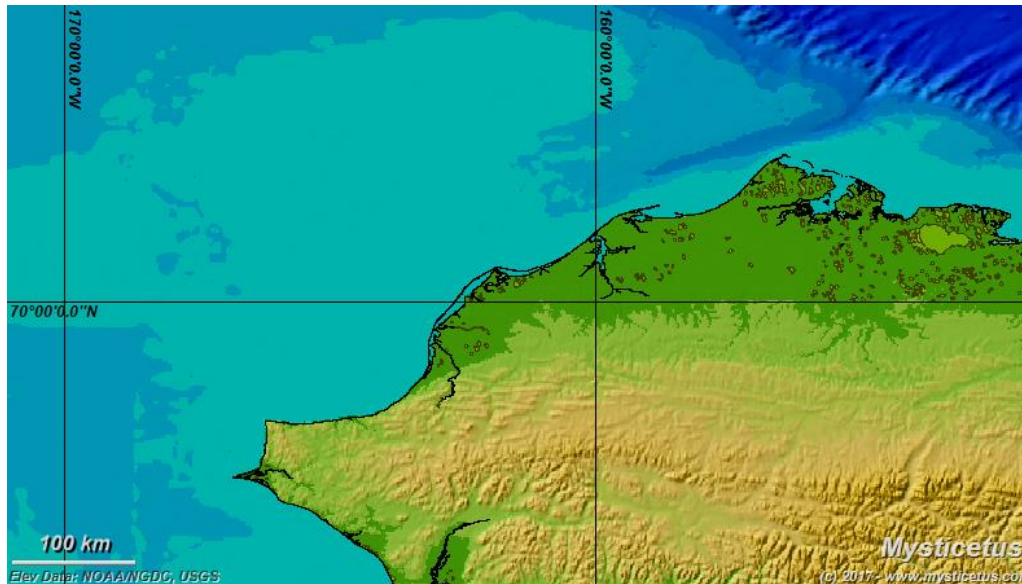
One feature to note: support for a Polar projection mode is provided for. This is a very useful feature for operations in the Arctic. This means your maps are no longer stretched as they were in equi-rectangular or Mercator projections. This is controlled via Settings -> System Options -> Map -> Polar Projection.



Which makes this:



Look like:



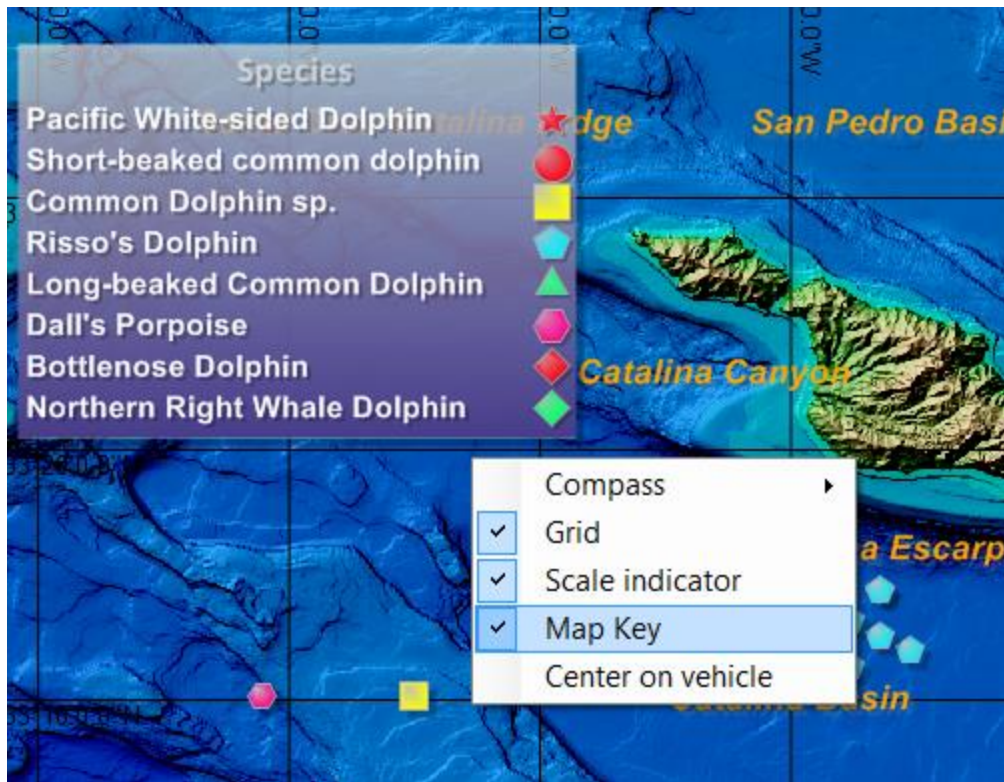
4.3 Species Icons

This is only supported in creating your species list in your template creation. See the button titled 'Default Sighting Format' on the entry sheet editor page (chapter on entry sheets).

Different species can be assigned different icons - shapes, colors and sizes are all configurable.

If you just want to keep all sightings the same icon (shape, size, color) - no sweat. That is configured under **Configure -> System Options -> Map**.

Mysticetus can automatically display different icons for each species! (or any other control field...such as count, or "calves", or whatever). The map key can be turned on by right clicking on the map and choosing the map key option.



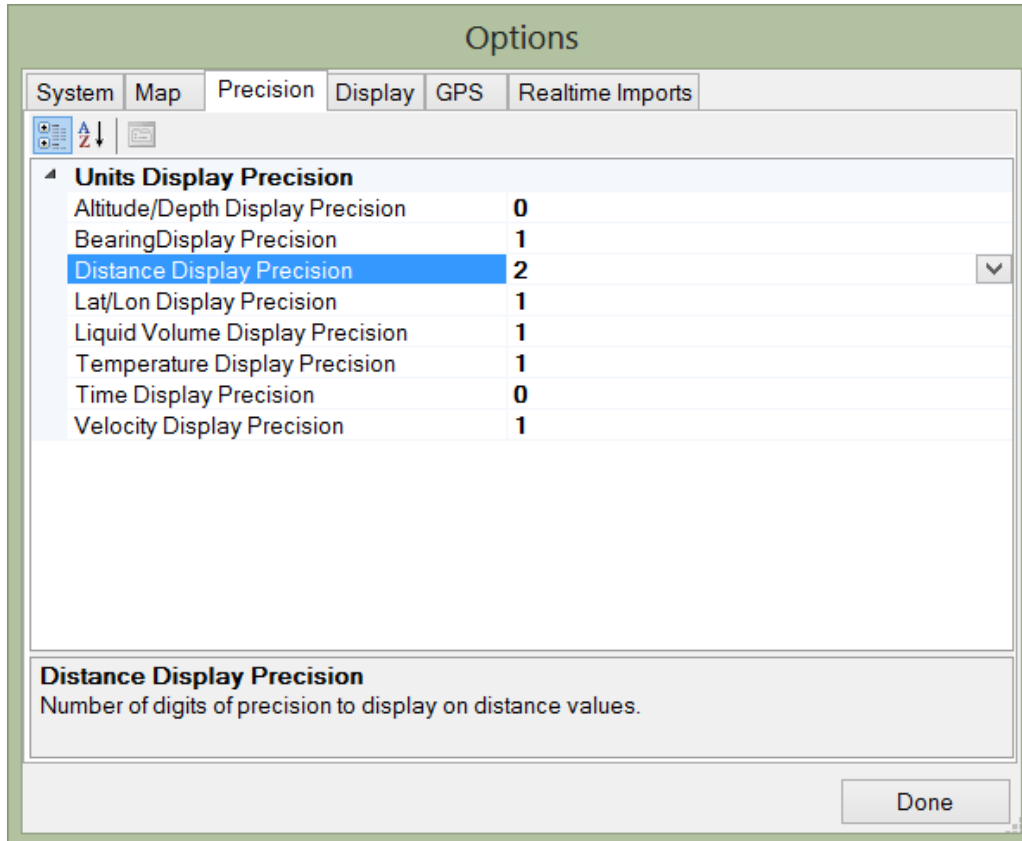
If you want different icon shapes, colors and sizes by species, you need to tell Mysticetus which icon to associate with which species. This is done when configuring the entry sheets. In particular, the setting is associated with the GeoPosition field that defines the Sighting location (makes sense, right? That setting defines where the sighting is plotted on the map, so that also defines how the sighting is plotted)

Choose *Configure -> Entry Sheets*

4.4 Precision

The precision tab controls exactly how many digits of precision are displayed for certain data items:

Pro Tip: Mysticetus stores all data at the highest precision possible for the data type – these settings control how much of that precision is displayed.



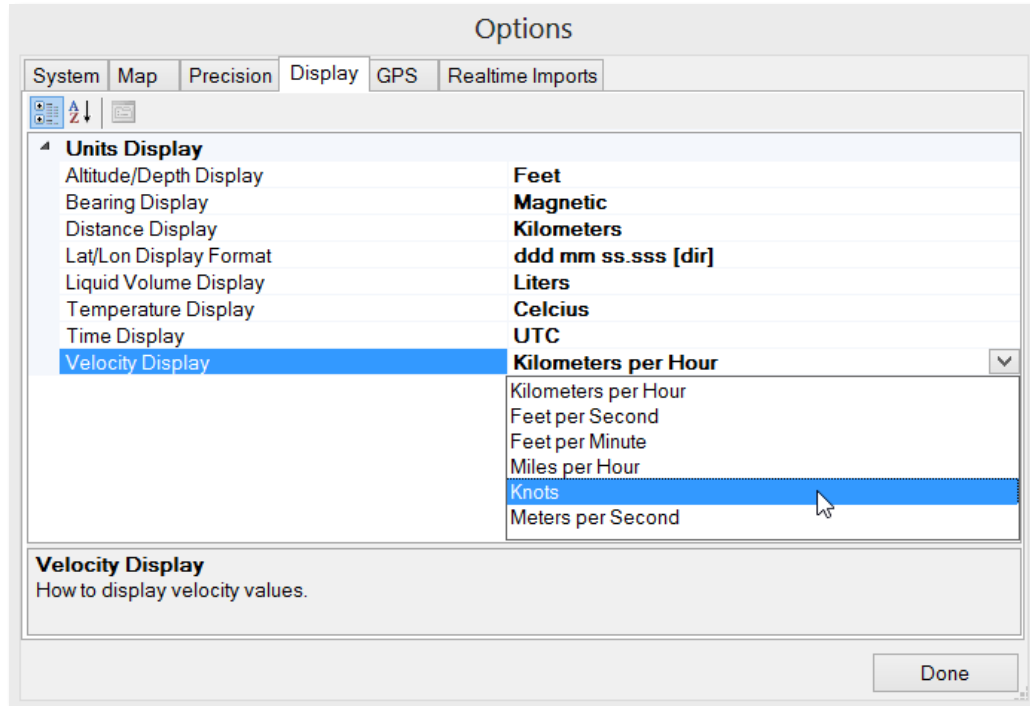
For example, a Distance Display Precision of 2 means Distance values will be display such as “123.45 km” (assuming Distance Units are set to Kilometers; see *section 4.5 - Display*).

Of special note, the Lat/Lon Display Precision setting controls the last item displayed. For example, if set to 1 digit of precision, and Lat/Lon is being displayed as Degree/Minutes, the minutes field will be displayed with 1 digit of precision, e.g. “12 14.2 N”. Conversely, if Lat/Lon is being displayed as Degrees/Minutes/Seconds, the seconds field will be displayed with 1 digit of precision, e.g. “12 14 2.3 N”

4.5 Display

The display tab controls what units are used to display values.

Pro Tip: Mysticetus stores everything internally in Metric (or True in the case of Bearings), and converts as necessary when it needs to display it.

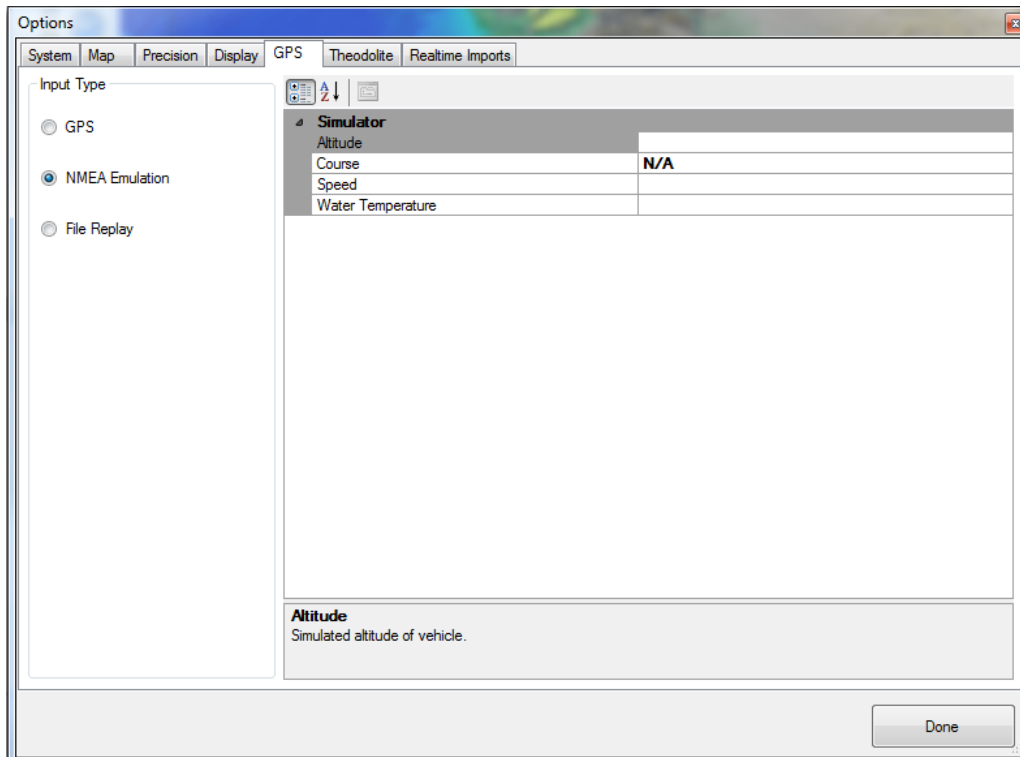


Note that this only applies to values output by Mysticetus (screen, reports, etc.). Input values can be in any format. For example, even if Mysticetus is configured to display distances in Kilometers, you can still enter “123 ft” and Mysticetus will detect that you really meant Feet and convert to the appropriate Kilometer value. Entering a value with a unit (such as “123”) tells Mysticetus to use the display value (“123 km”, in this example).

Of special note is the Bearing display. If set to Magnetic, Mysticetus will use the System Magnetic Variation value, which is either set manually (see *section 4.1.13 - Magnetic Variation*) or possibly set by an attached GPS. Note that many GPS’s do **not** send magnetic variation information – it is important to set this correctly so check your GPS specification for more detail. When in doubt, set the Magnetic Variation manually – if your GPS does send variation information, Mysticetus will assume that is more correct than what you entered.

4.6 GPS

The GPS tab controls where positioning data is coming from



Selecting **GPS** tells Mysticetus to connect to any GPS it finds. There are no configuration options – Mysticetus automatically scans all external ports looking for GPS data and latches on to whatever it finds.

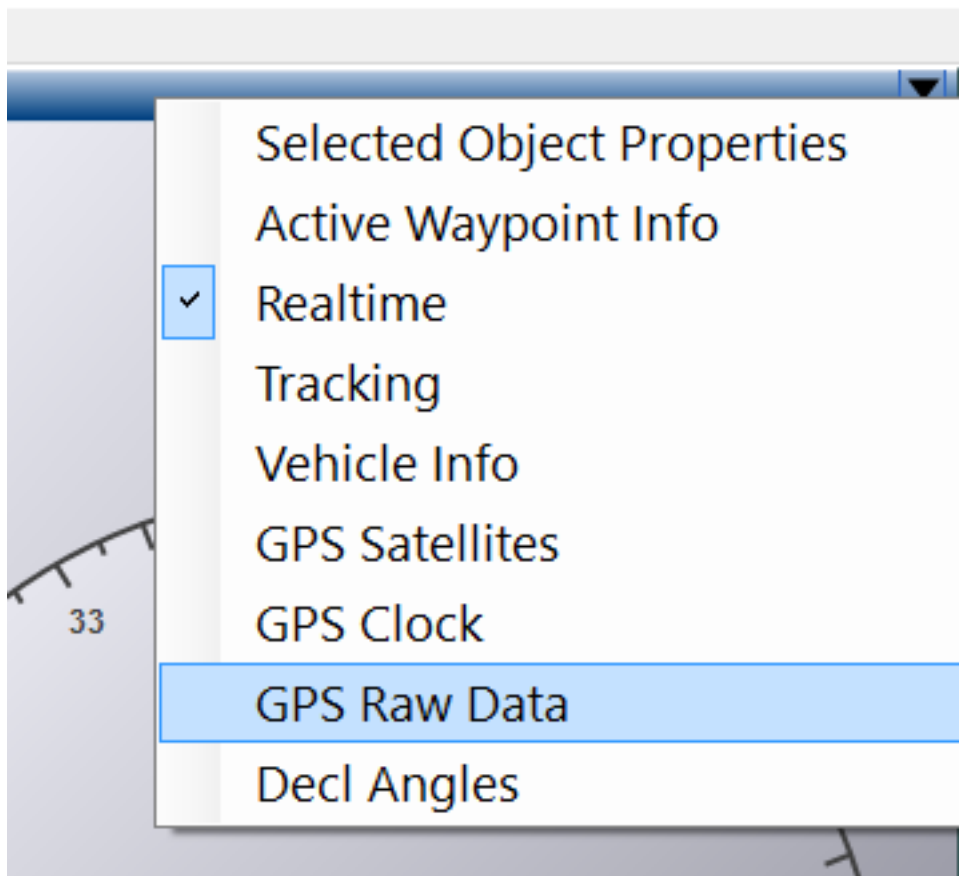
Selecting **NMEA Emulation** causes Mysticetus to run in an emulated fashion. In the above screenshot, you can see how to control the speed, course, starting position, etc.

Selecting **File Replay** will prompt for a text file containing NMEA 0183 strings to feed into the system. You can also set the rate at which the strings are parsed.

Mysticetus looks for NMEA data coming in from any USB (or old-school serial) port. It won't start looking, however, until a template file is loaded, or you click on Detect GPS button on the main page.

Mysticetus will tell you it's status in the bottom of the window - if it finds a NMEA device, it will say something like "GPS detected on COM3". Having detected a GPS may not result in any position data coming in, though - if, for example, the GPS does not have a fix. You can figure out what's going on by selecting the "GPS Raw Data" panel on the right (there is a little down arrow - click it, and choose "GPS Raw Data" to see the raw NMEA data streaming in.

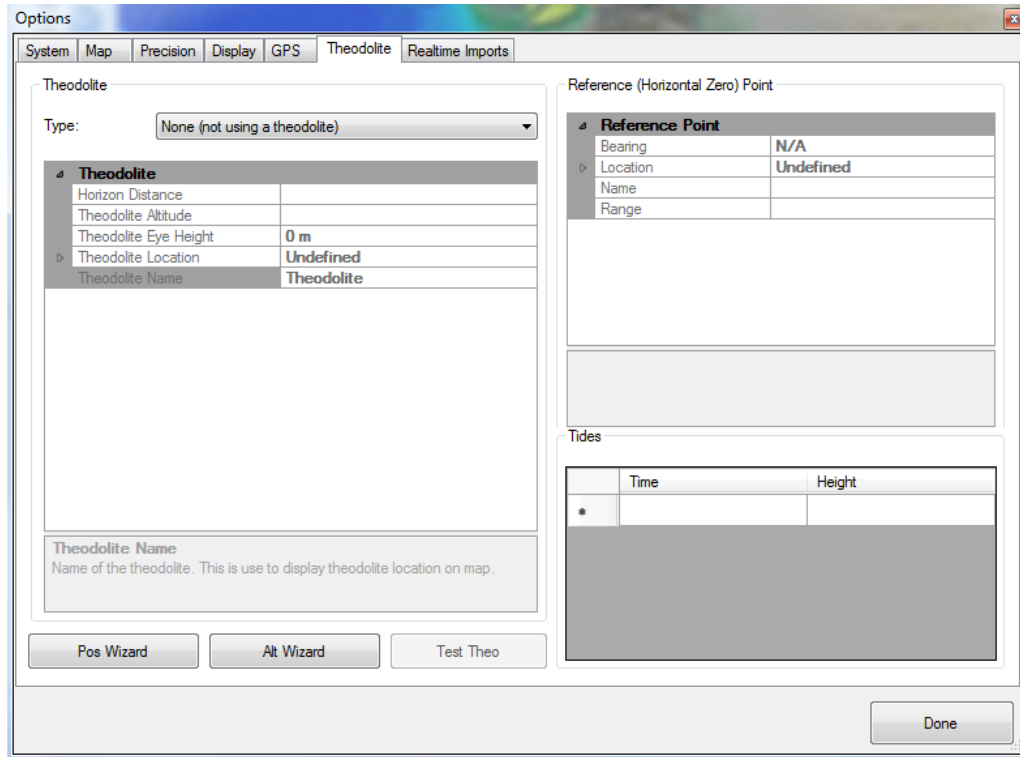
If you choose "GPS Satellites", Mysticetus will provide a bunch of information about the satellites it is seeing. Typically, GPS needs 3 "good" satellites before it can determine your position.



Some troubleshooting steps for GPS units not detected:

- 1) Check cable connection.
- 2) Check batteries (is it on, detecting).
- 3) Try a different USB port on your computer.
- 4) Reboot computer (it is Windows!) as a last ditch try.

4.7 Theodolite

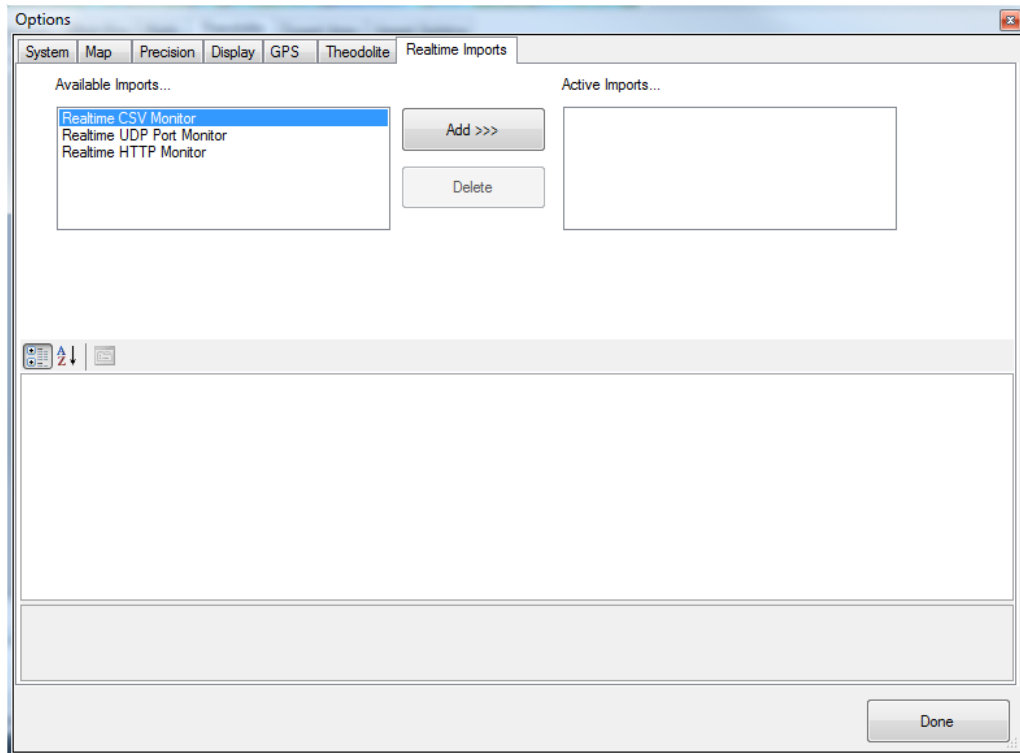


Adds a theodolite to your project. Part of setting up a theodolite includes sighting a known, reference point.

See the chapter on theodolites for more.

4.8 Real-time Imports

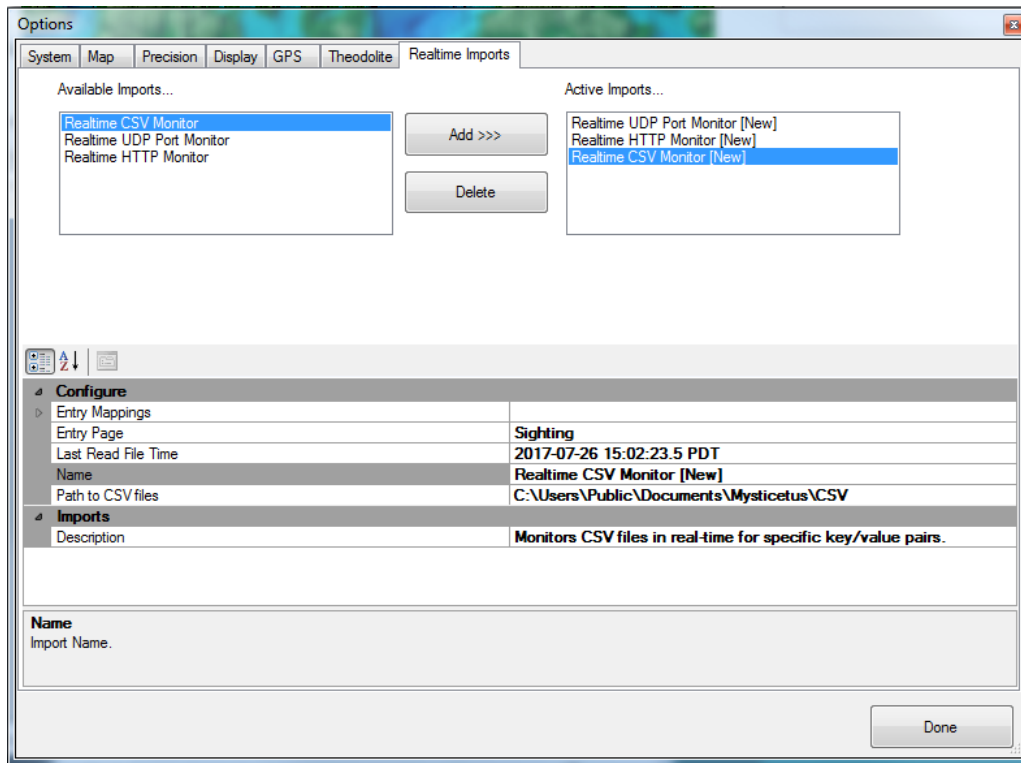
Mysticetus can be configured to import various information in real-time, usually from the output of other applications, including acoustics applications such as *Ishmael*. Real-time imports are **not** the usual way to import historical data into Mysticetus for further analysis – see *Chapter on Data Import* for more information on this topic. Real time imports are only for things expected to change over time. “One-off” items such as shape files via data->import->from shapfile. This does a one time import that you should save in your template.



4.8.1 Real-time CSV Monitor

Pro Tip: Real-time imports are a fairly advanced item – probably a good idea to give Dave a call before attempting to use them. See the next chapter on Data Imports – it is much more likely that’s what you are looking for.

Mysticetus can be configured to monitor a single directory for new CSV files that appear there (written by other applications, or by others across a network share). The contents of these files can be parsed, and data can be entered automatically into the Mysticetus system. This is typically useful in conjunction with PAMGuard.



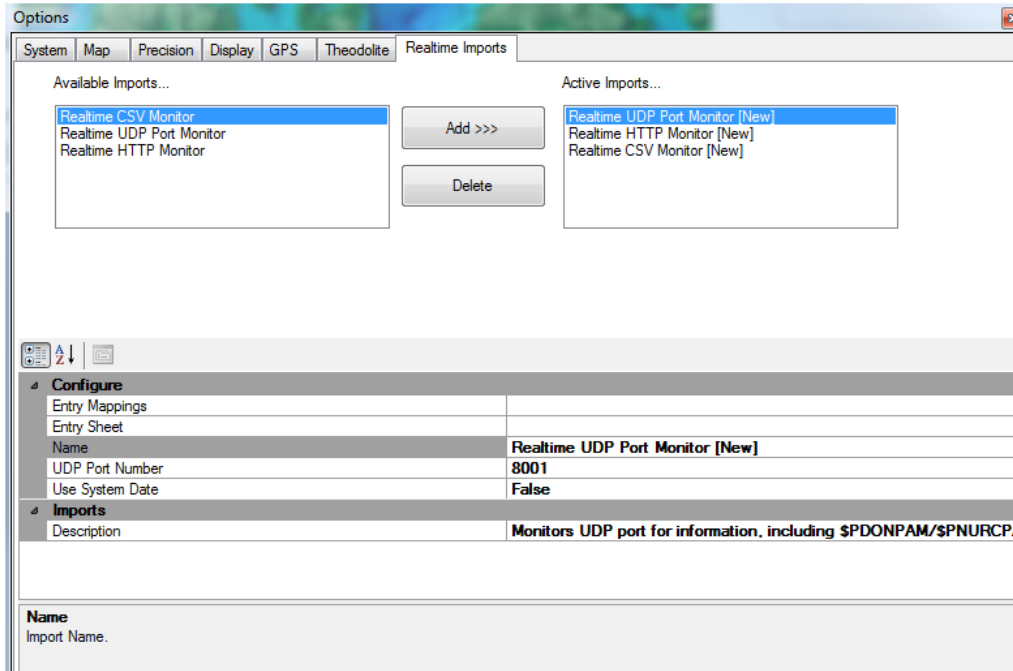
The controls for these imports includes specifying which entry page to add values to, as well as the mappings the data should take (Entry Mappings).

Note: this is **NOT** the general way to import CSV files into Mysticetus – this is intended for real-time data updates from other applications and, as such, is a fairly involved and complex operation. Chances are good this is not the Import function you are looking for.

To import pre-existing CSV data into Mysticetus, see Chapter 10 - Data Import.

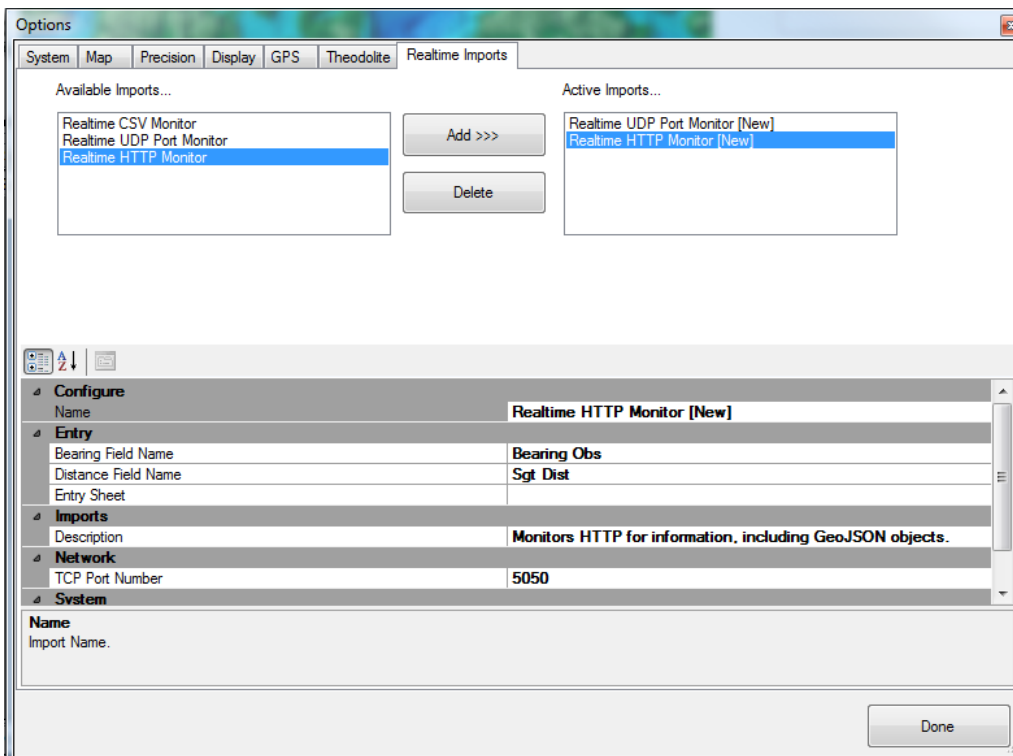
4.8.2 Real-time UDP Monitor

This allows you to use UDP to forward NMEA strings to Mysticetus.



4.8.3 RealTime HTTP Monitor

This feature allows Mysticetus to receive GeoJSON objects from compatible infrared cameras then displays alerts and embeds the media into sighting records.



5 Entry Manager - Template Management

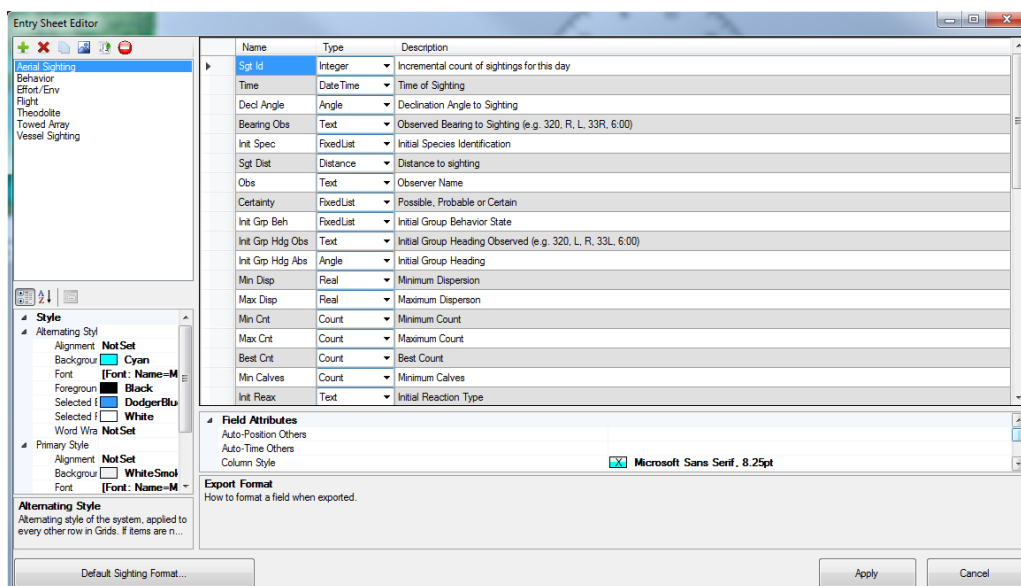
The Entry Manager is where you define your template. This dictates what data is collected, how data is collected and what data is automatically updated. There are no restrictions on data types or names or amounts – everything is at YOUR discretion and determination.

Entry Manager is the place to control exactly what data Mysticetus collects. Text fields, date/time fields, count fields, angle fields, geo-position fields and so on are all defined here. There are a few restrictions such as not having two entries of the same name on a given page so pay attention!

Entry Manager is accessed via clicking on the globe – Globe/configure/Entry Sheets. Exit via clicking the Done button in the lower righthand corner.


Here is an example of the Entry Manager with a sample Mysticetus template file loaded. The Aerial Sighting sheet is highlighted so that is what is being edited in this example.

Let's dive into more detail about each of the options available.




5.1 Sheet Management


In the top left are several icons that control the creation of pages. Pages in Mysticetus are always displayed in alphabetical order, so if you want to move pages around, you need to name them appropriately.

 - Add a new page.

 - Deletes a page.

 - Copies a page. A copy of the currently selected page will be created.

 - Renames the currently selected page.

 - Clears data out of the currently selected page. A page layout can only be changed when there is no data associated with (recorded in) the page. Note that clearing the data cannot be undone so make sure you have saved the data before you clear it from the page.

Press Alt+first letter of sheet name to easily switch sheets. If multiple sheets start with same letter press the Alt+letter repeatedly to switch between those.

NOTE: Mysticetus attaches special meaning to the first (leftmost) DateTime field in a sheet. Whether hidden or visible, this leftmost DateTime field is assumed to be the "relevant" date/time for a record. For example, in a Sightings sheet, the leftmost DateTime field is assumed to be the date/time of sighting for reporting and GPS track localization purposes. As another example, in an environmental or effort sheet, the leftmost DateTime field is assumed to be the date/time effort state or environmental condition changed. This leftmost DateTime field rule applies to situations ranging from reporting to track coloring.

5.2 Fields

Over on the right side of the Entry Manager are the field Description or definitions:

	Name	Type	Description
▶	Sgt Id	Integer	Sighting Id
	Time	DateTime	Date/Time of sighting (auto-entere
	Ind Behavior	Text	Individual Behavior Event
	Individual	Text	Individual
	Behavior State	Text	Behavior State
	Hdg	Angle	Group Heading
	Min Disp	Real	Minimum Dispersal
	Max Disp	Real	Maximum Dispersal
	Notes	Text	Notes
	Decl Angle	Angle	Declination Angle
	Bearing Angle	Angle	Bearing Sighting
Field Attributes			
	Alignment		Not Set
	Auto-Position Others		
Alignment			
How a particular column should be aligned.			

These field descriptions map 1:1 to what is displayed on the data entry form (see *chapter on Data Entry*) as clues to the PSO on what that field definition is.

Behavior	Difar	Effort/Env	Flight	Sighting	Vessels			
	Sgt Id	Time	Ind Behavior	Individual	Behavior State	Hdg	Min Disp	Max Disp
▶	0	2012-0...	Blow	Left	Fast Travel	280°	1	1
	0	2012-0...	No Blow Rise	R	Fast Travel	290°	1	2
*								

Each Name field must be unique within the context of a sheet; the same name can appear on different sheets, but only once on a given sheet. This name will be used as a column heading on the Data Entry form.

These data items can be dragged and dropped into new orderings, they can be deleted by clicking on the row header (on the left) and pressing the Delete key. New entries are created by entering them at the bottom of the list and then (optionally) dragging and dropping them where you want them.

5.3 Field Types

Each column can contain a single type of data, one of the following: This is controlled by pulling down the Type dropdown.

Name	Type	Description
Sgt Id	Integer	Incremental col
Time	Integer	Time of Sighting
Decl Angle	Real	Declination Ang
Bearing Obs	Boolean	Observed Beari
Init Spec	FixedList	Observed Beari
Sgt Dist	Distance	Initial Species k
Obs	DateTime	Elevation
Certainty	Elevation	Distance to sigt
Init Grp Beh	GeoPosition	Angle
	Count	Observer Name
	Text	Possible, Proba
	Velocity	Initial Group Bel
	Media	Temperature

There are fourteen different data types that can be represented in Mysticetus:

5.3.1 Angle

Contains an angle ranging from 0-360 degrees. In the data sheet, several options are available for the user to enter angles, including Left or Right, which maps to 90 degrees left and right of the current GPS heading, as well as explicit offsets from the current heading. Absolute angles can, of course, be entered directly as well (e.g. 278).

5.3.2 Boolean

Represents True or False values. On the data entry sheet, it will be presented as a checkbox. Checked is True.

5.3.3 Count

Contains a positive integer. For example a count of 4 Bottle Nose Dolphins.

5.3.4 Distance

Contains a distance. The distance will be formatted as specified in the System Options (**Configure->System Options->Display**). See *section 4.5 - Display* for more information on Display Options.

5.3.5 DateTime

Contains a date/time stamp. In the data sheet, this field can be automatically entered by Mysticetus (see *Chapter 7 - Formulas*), or the user can enter an explicit date/time. The user can also type 'x' or 'now' and Mysticetus will enter the current local date/time.

Mysticetus attaches special meaning to the first (leftmost) DateTime field in a sheet. It is assumed this is the "relevant" date/time for a thing (sighting, environmental, etc.). This leftmost field is assumed to be the timestamp for a sighting.

Keep your DATE field somewhere right of your ID field (which itself is kind of an interesting name to give to Sighting Time...but whatever). Mysticetus will then use the ID field as the date/time to trigger calculations (insert in tables along tracklines, etc.).

5.3.6 Elevation

Contains an elevation (positive) or water depth (negative) value. The value will be formatted as specified in the System Options (**Configure->System Options->Display**). See *section 4.5 - Display* for more information on Display Options.

5.3.7 FixedList

The user must select from a fixed list of items. The contents of the list are found in the Fixed List attribute of this entry.

5.3.8 GeoPosition

Contains a Latitude/Longitude/Altitude triplet - although in the data sheet, only the Latitude and Longitude will be displayed. Like a DateTime entry, this can be automatically entered by Mysticetus via a number of Formulas (see *Chapter 5 - Formulas*).

5.3.9 Integer

Contains whole numbers. 0, 13, 42, -256, 8834773 are examples.

5.3.10 Media

Enter photographs/videos. Mysticetus can embed all pictures related to a sighting inside the sighting record, stored in the Mysticetus file. Putting a media field in your row shows a little camera icon for each sighting. Click the camera icon to embed photos (jpg or png) - with optional size and quality reduction - with each individual sighting.

5.3.11 Real

Contains real numbers. 0.0, 159.123, 5.725, 14.2 are examples.

5.3.12 Temperature

Measured temperature (water, atmospheric) either manually or via NMEA measuring device.

5.3.13 Text

Contains any text. This field can be further modified to use an auto-complete list (see *section 5.5.4 - Auto-Complete List*) which makes data entry significantly easier and requires fewer keystrokes by data recorders in real-time.

5.3.14 Velocity

This can be an airplane or vessel speed from a NMEA-capable GPS, or a calculated speed of a sighting based on re-sight time and distance traveled.

5.4 Field Descriptions

The Description field contains a description or hint to the person who records the data.

Description
Date/Time of this record
Leg type being flown
Whether or not the Navy redirected this leg.
On, Off or Compromised
On when at 1000', observers on effort.
Left Beaufort (0 to 8)
Left Glare (0=None, 1=Diffuse, 2<10%, 3<50%, 4<75%, 5>75%)
Left Distance to see 25 Dolphins
Right Beaufort (0 to 8)
Right Glare (0=None, 1=Diffuse, 2<10%, 3<50%, 4<75%, 5>75%)
Right Distance to see 25 Dolphins

When entering data in a data sheet, Mysticetus will display the Description as a hint in the Status Bar:

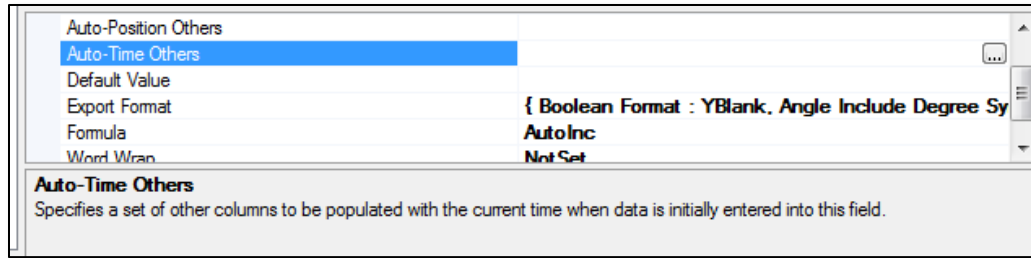
Pro Tip: Be careful how much text you put in the description – small screens may not be able to show it all in the Status Bar

Behavior	Dfar	Effort/Env	Flight	Sighting	Vessels							
	Time	Type	Navy Redirect	Observation	Line xsect	LBl	LGlare	LVs	RBl	RGlare	RVs	Cloud Co
	2012-0	System	<input type="checkbox"/>	On	On	2	2	3 k	2	1	2 k	30

Left Glare (0=None, 1=Diffuse, 2<10%, 3<50%, 4<75%, 5>75%)

5.5 Field Attributes

Additional Field Attributes are controlled down below the field list, and will contain the properties for the selected field.



Some properties only apply to certain field types. Note that selecting a field property will also display a helpful hint about the property. In the above example, basic information about the “Auto-Time Others” property is displayed.

Available properties:

5.5.1 Alias List

Contains a list of alias values that can be used to simplify data entry. This is a list of 1:1 mappings of shortcut to full value. For example, one might map “bw” to “Blue Whale” and “fw” to “Fin Whale”. Mysticetus will map the shortcut (alias) directly to the full value when the shortcut is entered in the data entry sheet cell. Mysticetus will also display the list of aliases in the status bar as an additional hint to the person entering data.

5.5.2 Alignment

Describes how the field values are aligned in their cells. Leaving this as the default (Not Set) will use the default formatting for this data type.

5.5.3 Angle Type

Only available on Angle fields. Can be set to Degrees or Reticles. If set to Reticles, the System Reticle conversion factor will be applied to anything entered in this field (**Configure->System Options->System->Reticle**)

5.5.4 Auto-Complete List

Contains a pre-populated list of auto-complete terms. For example, this may contain a list of common terms for animal behavior. When the data entry person enters the first few letters of the behavior, a list will drop down with appropriate matches for those letters.

5.5.5 Auto-Complete Source

Specifies that anything typed into this cell will be added to the Auto-Complete List for this cell.

5.5.6 Auto-Position Self

Only available in a GeoPosition cell – enters the current GPS position (or fixed position – see *section 4.1.21 - Obs Platforms - Observation Platform*) in this cell when a new row is added. (*note: generally this behavior is not what you want, as it immediately stamps the position as soon as a new row is created – use Auto-Position Others instead*)

5.5.7 Auto-Position Others

When data is entered into the current cell, Mysticetus will populate the list of other columns with the current GPS position (or fixed position – see *section 4.1.21 - Obs Platforms - Observation Platform*).

5.5.8 Auto-Time Self

Only available in Date/Time fields. When True, any time a new row is created this field will be immediately stamped with the current Date and Time. (*note: generally this behavior is not what you want, as it stamps the time as soon as a new row is created – use Auto-Time Others instead*)

5.5.9 Auto-Time Others

When data is entered into the current cell, Mysticetus will populate the list of other columns with the current time.

5.5.10 Default Value

If specified, any time a new row of data is created the default value will be applied.

5.5.11 Export Format

Includes some additional hints about how to export this data (see *chapter 11 - Data Export*).

5.5.12 Formula

A more complex way of controlling behavior in this cell. This is actually where a significant amount of Mysticetus' functionality is defined. Definitely read *chapter 5 - Formulas*.

5.5.13 Waypoint

Only available on a GeoPosition cell – will create a mapping waypoint at the position on the earth specified by the cell contents (see *chapter 8 - Mapping*). The value of the formula's single parameter also specifies the name of the waypoint as displayed on the screen. The name is constructed from the contents of named columns. For example, "[ID] – [Species] – [Time]" will create a waypoint with a name something like "17 – Blue Whale – 12:13:14 PST" (assuming those were the values of the ID, Species and Time fields for that record).

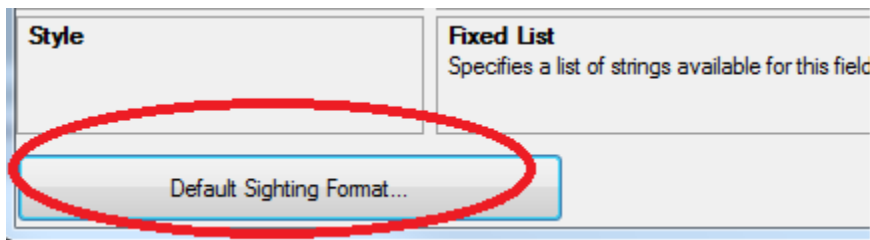
5.5.14 Word Wrap

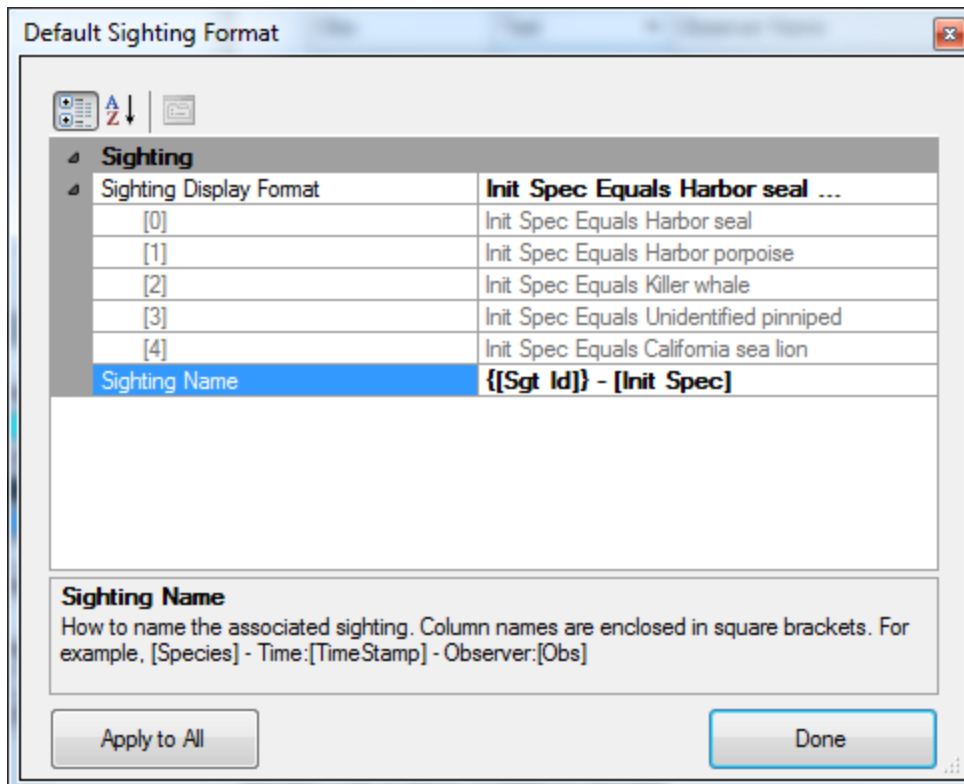
Whether or not to wrap contents of this cell if the data exceeds the cells horizontal bounds.

Pro Tip: Auto-Time Self and Auto-Position Self are rarely used. It can become inconvenient to have time and position stamp values entered the instant the cursor moves into a new record. Rather, the selected use of "auto-time others" and "auto-position others" is a more powerful way to time/position stamp a field when actual data entry begins.

5.6 Default Sighting Format

This button defines how or the shape and color a sighting will appear on the screen to the PSO.





6 Data Entry

Without data, Mysticetus is just a cute little application that shows you pretty pictures of the earth.

Entry of data happens in a few different fashions, either by importing data from another source (see *Chapter 10 - Data Import*) or by manually entering data while in the field. This chapter addresses the latter case.

Data entry starts by defining the Entry Sheets in the Entry Manager (see *chapter 3, Entry Manager and section 2's discussion on Sample Templates*). Once defined, entering data is a simple matter of selecting a cell and typing in the data. All fields can be typed into, although many fields will be automatically calculated by other fields. In the picture below, the Sighting tab is set up such that the declination angle and bearing angle are entered by a human, but the Sighting Distance (and, off screen, the Sighting Position) are automatically calculated by Mysticetus (see *Chapter 4, Formulas*).

Behavior	Difar	Effort/Env	Flight	Sighting	Vessels	Map		
	Sgt Id	Time	Decl Angle	Bearing Angle	Sgt Dist	Obs	Init Spec	Ce
	12	2012-0...	18°	325.4°	0.68 k	Bemd Würsig	Fin/Bryde's...	10
	13	2012-0...	52°	325.4°	0.27 k	Bemd Würsig	California S...	10
	15	2012-0...	61°	209.8°	0.3 k	Christina Go...	Fin Whale	10
	16	2012-0...	52°	28.4°	0.36 k	Bemd Würsig	Mola	10
	17	2012-0...	42°	211.5°	0.42 k	Bemd Würsig	Common D...	90
	19	2012-0...	48°	32°	0.4 k	Bemd Würsig	small dolphi...	10
	20	2012-0...	65°	30.2°	0.32 k	Bemd Würsig	Common Bo...	95

Behavior	Difar	Effort/Env	Flight	Sighting	Vessels			
	Time	Type	Navy Redirect	Observation	Line xsect	LBft	LGlare	LVis
	2012-0...	Wheels Up	<input type="checkbox"/>	Off	Off	0	0	0 k
	2012-0...	Overland	<input type="checkbox"/>	Off	Off	0	0	0 k
	2012-0...	Transit	<input type="checkbox"/>	On	On	1	2	2 k

6.1 Sheet Navigation

Navigating around the sheets is very straightforward and follows all standard Windows conventions. You can click on any cell with the mouse and start typing. When in editing mode for a particular cell, all standard text editing rules apply.

Effort/Env	Flight	Sighting	Vessels	Map
Time	Decl Angle	Bearing Angle	Sg	
2012-0...	18°	325.4°	0.6	
2012-0...	52°	325.4°	0.2	
2012-0...	61°	209.8°	0.3	
2012-0...	52°	28.4°	0.3	
2012-0...	42°	211.5°	0.4	
2012-0...	48°	32°	0.4	
2012-0...	65°	30.2°	0.3	

(note the cursor in the 211.5 entry). This includes Copy and Paste, arrow keys, etc.

When not editing a cell, you can use one of the following keys to navigate around the cells:

- Enter/Right Arrow – Moves the selection to the cell to the right.
- Down Arrow – Moves down. If you are at the last item in the list, a new item is automatically created and the cursor moves down there.
- Up Arrow – Moves up.
- Left Arrow – Moves left.

There are a few subtleties to be aware of, though. If you are editing a cell, pressing the right arrow past the end of the text will move the cursor to the next cell to the right. Similarly, pressing the left arrow when the cursor is at the start of text will move to the cell to the left.

6.2 Special Entries

Certain value types allow for built-in shortcut keys – that is, you don’t need to configure these keys as aliases in the Entry Manager. Hints about these built-in shortcut keys will show up in the status bar when a cell is selected, in addition to whatever Description was entered in the Entry Sheet Editor for this cell. For example, the following shows the additional built-in shortcut for DateTime values – you can enter the word “now” or a simple “x” and Mysticetus will stamp the entry with the current date/time:

Behavior	Difar	Effort/Env	Flight	Sighting	Vessels
	Sgt Id	Time	Ind Behavior	Individual	Behavior
	4	2012-03-31T15:21:26	Breach	1	Surface A
	4	2012-03-31T15:21:34	Blow	2	Surface A
	4	2012-03-31T15:22:39	Spin	2	Surface A
	7	2012-03-31T15:47:14

Date/Time of sighting (auto-entered) - ("now" or "x" will stamp with current time)

In addition to DateTime values, there are built-in shortcuts for Angle cells:

Behavior	Difar	Effort/Env	Flight	Sighting	Vessels
	Sgt Id	Time	Decl Angle	Bearing Angle	Sgt Dist
	1	2012-0...	9°	16.7°	2.24 k
	2	2012-0...	30°	217.5°	0.59 k
	3	2012-0...	40°	217.4°	0.44 k
	4	2012-0...	10°	121.6°	0.07 k

Bearing to Sighting - (examples: 33.2, L, R, 33L, 45R, -13, +45)

The available angle formats are:

- Raw angle value such as 332 – this will be entered as typed.
- R or L – this will be entered as the current heading plus 90 and 270 degrees (normalized from 0 to 360), respectively.
- A number starting or ending with R or L, such as 45R, L20 or 33L. If R, the number will be added to the current heading, if L it will be subtracted from the heading.
- A number starting with a plus (+) or minus (-) sign. The value will be added (or subtracted) with the heading. In this sense, plus means Right or heading and minus means Left.

- A clock face value, such as 4:00 or 12:30. The clock face value will be applied to the heading of the vessel or aircraft.

6.3 Units

Units will be converted to the Display settings (**Configure->System Options->Display**) for the appropriate unit type. For example, if distances are currently configured to display kilometers, entering a value of “500 m” in a Distance cell will display a value of “0.5 k”. Available distances types are:

- Meters – e.g. 123 m
- Millimeters – e.g. 1234 mm
- Feet – e.g. 3.45 ft
- Inches – e.g. 12.34 in
- Statute Miles – e.g. 123.4 mi
- Kilometers – e.g. 12.34 k
- Yards – e.g. 1234.5 yds
- Nautical Miles – e.g. 12.34 nm

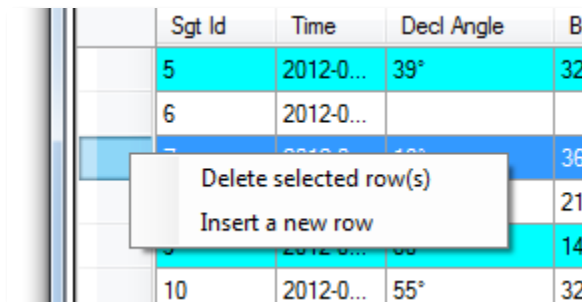
Similarly, GeoPosition cells will display their position according to the Lat/Lon setting. As with distances and other values, entering a GeoPosition can be done in any of the following formats:

- Raw Degrees (west and south are negative) – e.g. 43.2123 -117.340
- Degrees with direction indicator – e.g. 43.2123 N 117.340 W
- Degrees, minutes and fractional minutes – e.g. 43 21.23 N 117 34.12 W
- Degrees, minutes, seconds and fractional seconds – e.g.

43 21 23.23 N 117 34 12.32 W

6.4 Inserting and Deleting Rows

Right clicking on the row header (the gray area off to the left of the row) will pop up the following menu:



From these items you can insert a single new row or delete the selected row(s).

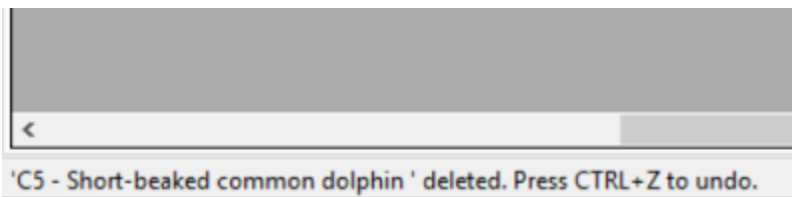
New rows at the bottom of the list can be created by either simply moving to that row via the arrow keys, or by clicking the little plus in the upper left corner:

Behavior	Effort/Env	Flight	Sighting	Vessels
+	Time	Type	Navy	
	2012-Mar-13 17:14:58.0 PDT	Circling		
	2012-Mar-13 17:19:49.0 PDT	Systematic		
	2012-Mar-13 17:22:11.0 PDT	Transit		
	2012-Mar-13 17:37:47.8 PDT	Shoreline		
	2012-Mar-13 17:42:45.0 PDT	Wheels Down		
	2012-Mar-13 17:46:58.1 PDT	Engine Off		
▶	2013-Jan-02 11:26:33.9 PST			

Date/Time of this record - ("now" or "x" will stamp w

6.5 Recovering from an Accidental Row Deletion

All potentially destructive operations, including deletion of map objects, deletion of GPS records, deletion of entry data (including sightings and effort), track mark restrictions (which removes GPS track marks before or after a certain time), etc. are now stored in an Undo Buffer. Press the CTRL and Z keys at the same time and Mysticetus will undo it for you. Whew! Mysticetus will even remind you how to Undo in the status at the bottom of the app:

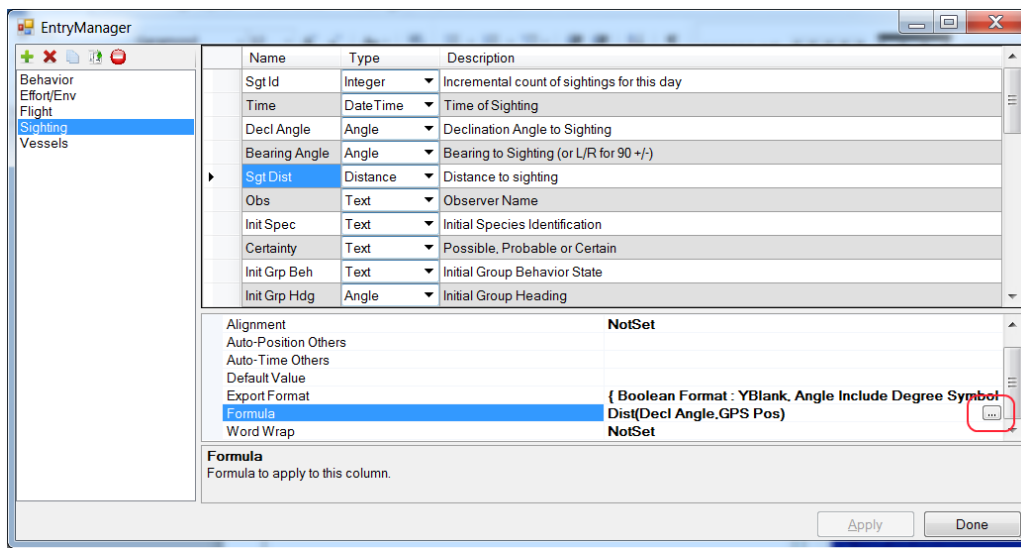


7 Formulas

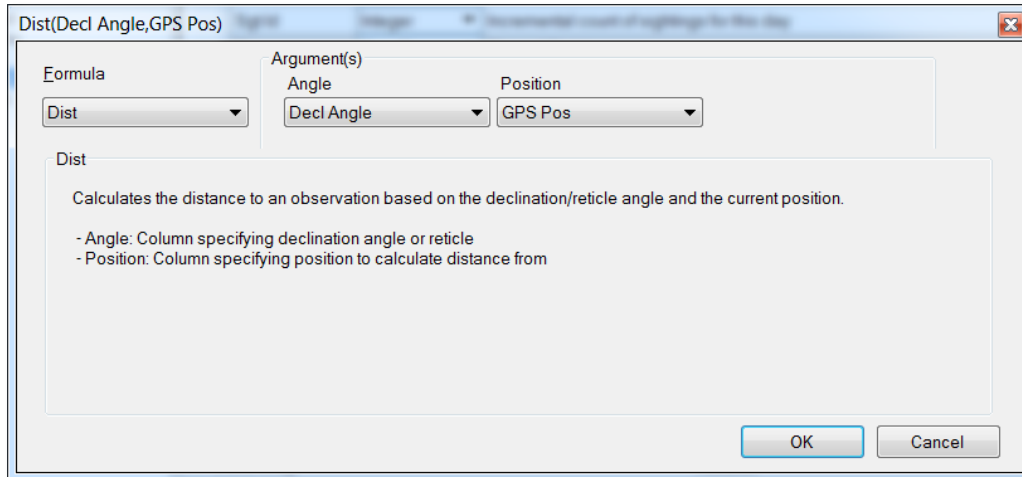
Formulas are the true power behind some of the more complex Mysticetus operations. They compute distance and geo-position of sightings, they turn aircraft and vessel tracking on and off, and they control various automations Mysticetus performs on the data.

Formulas are entered via the Entry Manager (**Configure->Entry Sheets**). Formulas are found as a property on each cell.

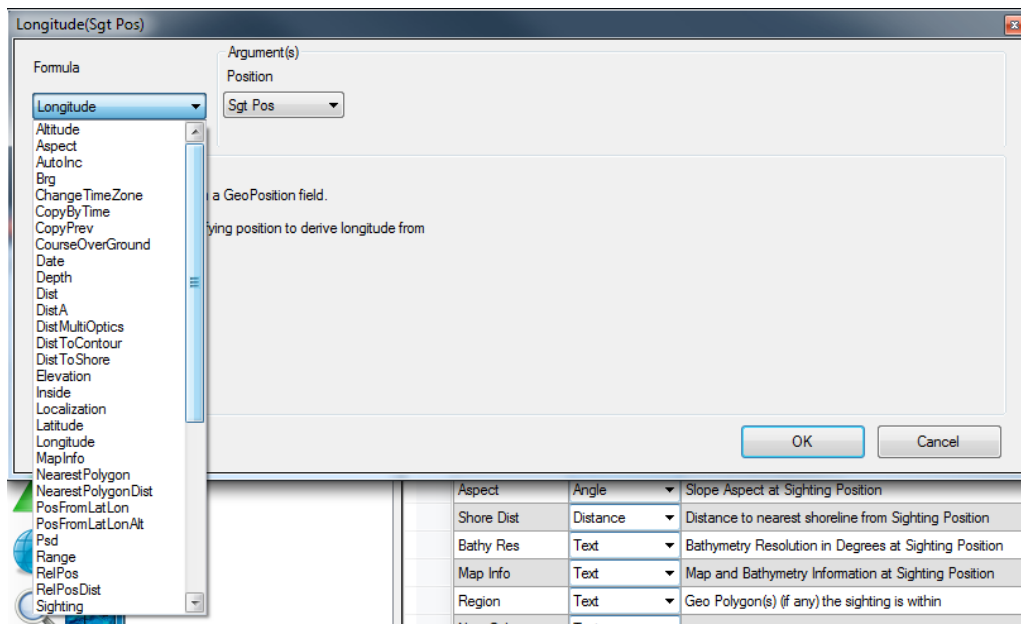
Formulas are edited by either simply typing the formula name (plus arguments) directly into the Formula line, or by opening the Formula Editor by clicking on the ellipses (...) after the formula:



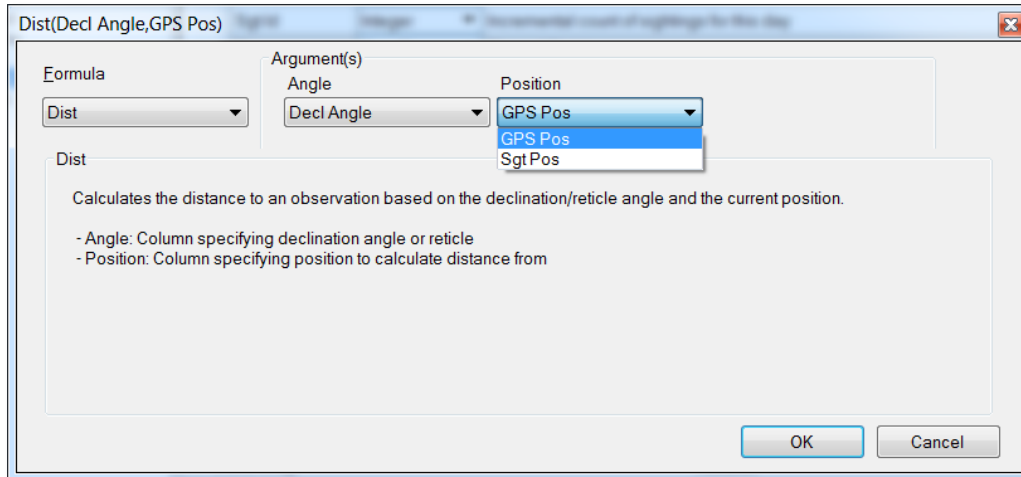
The Formula Editor makes it simple to build formulas.



The formula editor shows the list of possible formulas, and supplies drop-down boxes containing fields that might be appropriate for the arguments.



The formula editor will only display fields that match the appropriate argument type. For example, if a particular argument (Dist, in this case) requires a GeoPosition argument type, it will only display fields that match that type for you to choose from:



7.1 Formula Details

This section contains details about all available formulas.

7.1.1 Altitude

Altitude(Position)

Extracts the altitude component from a Position cell. Position has typically been set from the GPS via the Auto-Position Self or Auto-Position Others attribute (see *section 5.5 - Field Attributes*).

7.1.2 Aspect

Aspect(Position)

Calculates the terrain aspect at the specified Position. Position is typically a sighting location cell.

Aspect is defined as the compass direction a pole perpendicular to the earth surface will point. For example, a “north-facing slope” would have an aspect near 0, a “south facing slope” near 180.

Note that this calculation is only as precise as the highest resolution bathymetry/topographic data installed at Position. Mysticetus uses a 3x3 grid of data surrounding Position to perform the calculation. The more precise the bathymetric data, the more precise the Aspect calculation.

7.1.3 AutoInc

AutoInc

AutoInc attempts to increment the value to a number 1 value higher than any other present in the current column. Non-number values count as zero (so the next AutoInc'd number will be 1). This will assure you get an index number for every entry. Good one to use.

There are no parameters.

7.1.4 Brg

Brg (Bearing, Position)

The Brg formula attempts to parse the textual bearing value found in the Bearing column, and, using the GPS heading at the time the Position value was stamped, convert to an absolute bearing.

For example, entering “33R” in the Bearing column will cause the Brg function to grab the heading at the time the Position was set. Say, for example, this heading was 142 Magnetic. The Brg function will return the value 175 Magnetic (33 degrees to the right of the heading).

The more precise the Aspect calculation.

7.1.5 ChangeTimeZone

ChangeTimeZone (DateTime, Time Zone)

Copies a Date Time entry and changes the Time Zone

DateTime: Column Specifying where to obtain the date/time from

Time Zone: Specifies the new time zone

7.1.6 ClosestPlan

ClosestPlan (Position)

Determines the name of the closest plan to a given Position

Position: Column specifying where to obtain the position from.

7.1.7 ClosestPlan

ClosestPlan (Position)

Determines the leg (1-based index) of the closest plan leg. Use with ‘ClosestPlan’ to uniquely identify the closest plan and leg to a given point

Position: Column specifying where to obtain the position from.

7.1.8 CopyByTime

CopyByTime (Time, Sheet(other), Time (other), Property(other))

CopyByTime allows copying by value from a cell in an entirely different sheet into the current sheet, based on time matching.

Time: column specifying the time field for this sheet

Sheet (other): Name of another entry sheet to copy information from

Time (other): Column specifying the time field in the other sheet

Property (other): The property in the other sheet to copy to this sheet

7.1.9 CopyPrev

CopyPrev

The CopyPrev function simply copies the previous entry in this column down from the previous row.

CopyPrev has no parameters.

7.1.10 CourseOverGround(Time)

CourseOverGround (Position)

Calculates the vehicle course over ground from a specified GeoPosition.

Position: Column specifying where (GeoPosition) to obtain vehicle course over ground.

Pro Tip: Talk directly with Dave before you even think of using the DifarBrg formula. It is very specific to its task and requires a lot of setup in the entry sheets to function properly.

7.1.11 Date

Date (DateTime)

The Date formula extracts a date from a Date Time field.

DateTime: Column specifying where to extract the date from.

7.1.12 Depth

Depth (Position)

Calculates the bathymetric depth at a position. Relies on map data.

Position: column specifying where (GeoPosition) to obtain depth.

7.1.13 DifarBrg

DifarBrg(Channel, WaypointPos)

~~This formula is very specific to dealing with reading bearings from directional sonobuoys. This function will match a channel id to a previously entered drop id. When found, the position of the drop id (WaypointPos) will have a new bearing line added to the map.~~

7.1.14 Dist

Dist(Angle, Position)

Dist calculates the distance to a sighting based on declination angle and a position. Typically Position is set via Auto-Position Self or Auto-Position Others. If the column specified for Angle has the Reticule attribute set, the System Reticule conversion value will be applied (**Configure->System Options->System**). Otherwise Angle is assumed to be a declination angle.

7.1.15 DistA

DistA(Angle, Altitude)

DistA is similar to Dist, except that instead of using the current altitude from another column, it uses an altitude value from the Altitude column (typically, the Altitude column is set via the Altitude function).

DistA calculates the distance to a sighting based on declination angle and the Altitude. If the column specified for Angle has the Reticle attribute set, the System Reticle conversion value will be applied (**Configure->System Options->System**). Otherwise Angle is assumed to be a declination angle.

7.1.16 DistMultiOptics

DistMultiOptics(Optic, Angle, Altitude)

Coordinates the calculation of radial distance involving multiple optics devices. For example: how to mix and mingle between BigEye, Handheld, Theodolites, etc. This formula should be applied on a column that specifies the radial distance to the sighting. If the selected optics type contains the phrase 'naked' it is assumed the PSO will enter the sighting distance manually.

Optic: column specifying the name of the optic device. If a match can be found in System Options -> Reticles, that conversion factor will be used (and the value assumed to be a reticle count below the horizon). If no match is found, the field will be assumed to a declination angle below horizontal (NOT horizon).

Angle: column specifying an angle or reticle input value.

Altitude: Column specifying altitude of the observer. Can be extracted from a GeoPosition such as from GPS.

See chapter on System Options for Obs Platform for more.

7.1.17 DistToContour

DistToContour(Position, Elev)

Calculates the distance to the nearest contour of a specified depth from a specified GeoPosition.

Position: column specifying position to calculate distance to contour from.

Elev: Elevation (positive) or depth (negative) of contour to calculate distance to.

7.1.18 DistToShore

DistToShore(Position)

DistToShore calculates the distance to shore from Position. This is based on the highest resolution bathymetry/topography data installed. As with other bathymetric/topographic functions, the accuracy of DistToShore is only as good as the installed data. For example, if the best installed data has only 1 arc second of accuracy, that's all the accuracy this function can guarantee.

7.1.19 Elevation

Elevation(Position)

Calculates the elevation at the specified Position. Position is typically a sighting location cell. Positive is above sea level, negative below.

Note that this calculation is only as precise as the highest resolution bathymetry/topographic data installed at Position.

7.1.20 GetTrailingPos

Records the actual position of a trailing point (e.g. hydrophone or seismic array) at an exact point in time in whichever field the user wants.

7.1.21 Inside

Inside(Position)

Calculates the set of Geo-Polygons the Position is contained within. If the Position is contained within multiple geo-polygons, they will be comma-separated (e.g. "Poly1,Poly2,Poly3")

7.1.22 Latitude

Latitude(Position)

This formula extracts the Latitude as a real number from a Position.

7.1.23 Longitude

Longitude(Position)

This formula extracts the Longitude as a real number from a Position.

7.1.24 MapInfo

MapInfo (Position)

Inserts all the information about maps and bathymetry layers at the specified position.

Position: Column specifying position to obtain map and bathymetry information at.

7.1.25 NearestPolygon

NearestPolygon (Position)

Determine which polygon (polygon edge, actually) is closest to the given GeoPosition.

Position: Column specifying position to calculate nearest polygon information about.

7.1.26 NearestPolygonDist

NearestPolygonDist (Position)

Determine how close the nearest polygon (polygon edge) is to the given GeoPosition.

Position: Column specifying position to calculate nearest polygon information about.

7.1.27 PosFromLatLon

PosFromLatLon(Latitude, Longitude)

This formula synthesizes a GeoPosition from a latitude and longitude pair. The resulting altitude component of the GeoPosition is undefined.

7.1.28 PosFromLatLonAlt

PosFromLatLonAlt(Latitude, Longitude, Altitude)

This formula synthesizes a GeoPosition from a latitude, a longitude and an altitude cell.

7.1.29 Psd

Psd(Position, Sighting)

This formula calculates the perpendicular sighting distance from a GPS position to a sighting position. This takes into account the heading of the vehicle at the time of sighting. This formula is especially important in density/abundance calculations in line transect surveys.

7.1.30 Range

Calculates the range between two GeoPosition columns defined in your data sheet.

Pos 1: column specifying the first position.

Pos 2: column specifying the second position.

7.1.31 RelPos

RelPos(Angle, AngleDir, Position)

Calculates the position of a sighting, given a declination or reticle Angle, an Angle Direction (absolute) and a current Position.

7.1.32 RelPosDist

RelPosDist(Dist, Bearing, Position)

Similar to RelPos, RelPosDist uses a pre-calculated Distance and Bearing to determine the position of the sighting relative to the Position parameter. This function is frequently triggered off of a Distance column being filled in via Dist() or DistA(). Alternatively, this function allows for an estimate distance to sighting to be entered and used.

7.1.33 Sighting

Sighting (Sighting Time, Sighting Pos)

Denotes that this field is a sighting identifier, and also tells Mysticetus which column to obtain GeoPosition for this sighting/resight. Attempts to increment the sighting ID.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.34 SightingAvgCourse

SightingAvgCourse (SightingId, Sighting Time, Sighting Pos)

Calculates the average sighting course over ground at this resight by determining which direction it has moved across all sightings of this sighting id.

SightingID: Column specifying the sighting id.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.35 SightingAvgVelocity

SightingAvgVelocity (SightingId, Sighting Time, Sighting Pos)

Calculates the average sighting velocity at this resight by determining how far/fast it has moved across all sightings of this sighting id.

SightingID: Column specifying the sighting id.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.36 SightingCopyId

SightingCopyId (Sighting Time, Sighting Pos)

Denotes that this field is a sighting identifier, and also tells Mysticetus which column to obtain GeoPosition for this sighting/resight. Copies the previous sighting ID if one is present.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.37 SightingCourse

SightingCourse (SightingId, Sighting Time, Sighting Pos)

Calculates the sighting course at this resight by determining which direction it has moved since the last sighting of this sighting id.

SightingID: Column specifying the sighting id.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.38 SightingVelocity

SightingVelocity (SightingId, Sighting Time, Sighting Pos)

Calculates the sighting velocity at this resight by determining which how far/fast it has moved since the last sighting of this sighting id.

SightingID: Column specifying the sighting id.

Sighting Time: Column specifying the time the sighting / resight was recorded.

Sighting Pos: Column specifying sighting position including resight.

7.1.39 Slope

Slope(Position)

Calculates slope in degrees at the specified position.

Note that this calculation is only as precise as the highest resolution bathymetry/topographic data installed at Position.

Position: Column specifying where (GeoPosition) to obtain slope.

7.1.40 SpeedOverGround

SpeedOverGround (Position)

Calculates the vehicle speed over ground from a specified GeoPosition.

Position: Column specifying where (GeoPosition) to obtain vehicle speed over ground.

7.1.41 TheoHorz

TheoHorz (HorizontalRaw)

Converts a theodolite's horizontal angle to bearing, based upon the theodolite's reference zero point.

HorizontalRaw: Column specifying where to obtain the raw horizontal angle.

7.1.42 TheoInfo

TheoInfo (TheoPos, TheoAlt, HorizontalRaw, VerticalRaw, HorizontalConv, VerticalConv)

Queries an attached theodolite for angular information and fills in the various information from the theodolite

TheoPos: Column specifying where to place the theodolite position

TheoAlt: Column specifying where to place the theodolite Altitude. Optionally can be the same as TheoPos, in which case it will be merged with the position.

HorizontalRaw: Column specifying where to place the raw horizontal angle.

VerticalRaw: Column specifying where to place the raw vertical angle.

HorizontalConv: Column specifying where to place the converted horizontal angle.

VerticalConv: Column specifying where to place the converted vertical angle.

7.1.43 TheoVert

TheoVert (VerticalRaw)

Converts a theodolite's vertical angle to a declination angle.

VerticalRaw: Column specifying where to obtain the raw vertical angle.

7.1.44 Time

Time (DateTime)

Extracts time from the DateTime field

DateTime: Column specifying where to extract time from.

7.1.45 TopoResolution

TopoResolution(Position)

Determines the highest resolution of topography/bathymetry installed at a given Position. If the current cell is a Real number, the number is entered in degrees (e.g. 0.00677777). If the current cell is Text, the value is entered with units information (e.g. "3 arc-seconds").

7.1.46 TowedArrayBearing

TowedArrayBearing(Time, Bearing)

Given where the ship was at a specified Time, a bearing line will be drawn uni or bi-directionally from a distance behind the ship (distance is specified in System Options), in the direction(s) given by Bearing.

7.1.47 TowedArrayReciprocal

TowedArrayReciprocal (Bearing)

Calculates the raw reciprocal of a towed array bearing. For example if the input bearing is 23, the reciprocal will be 337 (360-23).

Bearing: Column specifying the raw bearing

Pro Tip: Mysticetus can be told to explicitly turn tracking on and off via the Tracking data panel.

7.1.48 TrackOnOff

TrackOnOff(OnCommand, OffCommand, Interval)

This function is different in that it does not register a value in the cell when evaluated. Instead, any time the value of this cell changes, it is compared to the OnCommand or OffCommand, and turns tracking of the active vehicle on or off. The Interval parameter specifies the tracking interval if being turned on.

For example, TrackOnOff(Engine On, Engine Off, 10) denotes that when the user enters "Engine On" in this field, tracking will be enabled at a 10 second interval. When the user enters "Engine Off", tracking will be turned off.

OnCommand: specifies the exact text used to start a new vehicle track.

OffCommand: specifies the exact text used to stop a vehicle track.

Interval: Specifies the tracking interval in seconds.

7.1.49 TrailingPointPos

TrailingPointPos – no arguments

Inserts the position (if any) at this point in time of a trailing point such as a range circle center.

7.1.50 WaterDepth

WaterDepth (OnCommand, OffCommand, Interval)

Records measured water depth captured via NMEA device.

OnCommand: specifies the exact text used to start a new vehicle track.

OffCommand: specifies the exact text used to stop a vehicle track.

Interval: Specifies the tracking interval in seconds.

7.1.51 WaterTemperature

WaterTemperature (OnCommand, OffCommand, Interval)

Records measured water temperature captured via NMEA device.

OnCommand: specifies the exact text used to start a new vehicle track.

OffCommand: specifies the exact text used to stop a vehicle track.

Interval: Specifies the tracking interval in seconds.

8 Mapping

The Mysticetus mapping interface provides a quick and easy way to visualize where you are, where you've been and what you've seen. On a map. Sweet, huh?

Maps are indispensable for keeping geo-spatial track of a multitude of sightings and the observers own track. Mapping can be broken down into three components:

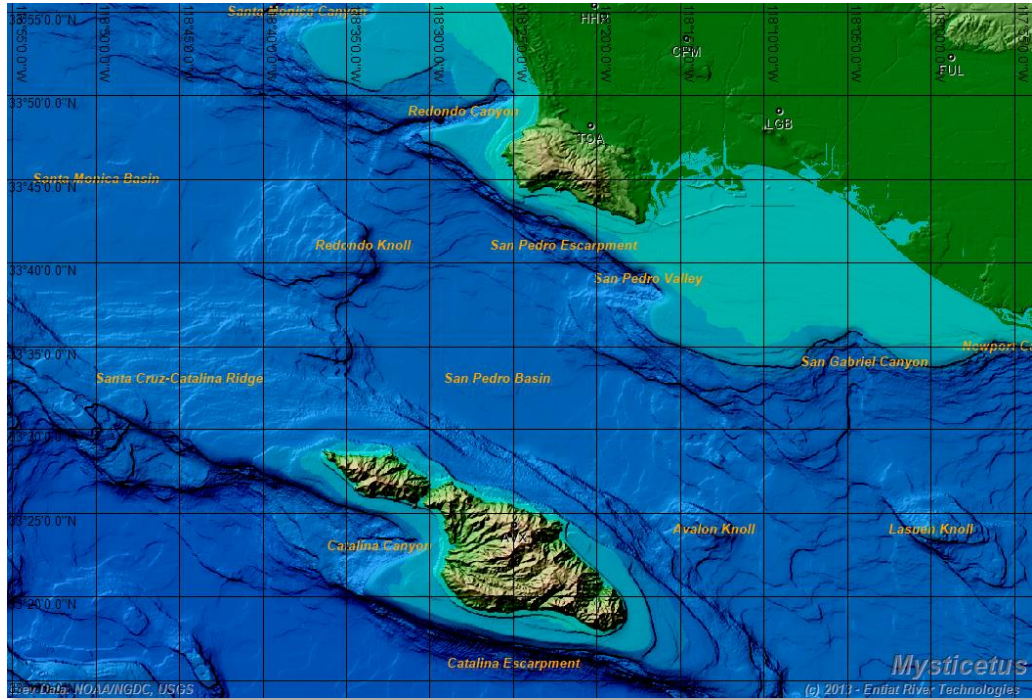
1. Bathymetry / Topography
2. Shapefile Maps
3. Geo-Spatial Objects

Note: Maps can be mighty big, they may take a short bit to fully render.

8.1 Bathymetry / Topography

Mysticetus uses detailed bathymetry and topography information from the NOAA National Geodesic Data Center and the USGS to paint shaded relief backgrounds in the map window. Mysticetus also uses this information to determine depth, slope, aspect and distance to shore characteristics of sightings.

Sighting	Depth	Slope	Sighting Pos	Plane Pos
0.84 k	-3073 ft	0.6°	32°56'42.6"N 1...	32°56'18.1'
0.77 k	-528 ft	4.6°	33°00'41.8"N 1...	33°00'18.6'
1.3 k	-1736 ft	9.9°	32°56'27.6"N 1...	32°56'9.8'
0.62 k	-1865 ft	5.1°	32°55'18.9"N 1...	32°55'7.2'
0.37 k	-2810 ft	0°	32°52'28.0"N 1...	32°52'39.8'
0.51 k	-2010 ft	14.9°	32°52'12.5"N 1...	32°52'27.7'
0.84 k	-2871 ft	0.1°	32°55'42.1"N 1...	32°55'22.5'
0.75 k	-3704 ft	5.8°	33°00'51.7"N 1...	33°01'14.7'
0.54 k	-2123 ft	19.1°	32°53'49.3"N 1...	32°53'57.0'

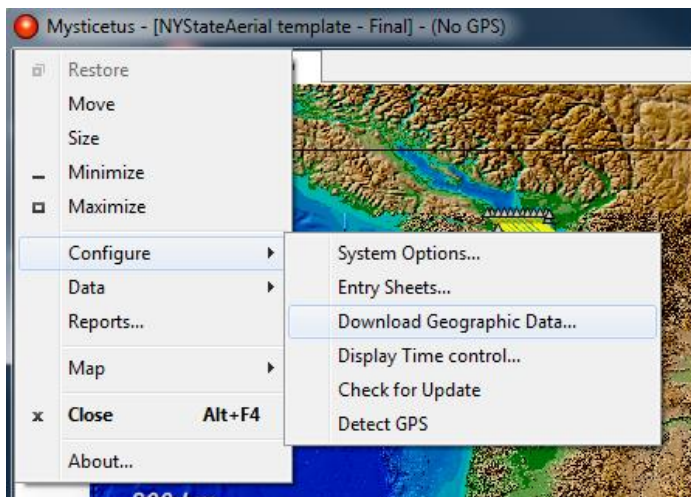


Bathymetry can be obtained in two different ways:

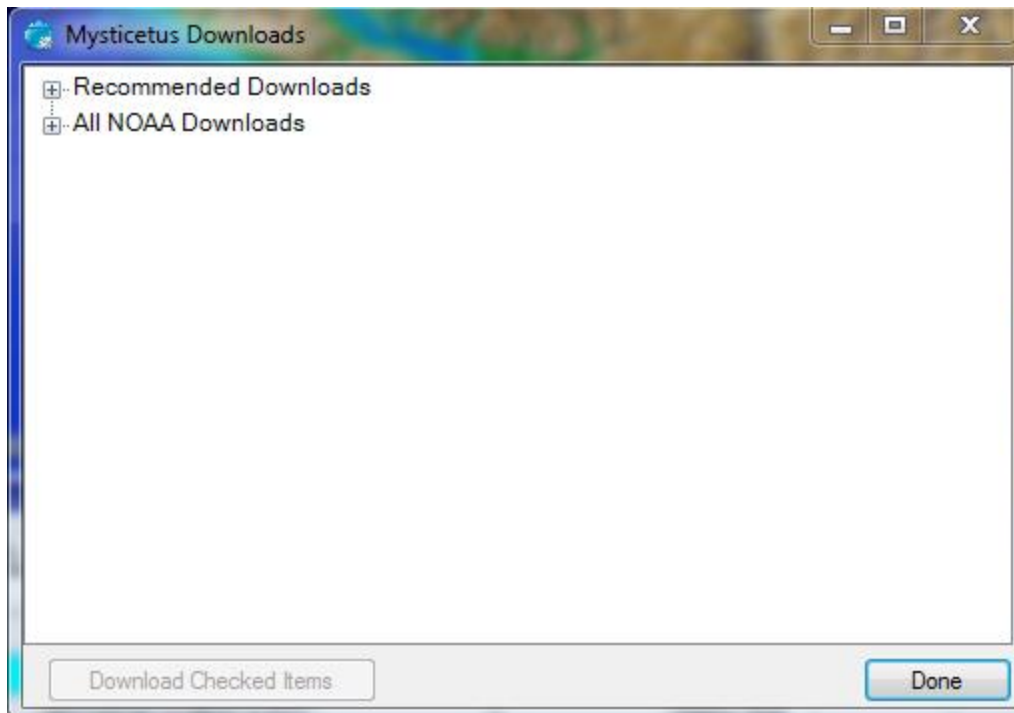
1. Automatic download via Download Manager
2. Download it yourself from the USGS or NOAA/NGDC websites

8.1.1 Automatic Download / Download Manager

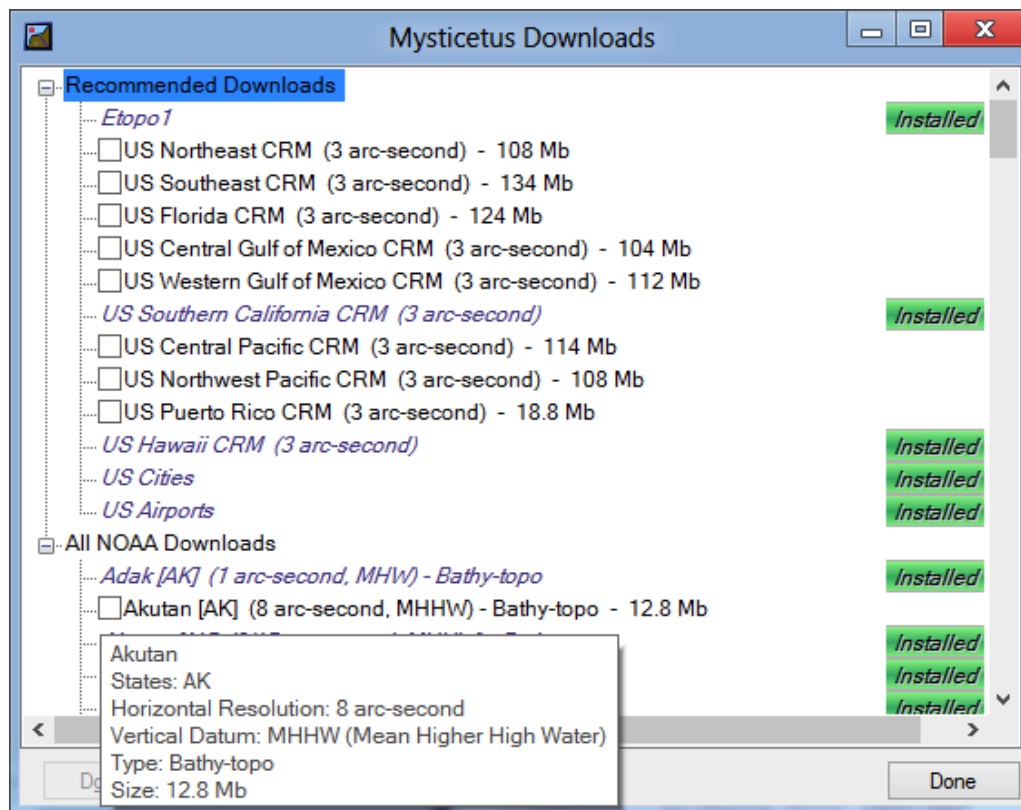
The Download Manager is available via the **Configure->Download Topo and Geo Data** menu item.



This will bring up the following dialog:



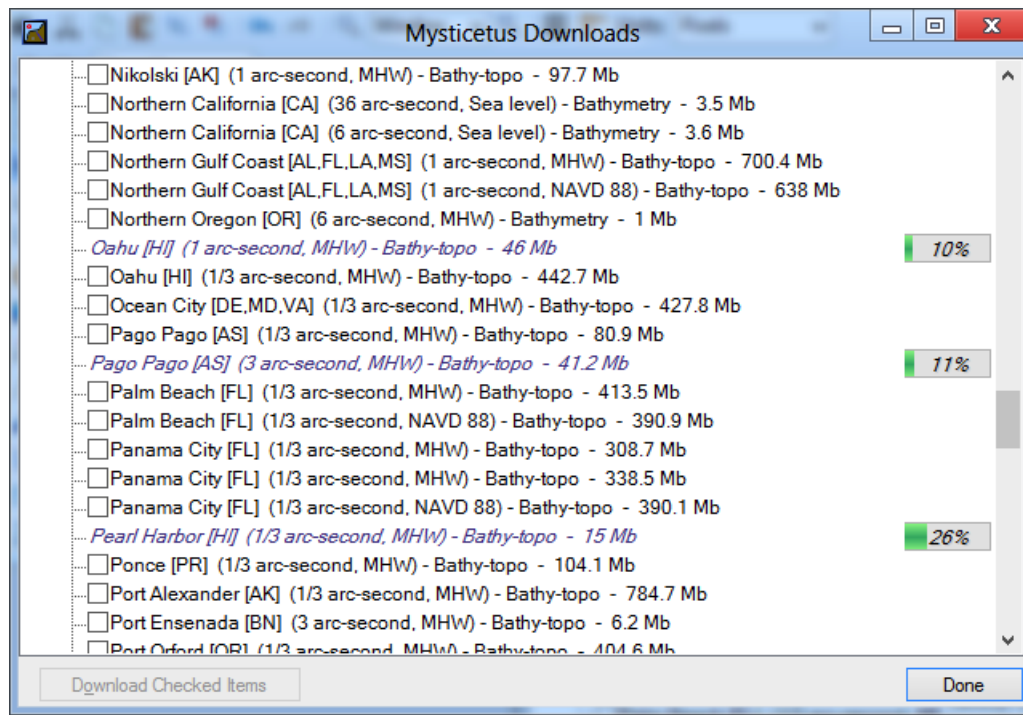
Expand the pluses to reveal download options that looks very much like this:



Pro Tip: You're going to want at least ETOPO1. This is a 1 arc-minute worldwide bathy/topo dataset. While it is fairly useless as an analytical dataset (too coarse), it serves as a nice backdrop for everything else.

Simply click the checkboxes for the items you wish to download, select the "Download Checked Items" button and Mysticetus will download and install them for you.

Here is a picture of the Download Manager in action, downloading and installing some items:



Pro Tip: It is a good idea to unzip or untar Bathymetry / Topography files yourself – that will dramatically speed up load time.

8.1.2 Custom Bathymetry / Topography

You can create and download your own custom bathymetry and topography data from NOAA, the USGS or other sources. The data needs to adhere to the following requirements:

1. The data can be archived in a zip, gz, or tar.gz file, but all contained data files will be extracted into a folder with the same name as the original archive the first time Mysticetus uses it. This makes future access faster.
2. The contained data files must be in the hdr/bin or hdr/flt formats. The hdr file contains header information, the bin or flt files contain the actual data. Mysticetus supports either I2 or F4 data formats (also sometimes known as int16 or float4).
3. Alternatively, the contained data files must be in the asc file format. This file format is a text format; the header portion is at the start of the file, followed by text rows of ASCII data. The first time Mysticetus uses an asc file, it will be converted to a equivalent hdr/flt set of files (for faster access in the future).

Mysticetus will use the filename (without extension) of the hdr or asc file as the primary name of the bathymetry / topography data displayed in the program. Thus you should name these files something useful; that is, name it something "Southern Island (1-9 arc second).asc" rather than "12749342.asc".

8.1.3 Custom Storage of Topo data

You can control where your topo folder is via two different methods:

1. A command line parameter. When you start Mysticetus, you can specify the /topodir command line parameter. For example

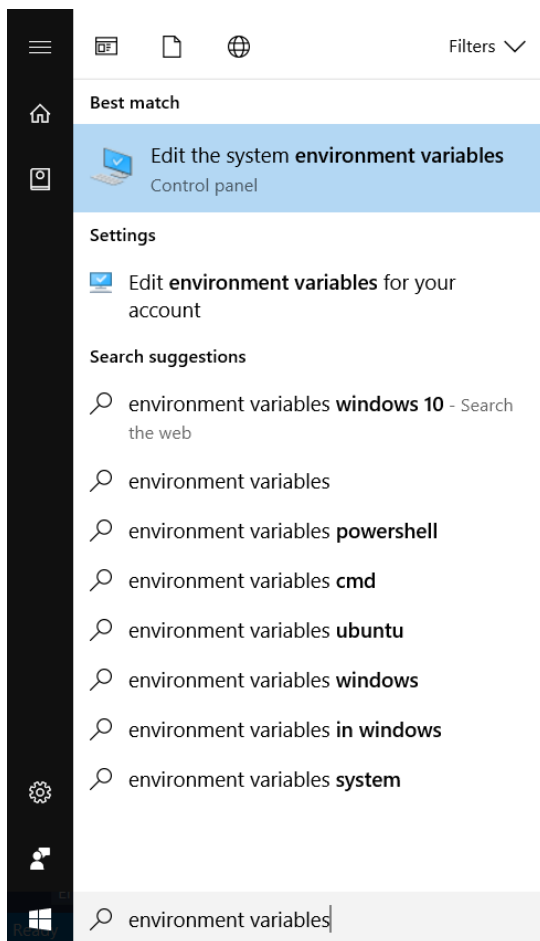
```
/topodir:"G:\Elevation"
```

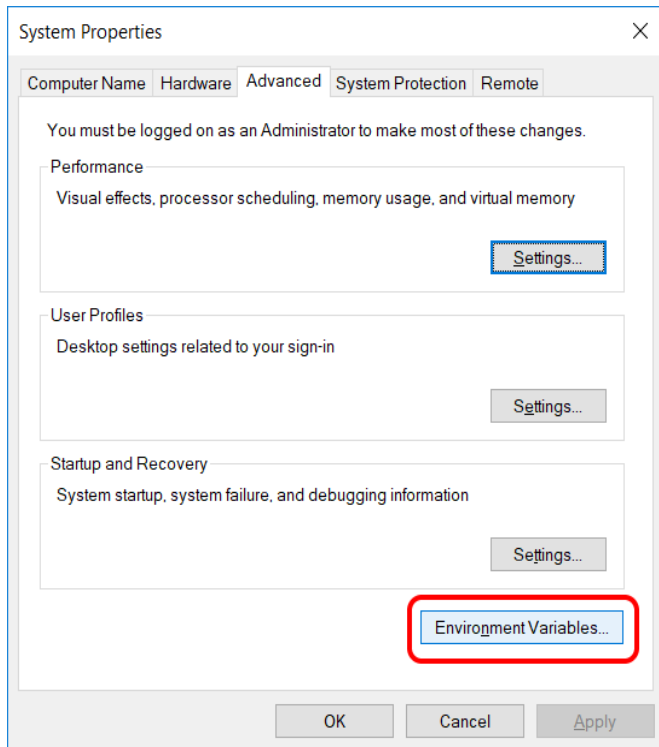
This is usually done via shortcut - see my blog post last year about command line parameters in general, and Mysticetus command line parameters specifically, here:

<http://mysticetus.blogspot.com/2014/09/mysticetus-command-line-switches.html>

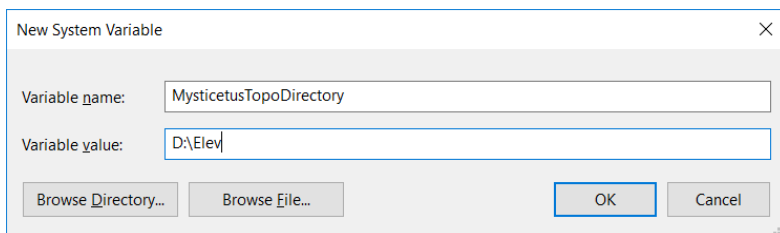
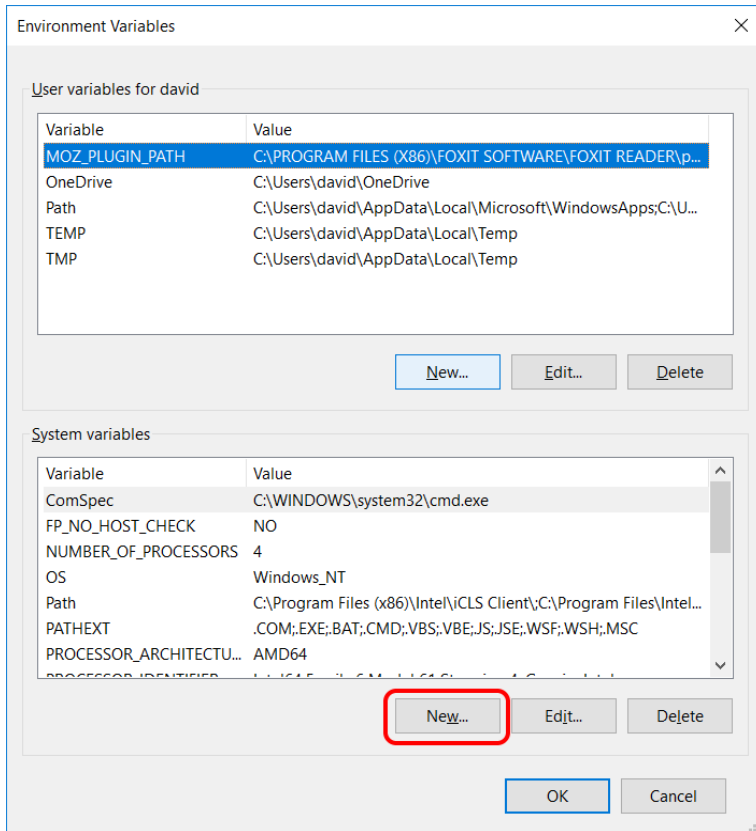
2. An environment variable. You need to set MysticetusTopoDirectory to point to where your topo/bathy files are (for example, D:\Elev).

First, press the Windows key to open the Start Menu. Type "Environment Variables". Click "Edit the system environment variables"

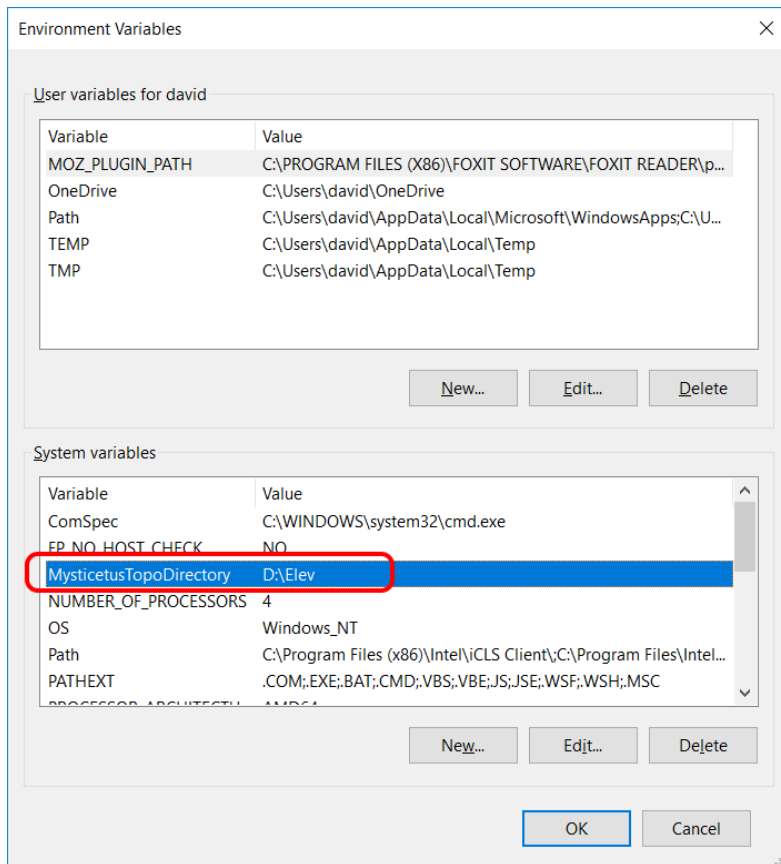




After it launches, you can add a new environment variable named `MysticetusTopoDirectory` that points at the `topo/bathy` files location.



Verify that it was created successfully:

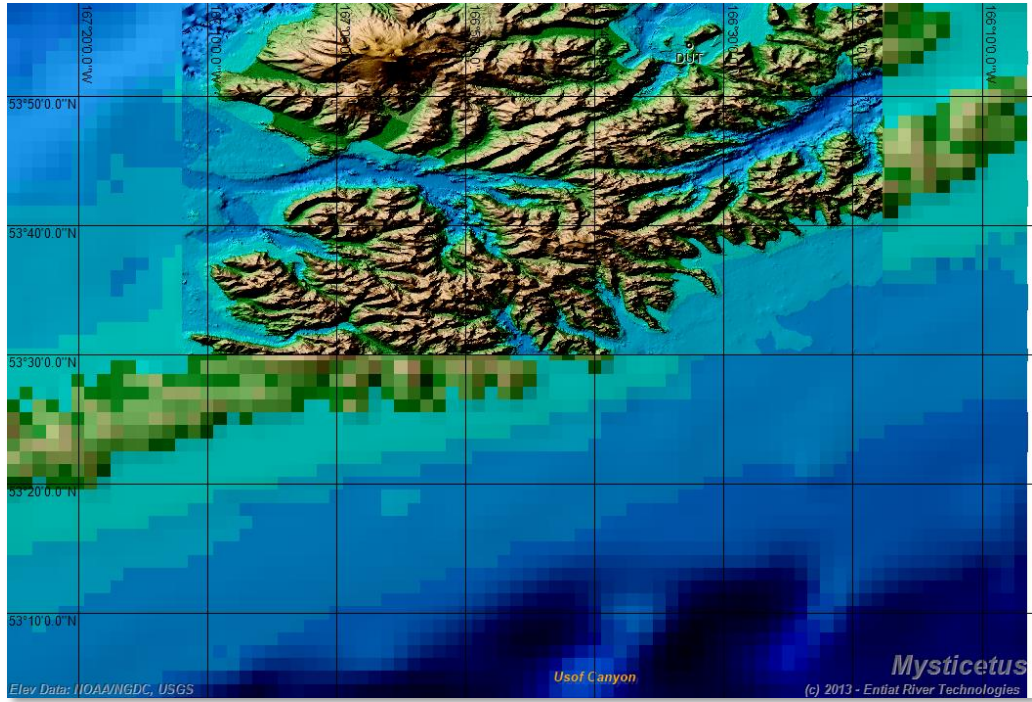


Press OK to save this change.

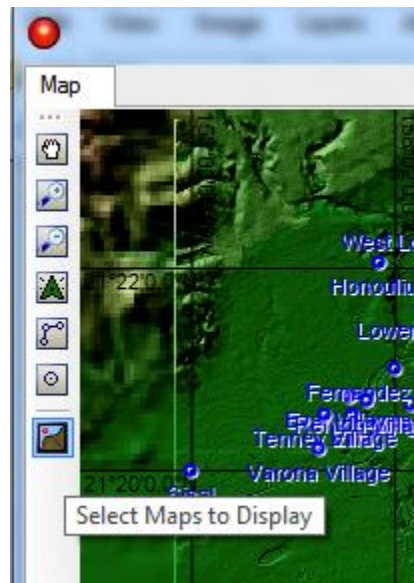
Re-launch Mysticetus. It should now read from (and download to) topo/bathy files this folder.

8.1.4 Bathymetry as Maps

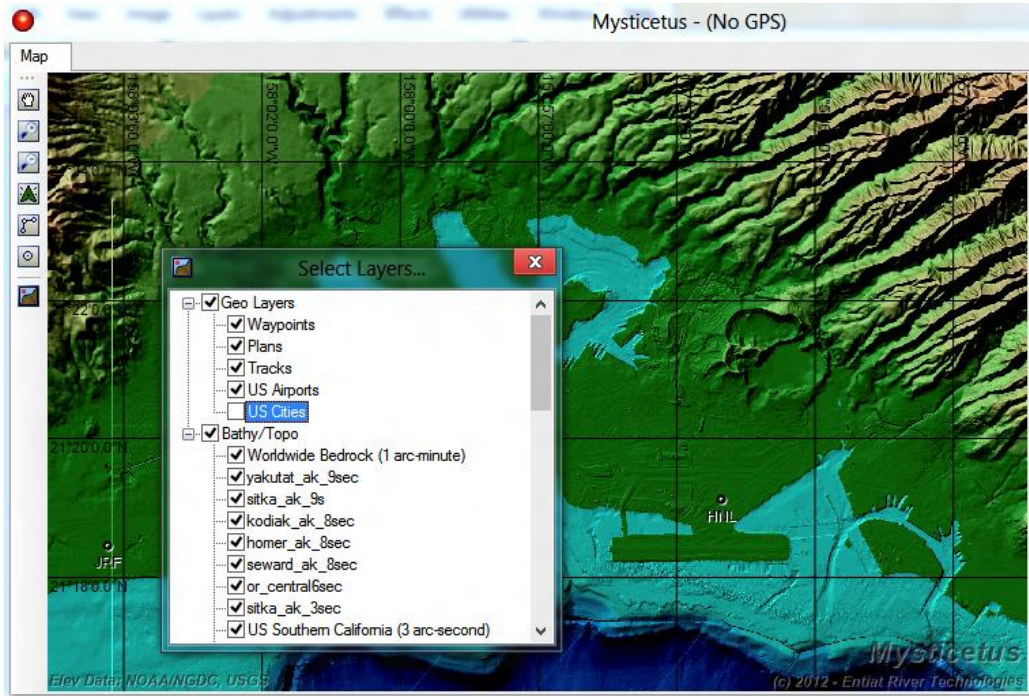
Mysticetus “quilts” bathymetry together; that is, it displays the highest resolution bathymetry on top of lower resolution data. Here is an area around Dutch Harbor, AK. You can clearly see the high resolution bathymetry and topography plotted “on top” (or “inset”) within the very coarse ETOPO1 data:



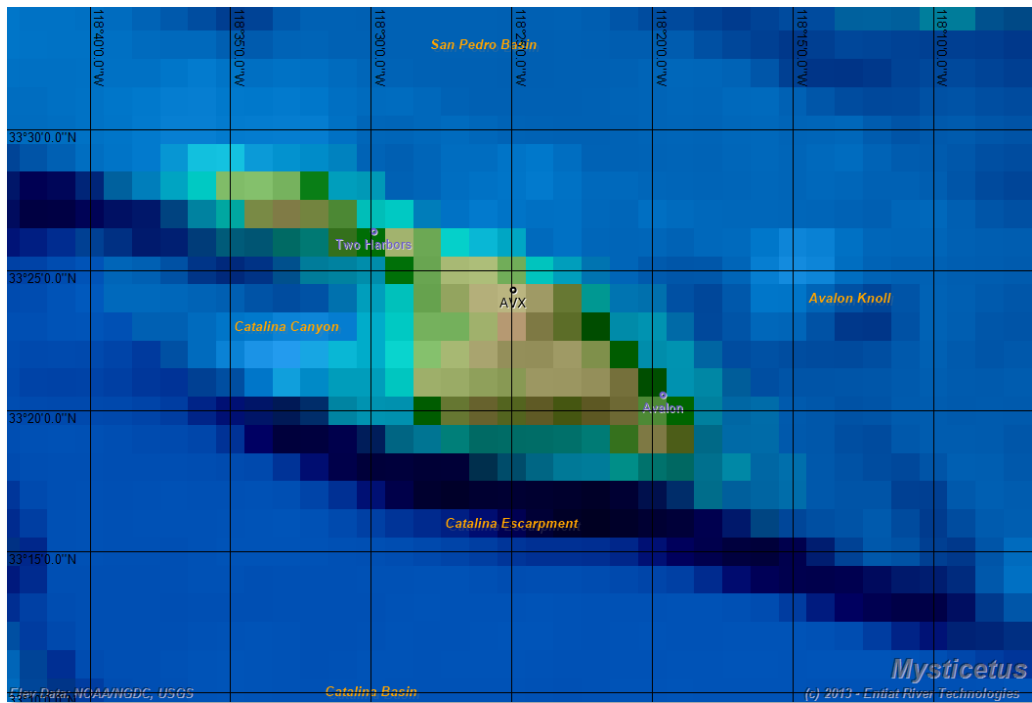
Display of these layers are controlled via the Layer Selection dialog (which controls display of every layer type on the map, not only bathymetry / topography):



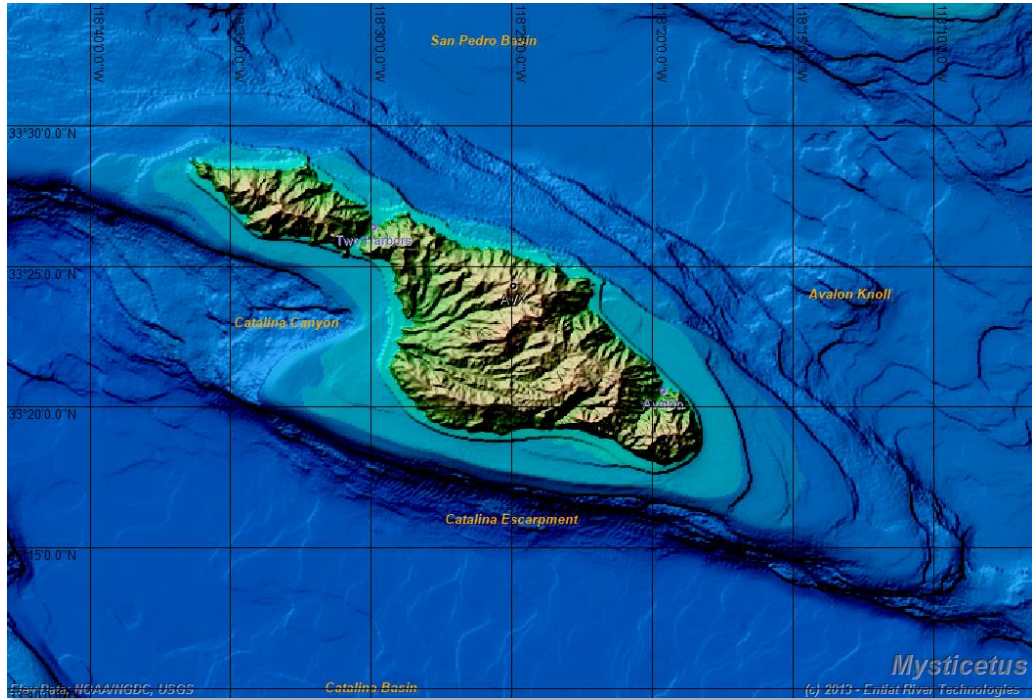
The select the layers you wish to display



Here is Catalina Island, as it is rendered via ETOPO1 (coarse 1 arc-minute)

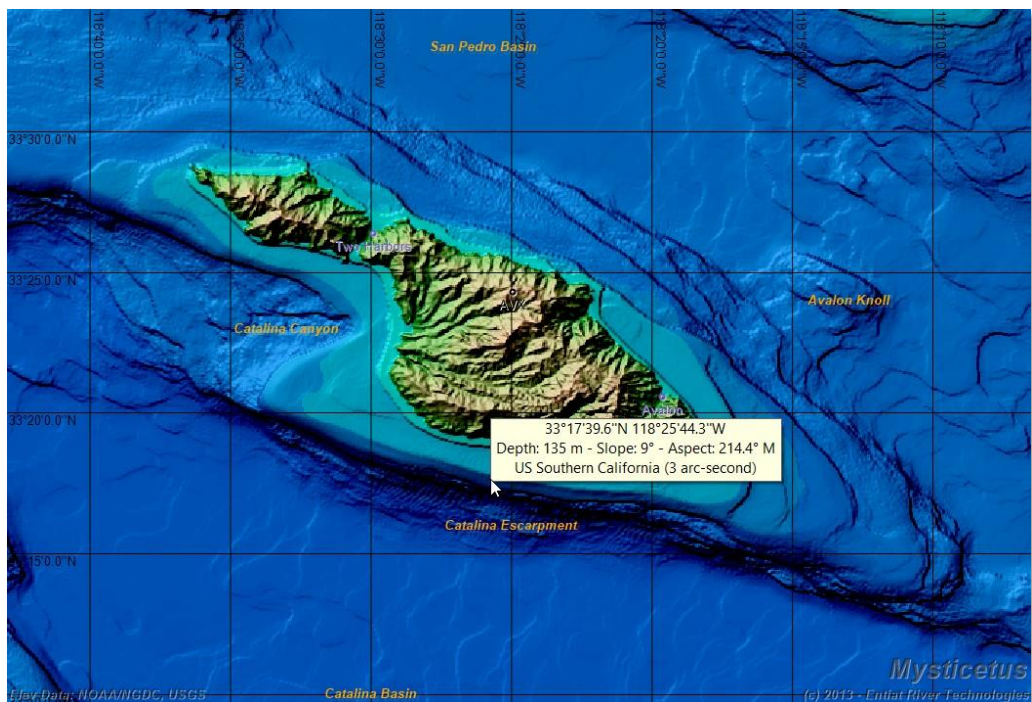


Simply choosing the Southern California 3 arc-second data brings the island into a much better focus (and there is even better data available for select coastal regions, down to 1/9th arc-second):



8.1.5 Bathymetry / Topography Instant Information

Holding the mouse steady over the map for a second will cause a “tooltip” to pop up and display interesting information about that point, including the Depth, Slope, Aspect and the highest resolution bathymetry available at that point (in this case US Southern California 3 arc-second).



8.1.6 Bathymetry / Topography Analysis

Bathymetry is also used for analysis of the seafloor (or land) at sighting location.

Sighting	Depth	Slope	Sighting Pos	Plane Pos
0.84 k	-3073 ft	0.6°	32°56'42.6"N 1...	32°56'18.1"
0.77 k	-528 ft	4.6°	33°00'41.8"N 1...	33°00'18.6"
1.3 k	-1736 ft	9.9°	32°56'27.6"N 1...	32°56'9.8"
0.62 k	-1865 ft	5.1°	32°55'18.9"N 1...	32°55'7.2"
0.37 k	-2810 ft	0°	32°52'28.0"N 1...	32°52'39.8"
0.51 k	-2010 ft	14.9°	32°52'12.5"N 1...	32°52'27.7"
0.84 k	-2871 ft	0.1°	32°55'42.1"N 1...	32°55'22.5"
0.75 k	-3704 ft	5.8°	33°00'51.7"N 1...	33°01'14.7"
0.54 k	-2123 ft	19.1°	32°53'49.3"N 1...	32°53'57.0"

In addition to the Depth and Slope shown in the example above, Aspect and Distance to Shore can also be automatically calculated. This is accomplished by applying a Formula to a cell, based on sighting position. See *chapter 5 - Formulas*, in particular the sections on Elevation, Slope, Aspect and DistToShore.

Once calculated, this information can of course be exported (see *chapter 11 - Data Export*) to Excel or a CSV file.

8.1.7 Importing Custom Bathymetry

Importing custom bathymetry can be accomplished either as Digital Elevation Models in the same format as supplied by NOAA/NCEI, or as custom shapefiles. For custom shapefiles each Polyline object has an attribute named "Depth" (and optionally "Color" or "LineColor").

8.1.8 Apply Bathymetry / Topography Information to Pre-existing Data

This data can also be calculated from older sighting data. For example, if you have the locations of the sightings, you can create a new, empty entry sheet with columns for the sighting location, and then columns for the various attributes you want Mysticetus to calculate (with appropriate formulas applied to the cells). Import the old data, and Mysticetus will calculate this information for you. See the following chapters for more information:

- *Chapter on Entry Manager*, for more information on configuring entry sheets.
- *Chapter on Formulas*, for more information on Formulas. In particular, see the Elevation, Slope, Aspect, and DistToShore formulas.
- *Chapter on Data Import*, for more information on importing pre-existing data.

8.2 Shapefile Maps

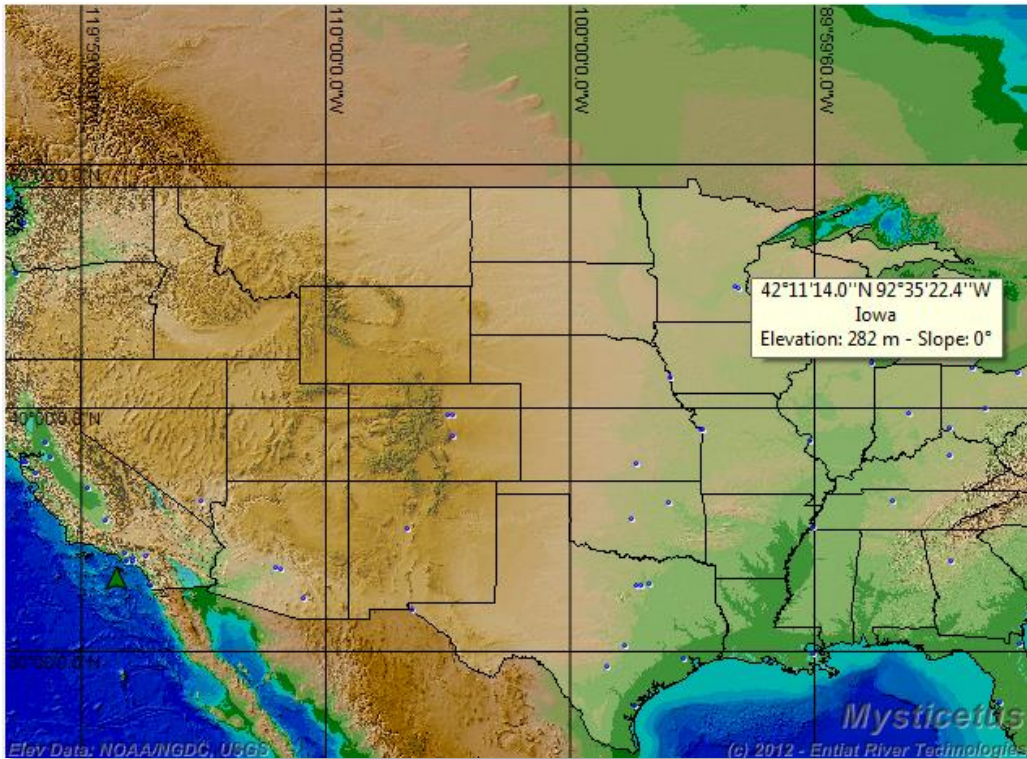
You can use geo-referenced ESRI shapefiles as another mapping layer.

8.2.1 Overview

ESRI Shapefiles can also be displayed in Mysticetus as maps, provided the shapefile is geo-referenced to WGS84 coordinates (latitude/longitude). Unfortunately, some shapefiles simply use rectangular coordinates

that *Mysticetus* cannot map to the earth, but for those that are geo-referenced, *Mysticetus* will overlay them on top of the bathymetry / topography.

Here is a United States shapefile over North America. If the shapefile has information about the geo-polygons within (such as state names), *Mysticetus* will display that if you hover your mouse over an area (such as Iowa, in this case).



For another

example, consider the following area in the Cascade Mountains of Washington state:

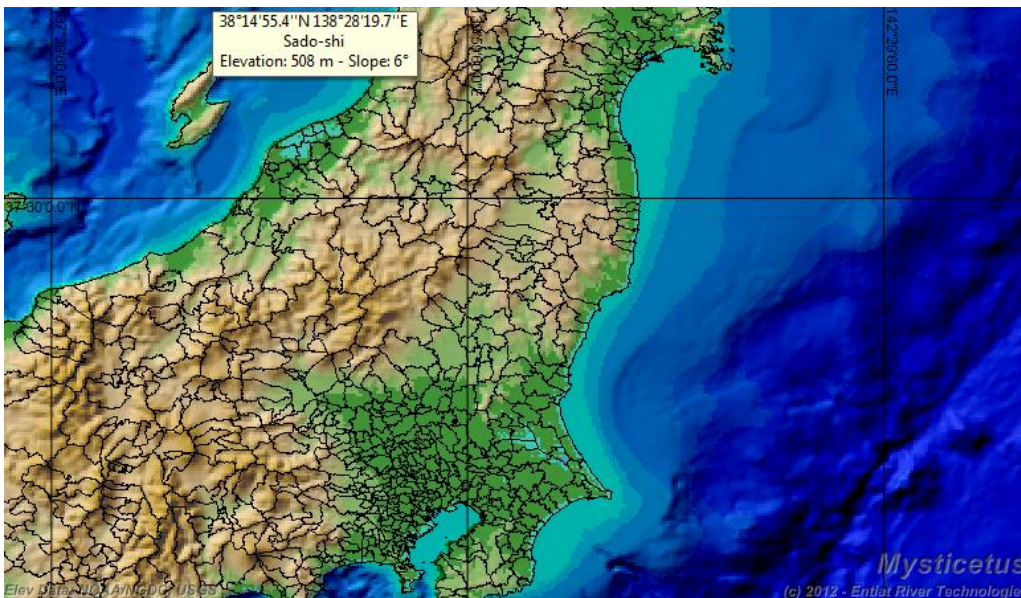


Now see what happens when a shapefile containing lake outlines is displayed (this shapefile was found at the Washington State Department of Ecology's website):



As usual, you can point at a feature and Mysticetus will tell you what it is if that data is embedded in the shapefile. All of these are controlled via the Layer Display dialog discussed in the previous section.

As a final note, shapefiles have been around for a long time and are available for regions around the world. The following shapefile was found at a Japanese language site and blindly downloaded (shapefiles cannot contain viruses). Turns out it was a set of Japanese city/state boundaries:



8.2.2 Download and Configuration

Pro Tip: Unlike bathymetry / topography data, shapefiles are relatively small in size and do not generally need to be pre-unzipped. Let Mysticetus do that for you on the fly.

Shapefile maps can be downloaded from a million different sources around the internet. As previously noted, some of them are not geo-referenced and will not load into Mysticetus. Your best bet is to simply try.

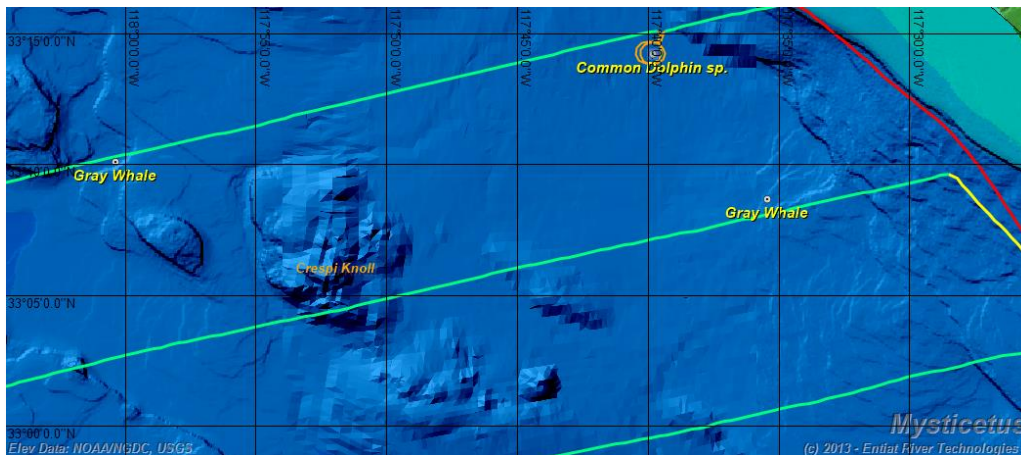
The shapefiles can be zipped (or tar.gz'd) or not. Place the file (or set of files) in a folder somewhere under [DOCUMENTS]\Mysticetus\Maps, where [DOCUMENTS] is your documents folder (this is typically something like C:\users\YourNameHere\Documents).

Thus, a good place to put MyShapefile.zip might be in
c:\users\dave\Documents\Mysticetus\Maps\MyShapefile\Myshapefile.zip.

Mysticetus searches the Maps subfolder (under [DOCUMENTS]\Mysticetus) and attempts to load all shapefiles, zipped or not, it finds.

8.3 Geo-Spatial Objects

Geo-Spatial objects round out the mapping features. They are things drawn on top of the bathymetry, such as routes, waypoints / sightings, polygons, GPS tracklines, bearing lines, and so on.

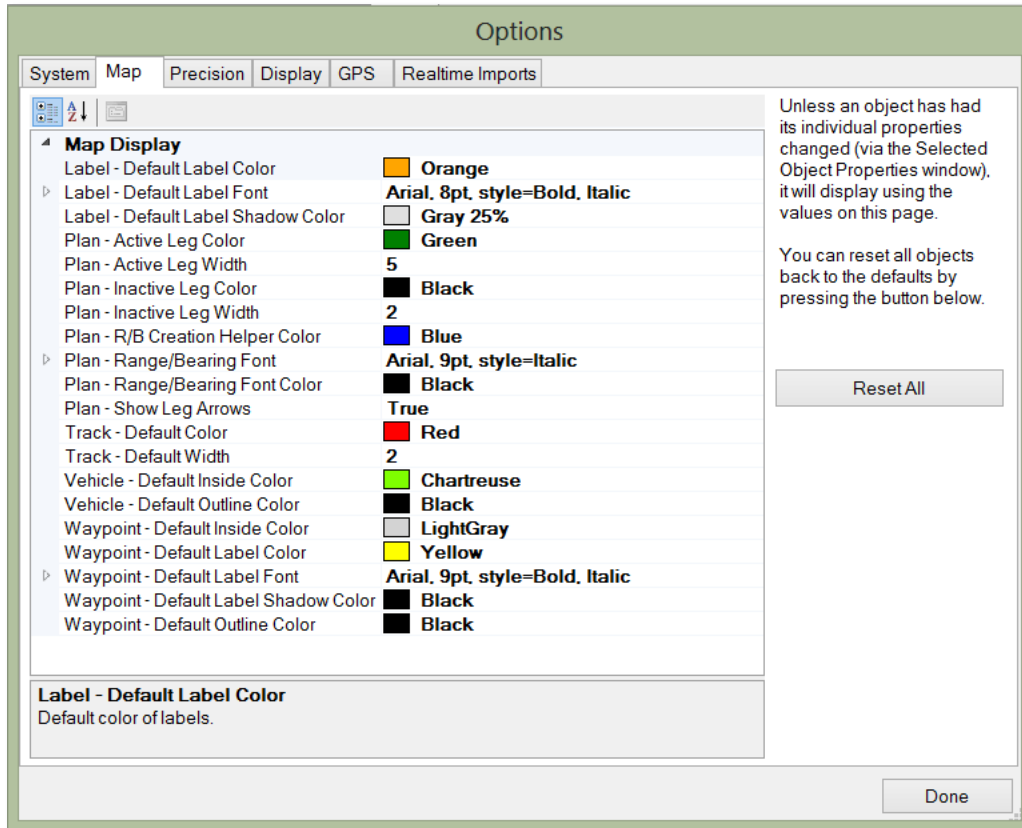


The above picture shows some sightings (which are automatically recorded in the mapping system as waypoints) and a GPS trackline, colored by effort (see *section 8.3.10 - Track line Coloring*). In this case, systematic legs are green, connector legs are yellow, circling legs are orange, and all else (transit, off-effort, etc.) are red.

All of these options (fonts, colors, line widths, etc.) are controllable via the System Settings.

8.3.1 Configuration

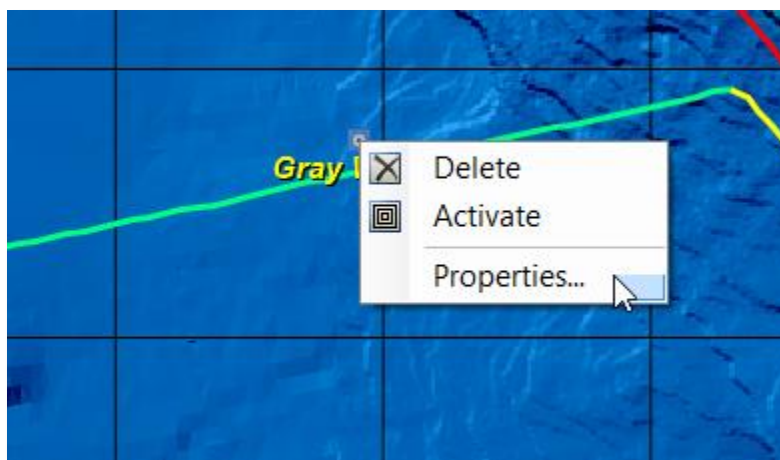
The colors, widths and icons displayed for various objects in the system is controlled via the **Configuration -> System Options -> Map** menu item:



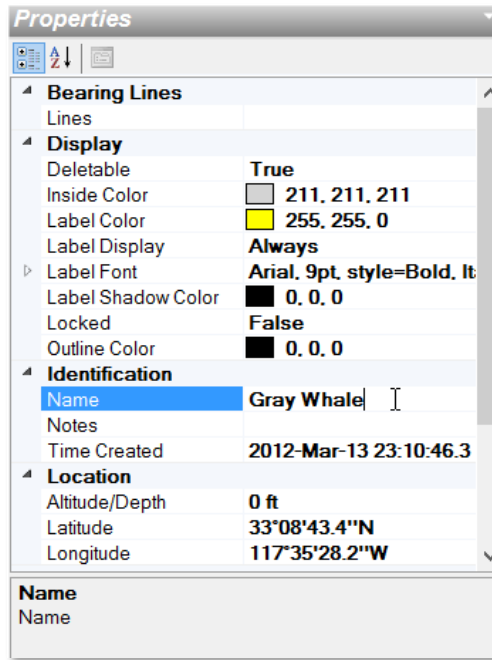
Waypoint fonts, Plan Colors, Track Colors, Line Widths, etc. are (almost) all controlled here.

The exception is Trackline Effort Leg configuration – if enabled, it is controlled as describe in *section 8.3.10 - Track line Coloring*. If Track line coloring based on effort is not enabled, then all GPS tracklines are set here as well.

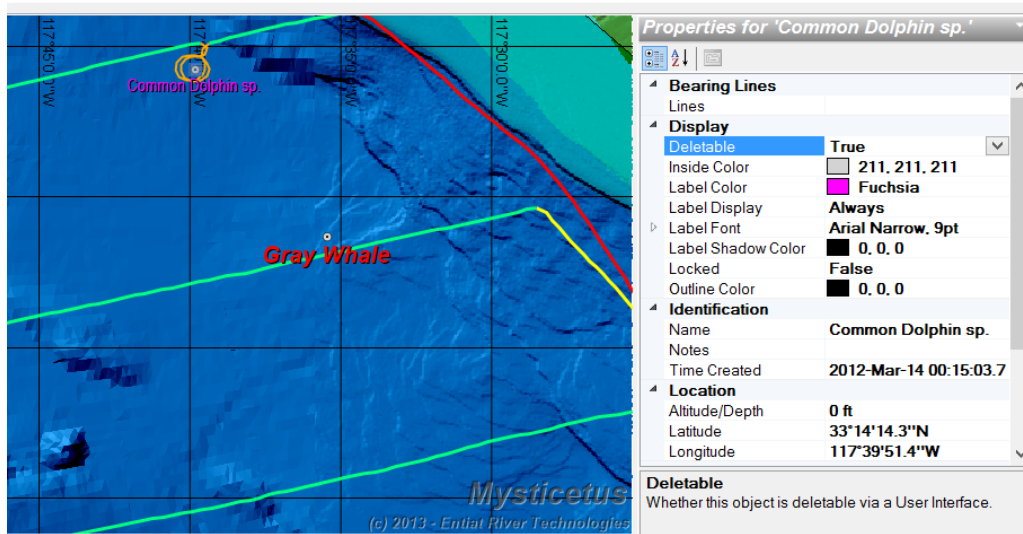
Note that individual components on the map can be configured separately from the defaults by right clicking on them and choosing “Properties...”.



This brings up a Properties window for the selected object where its individual characteristics can be altered:



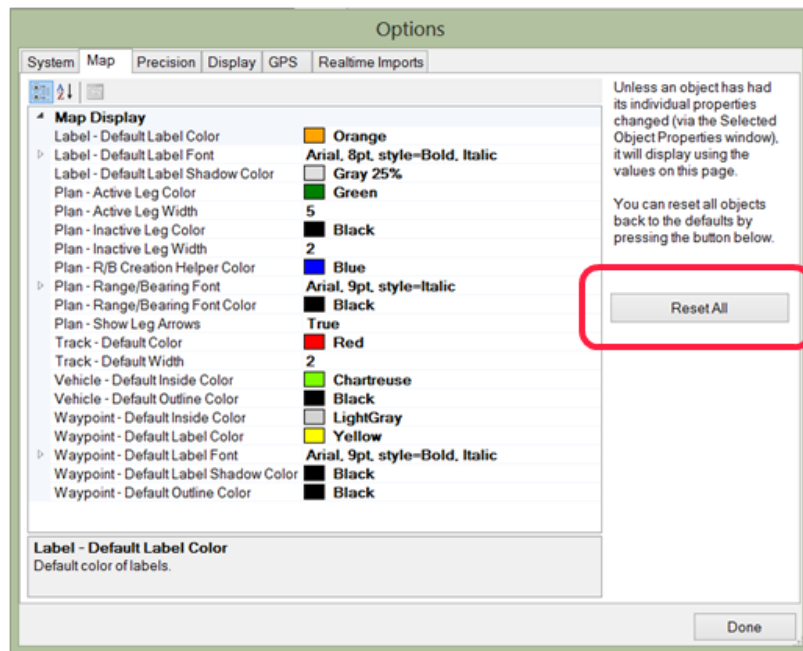
Different objects can have widely differing individual settings. In this example, the Gray Whale has been told to display in a larger Red font, while the Common Dolphin has been told to display with a smaller, Fuschia-colored font.



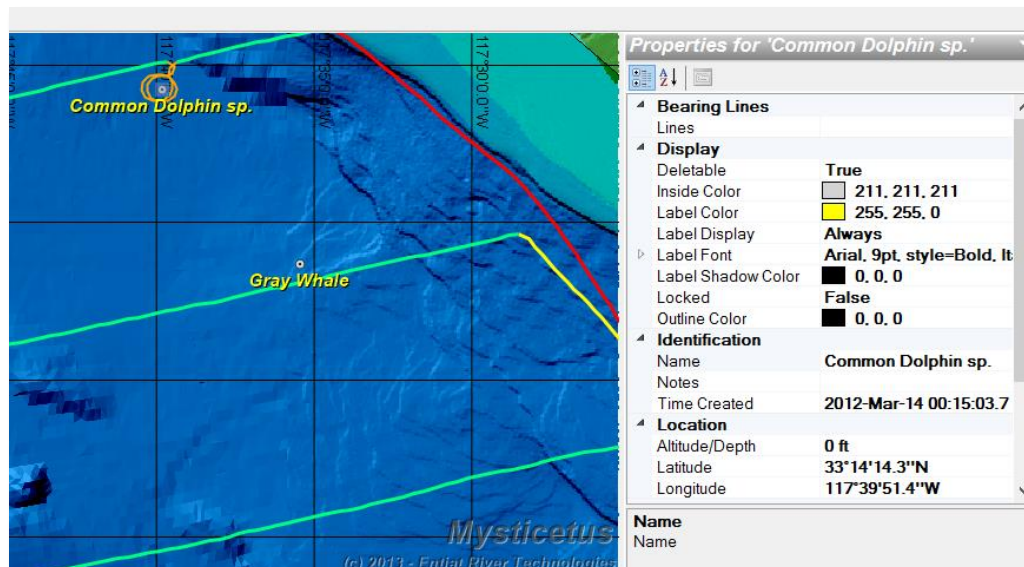
Pro Tip: When in doubt, Right Click on a Thing. Chances are Mysticetus will present you with a list of useful things you can do with that Thing (route, waypoint, entry item, whatever).

All objects, including Vehicles (aircraft, vessels), planned routes, waypoints, and polygons can be individually controlled by right clicking and choosing to bring up their Properties window.

Back in the Map Options, clicking on the Reset All button resets all Geo-Spatial objects to their defaults as specified on that page:

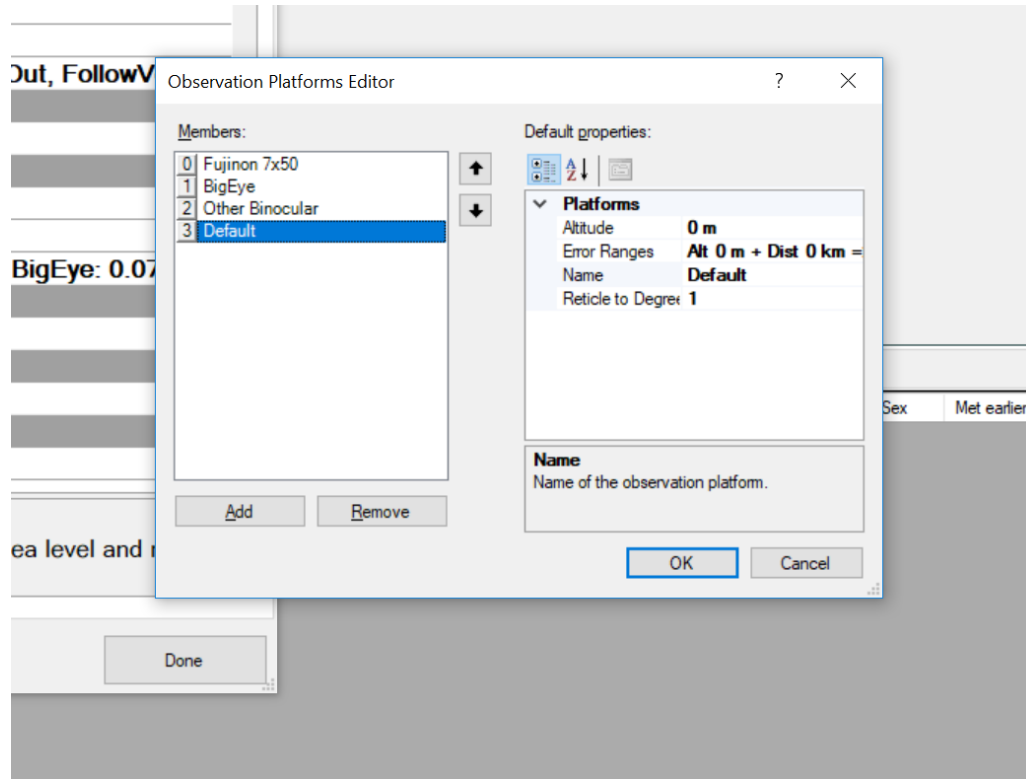


Leads to

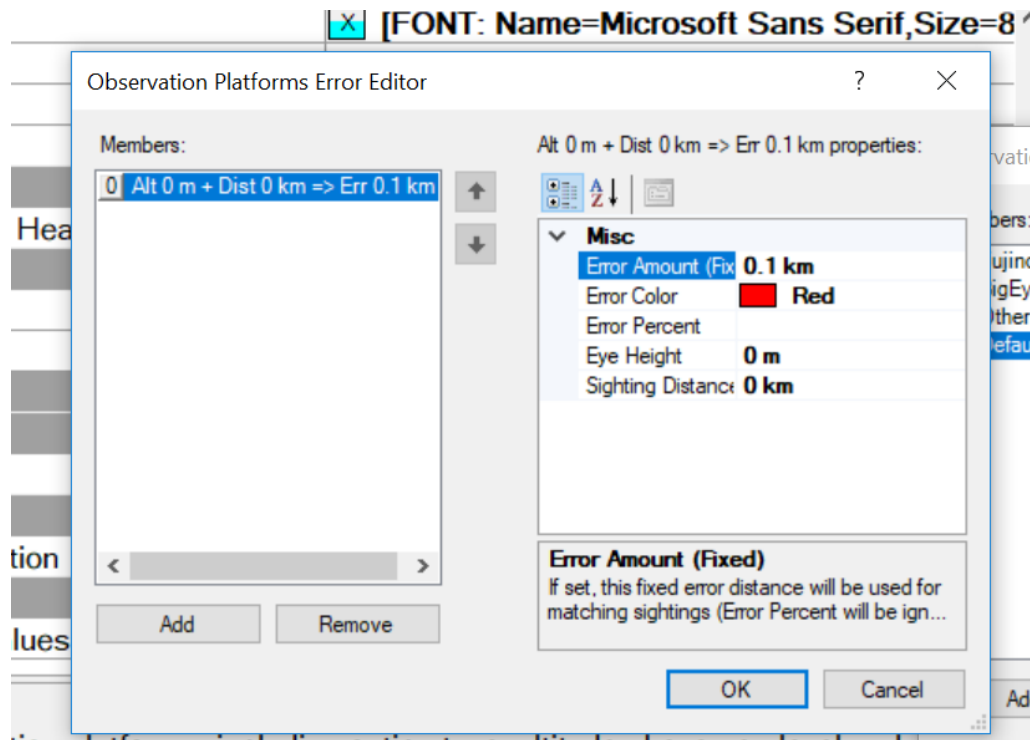


8.3.2 Sighting Error Ranges

Sightings can have error circles placed around them. This can define an area of probability that the observer's sighting is in and used to govern project decisions. Error circles can be defined and displayed in Mysticetus.



Error ranges are defined in the template, and they are relative to a station and its elevation above water. If you simply want 100m, define a Default observation platform. Leave everything else as default, but set the fixed error amount to 100m (or 0.1km as shown here...depends on your Display Units):



You can finesse this some by setting up matching elevations and distances, and different errors for those factors. Error can be customized based on observation station (for example a project with multiple theodolites in use). Unless behavior is specifically defined Mysticetus uses the Default setting.

8.3.3 Importing from Google Earth

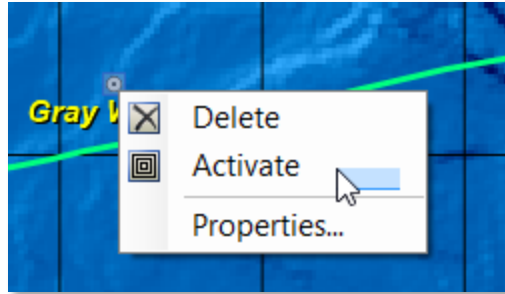
If you already have objects created in Google Earth, they can be easily imported via **Data -> Import -> From Google Earth**. Plans (Google Earth “Paths”), Waypoints (Google Earth “Places”) and Polygons will import to the equivalent Mysticetus geo-spatial objects. See *Chapter 10 - Data Import* for more details on this method.

8.3.4 Manual Creation

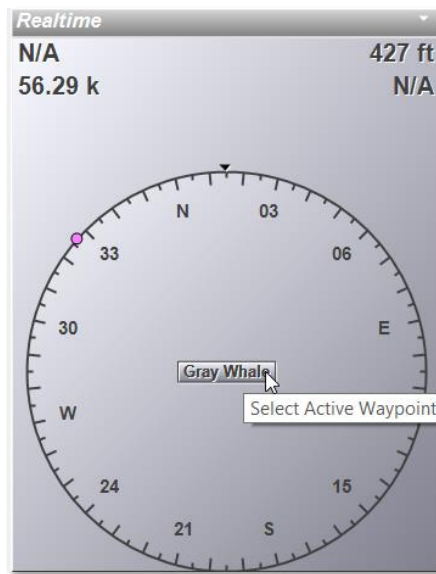
Although many objects, such as tracklines, sightings (as waypoints), and vehicles (vessels, aircraft) are created automatically by Mysticetus as events unfold, some are left for the user to create (or Import from sources such as Google Earth or Shapefiles, see *Chapter 10 - Data Import*). In particular, Plans (intended Routes), standalone Waypoints, and Polygons are created by selecting the appropriate toolbar button on the left side of the map window:

8.3.5 Activation (Plans, Waypoints/Sightings)

Plans and Waypoints (Sightings) can be activated by right clicking on them and choosing “Activate”

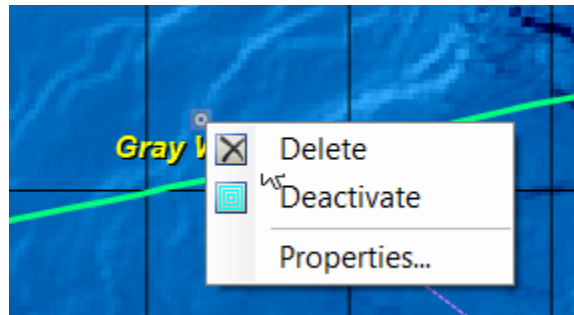


Mysticetus will draw a line from the active vehicle (vessel/aircraft) to the active waypoint and keep that updated at all times. In addition, the real-time navigation panel on the right side will be updated. Waypoints can also be activated by selecting them from the real-time navigation panel:

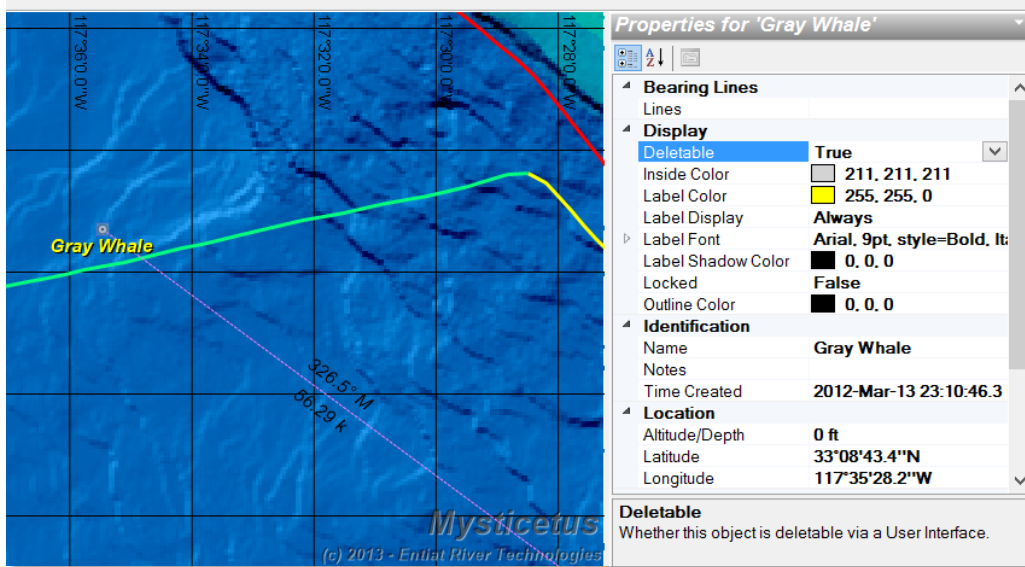


8.3.6 Deletion

All objects (Plans, Waypoints/Sightings, Tracks, Polygons) can be deleted by right clicking on them and choosing Delete.



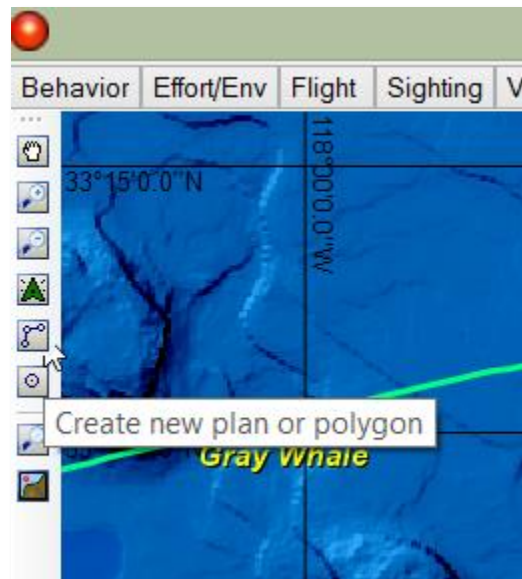
Note that some objects are marked as “Not Deletable”. To see (or change) this setting, right click on the object, choose Properties... and then check the Properties window for the “Deletable” setting:



S

8.3.7 Plans (Intended Routes)

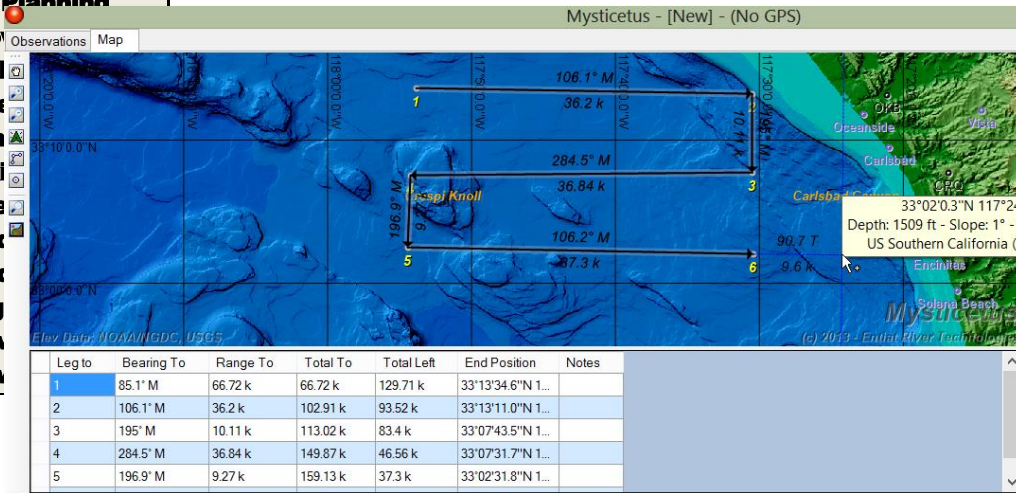
Plans (aka intended Routes) are created by clicking the Create New Plan or Polygon button in the map window:



Select Create New Plan, and start clicking on the map. Each time you click a new Waypoint will be added to the Plan. Stop adding waypoints by either right clicking, or by pressing the Escape key on your keyboard.

While creating or editing a plan (left click on an existing plan in the map window to edit it), the Planning window will be visible inside the map Window.

Pro Tip: The size of the Planning window
 everything
 Mysticet
 cha
 click
 "splitte
 it and
 wind
 drag
 whatev

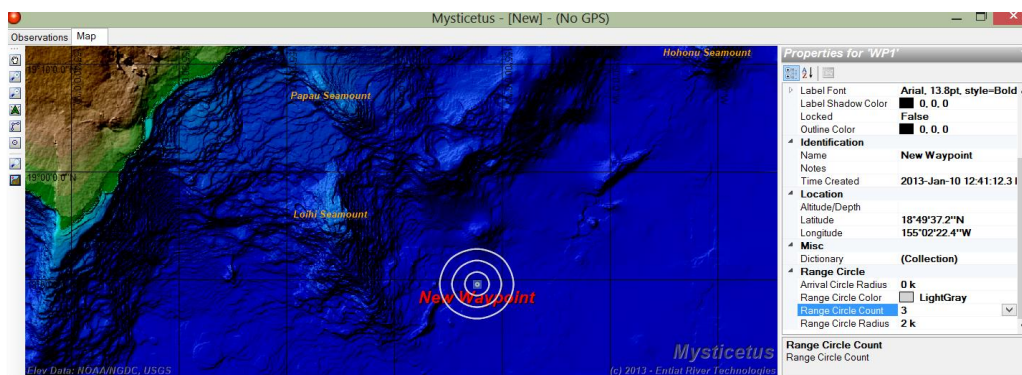


This window provides all sorts of good information about your Plan, range and bearing between waypoints, and so on. If your waypoint isn't in the exact correct location, you can edit the "End Position" cell to perfectly position it.

After a Plan has been created, the individual waypoints within the Plan can be dragged to new locations – the plan (and Planning Window) will be updated with the new information.

8.3.8 Waypoints

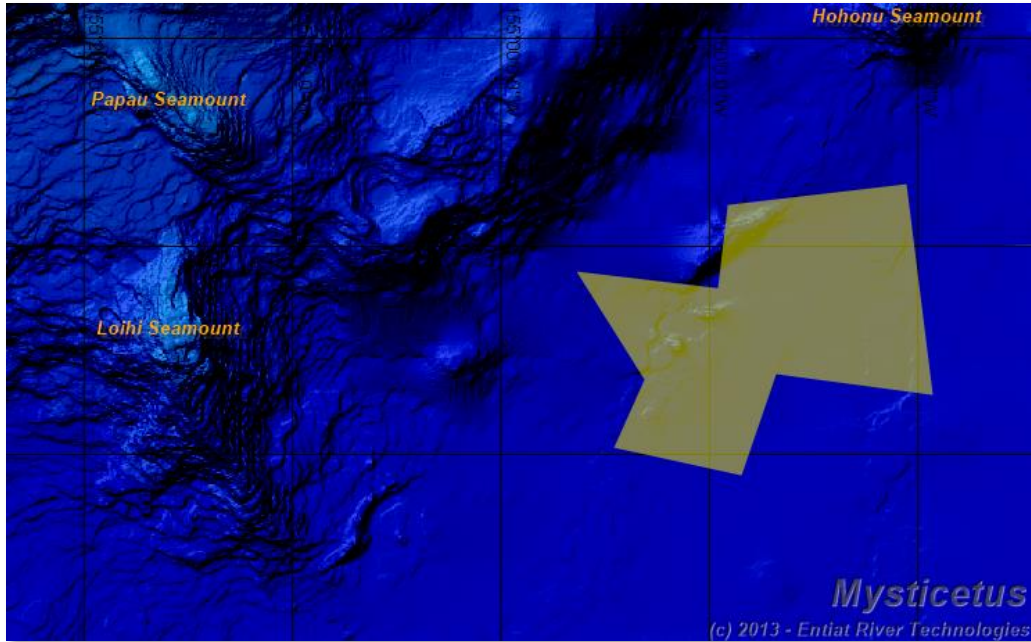
Individual waypoints can be created by clicking the New Waypoint button and then clicking on the map where you want the waypoint to be positioned. As with all objects, you can right click on the newly created waypoint, choose "Properties..." and edit things such as the precise location, label color and font, size and number of range circles, and so on:



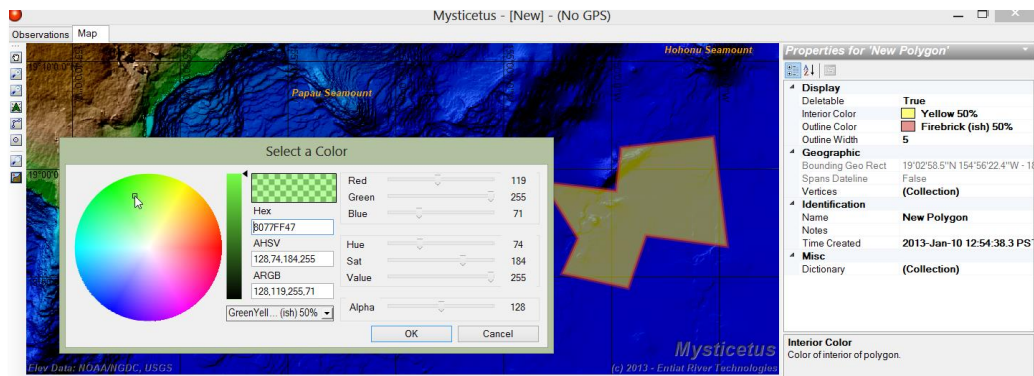
As mentioned in section 8.3.5 - Activation (Plans, Waypoints/Sightings), waypoints can then be activated and a large amount of navigation information about range, bearing, time-to-go, and so on will be displayed.

8.3.9 Polygons

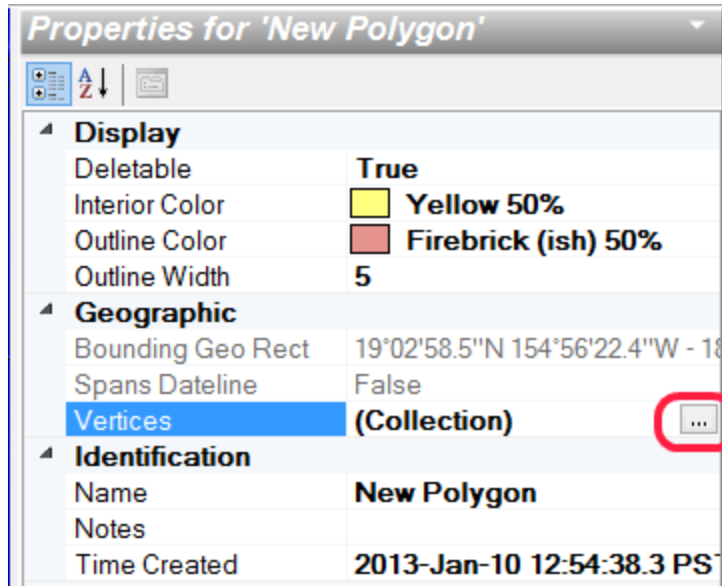
Polygons provide a method for delineating geographical regions. When coupled with the Inside formula (see *section 7.1.21*), Mysticetus can automatically calculate which, if any sightings are inside any of the Polygons in the system. Polygons are created by selecting the Create New Plan or Polygon button, and choosing Polygon. Then start clicking the points. After you have entered 3 or more points, Mysticetus will start drawing a polygon composed of those points:



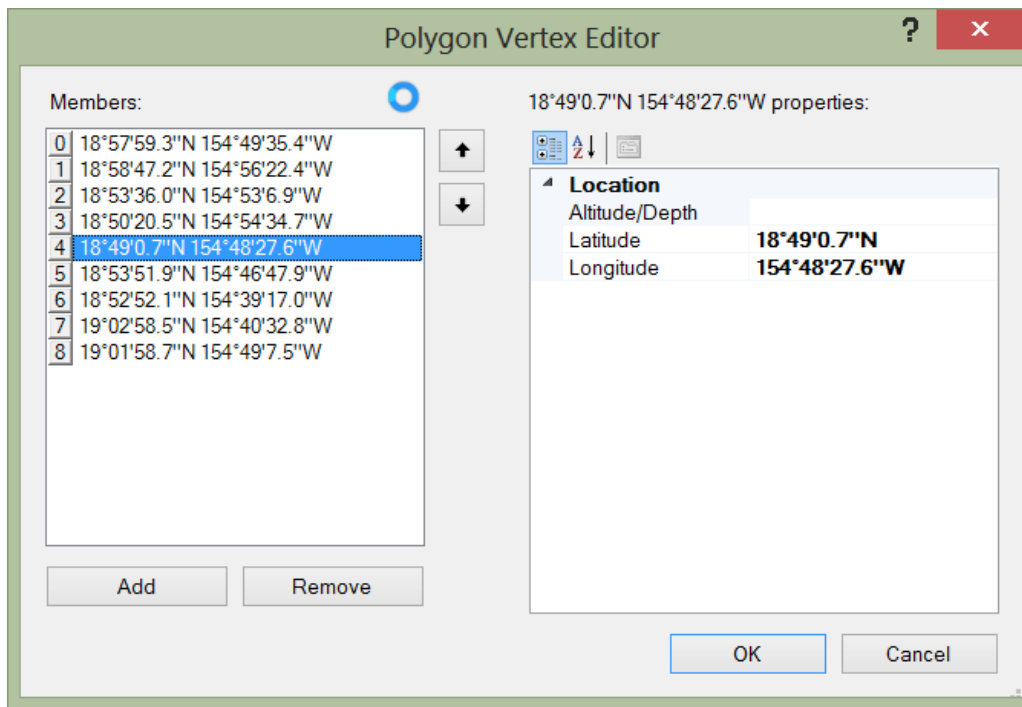
When finished, you can edit the various properties of the Polygon, including colors, transparency levels, and the details of the points, by right clicking on the Polygon and choosing "Properties..."



The vertices can be fine-tuned in the Polygon Vertex Editor. Select the ellipses next to the Vertices in the Polygon Properties:



And the vertex editor will pop up, where you can add, delete or precisely position any vertex in the Polygon.

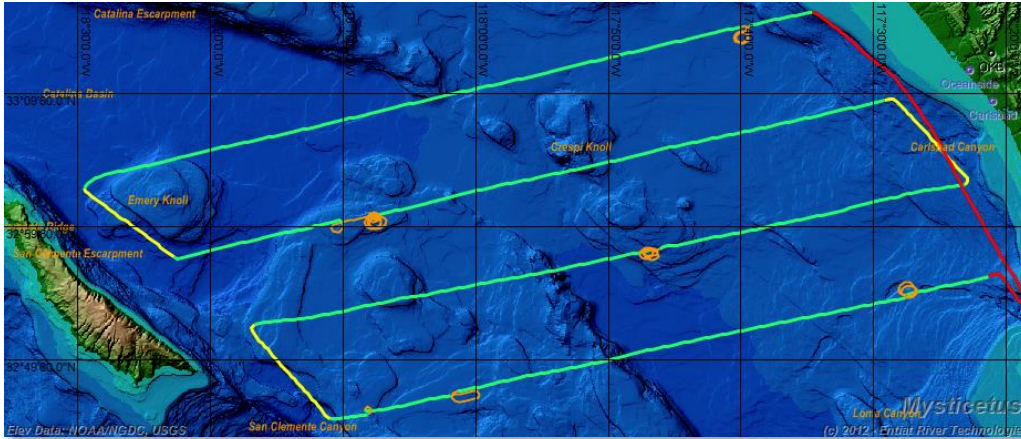


8.3.10 Track line Coloring

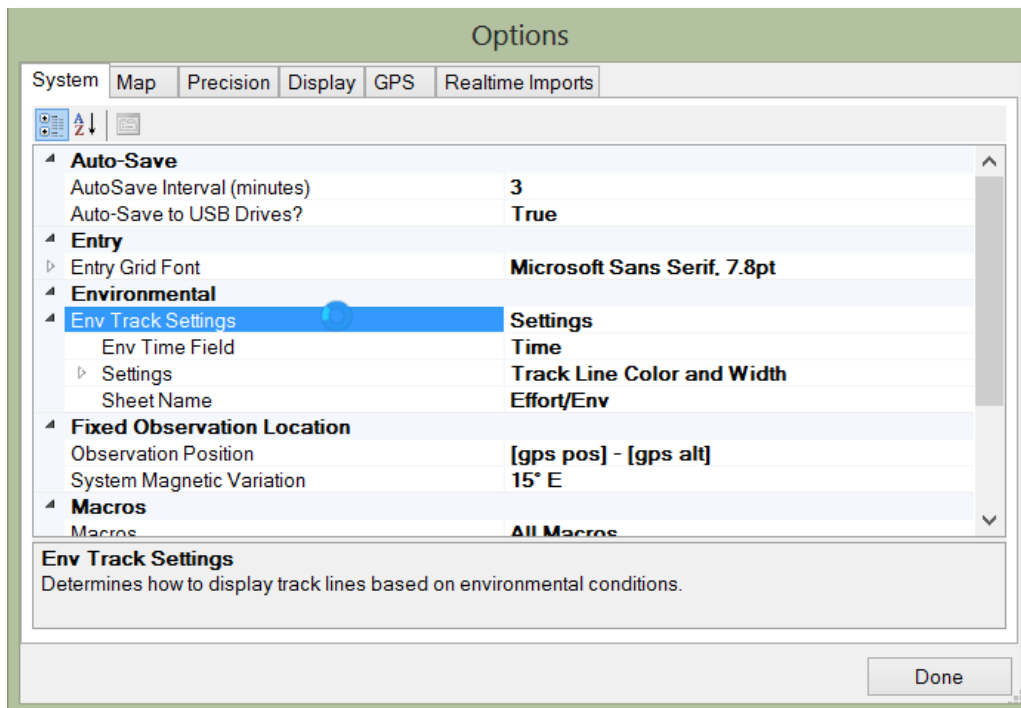
This relatively simple feature turns out to be one of the more useful tools in the application. With one glance you can see information chronologically spaced across an entire survey. And, while in the field, your data recorder can, in an instant, see possible data entry errors (for example, they forgot to note you went from a Systematic leg to a Circling leg). This feature brings these situations (and more) immediately to the screen.

GPS Track lines can either be a single color (controlled globally via **Configure -> System Options -> Map**, or via the individual Track's Properties), or the track can be colored to match ongoing information in an entry sheet. Typically, this is Environmental information, such as which survey leg type is being traversed, or perhaps the current Beaufort Sea State. However, since Track Line Coloring is configurable based on any information in the sighting sheets, it could theoretically be used to display track lines based on which sighting was most recent.

Here is an example of a track line colored based on survey leg type:



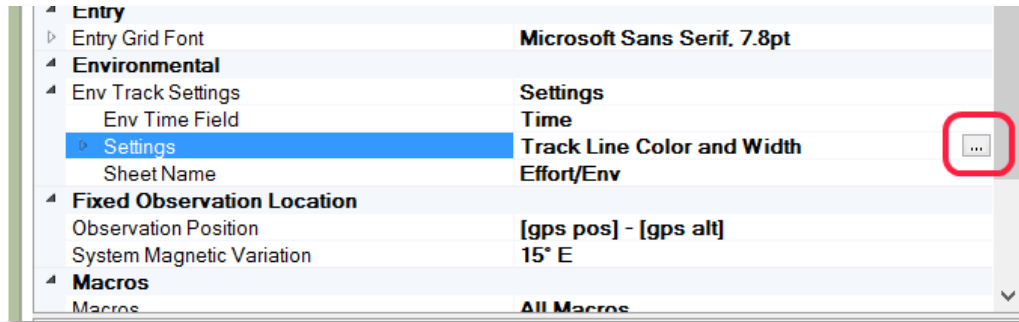
In this example from an aerial survey, Red indicates a transit or overland leg, Green indicates a Systematic leg, Yellow is a Connector and light Orange is Circling. Colors and line widths are configured by going to the System Options (**Configure -> System Options**), and expanding the Environment Track Settings entries:



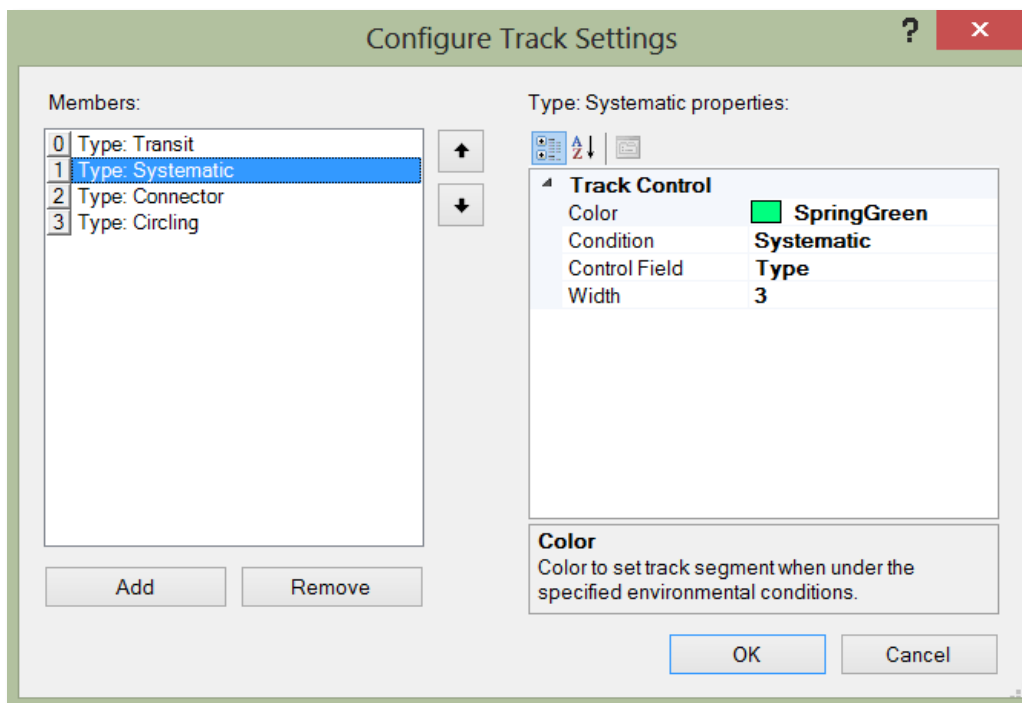
First, set the Sheet Name where the entry data is to be found. In this case, it is set to "Effort/Env".

Next, set the Time Field. In order to color the Track Line, Mysticetus needs to know how to match up the rows in the entry sheet with recorded track marks – this field does that. In this example, that field is simply named, “Time”.

Select the Settings row and some ellipses will appear; click on those:



And the Configure Track Settings dialog will appear:

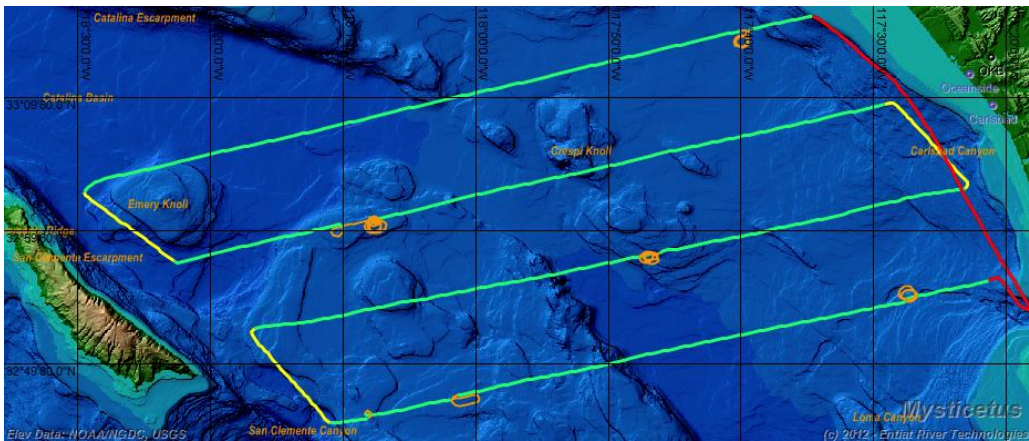


In here you control which fields will determine which colors (and widths) the trackline displays for various conditions. In this example, Mysticetus will match up the Type field with Transit, Systematic, Connector and Circling and set the colors as specified. You can, of course, choose different fields and different Conditions (and different colors, and different line widths). Here is part of the example Effort/Env sheet that drives the initial trackline image we saw earlier:

Behavior	Effort/Env	Flight	Sighting	Vessels				
+	Time	Type	Navy Redirect	Observation Effort	Line xsect Effort	LBft	LGlare	
▶	2012-Mar-13 14:37:40.4 PDT	Engine On	<input type="checkbox"/>	Off	Off	0	0	
	2012-Mar-13 14:42:20.2 PDT	Wheels Up	<input type="checkbox"/>	Off	Off	0	0	
	2012-Mar-13 14:45:54.4 PDT	Transit	<input type="checkbox"/>	On	On	0	0	
	2012-Mar-13 14:47:46.1 PDT	Transit	<input type="checkbox"/>	On	On	3	3	
	2012-Mar-13 14:50:06.0 PDT	Systematic	<input type="checkbox"/>	On	On	3	3	
	2012-Mar-13 14:53:35.0 PDT	Circling	<input type="checkbox"/>	On	Off	0	0	
	2012-Mar-13 14:57:14.0 PDT	Systematic	<input type="checkbox"/>	On	On	2	3	
	2012-Mar-13 15:02:30.7 PDT	Systematic	<input type="checkbox"/>	On	On	2	2	
	2012-Mar-13 15:05:45.3 PDT	Systematic	<input type="checkbox"/>	On	On	3	2	
	2012-Mar-13 15:08:14.2 PDT	Systematic	<input type="checkbox"/>	On	On	3	1	
	2012-Mar-13 15:14:57.0 PDT	Circling	<input type="checkbox"/>	On	Off			
	2012-Mar-13 15:16:38.0 PDT	Systematic	<input type="checkbox"/>	On	On	3	3	
	2012-Mar-13 15:20:58.0 PDT	Circling	<input checked="" type="checkbox"/>	On	Off	0	0	
	2012-Mar-13 15:21:28.0 PDT	Systematic	<input type="checkbox"/>	On	On	0	0	

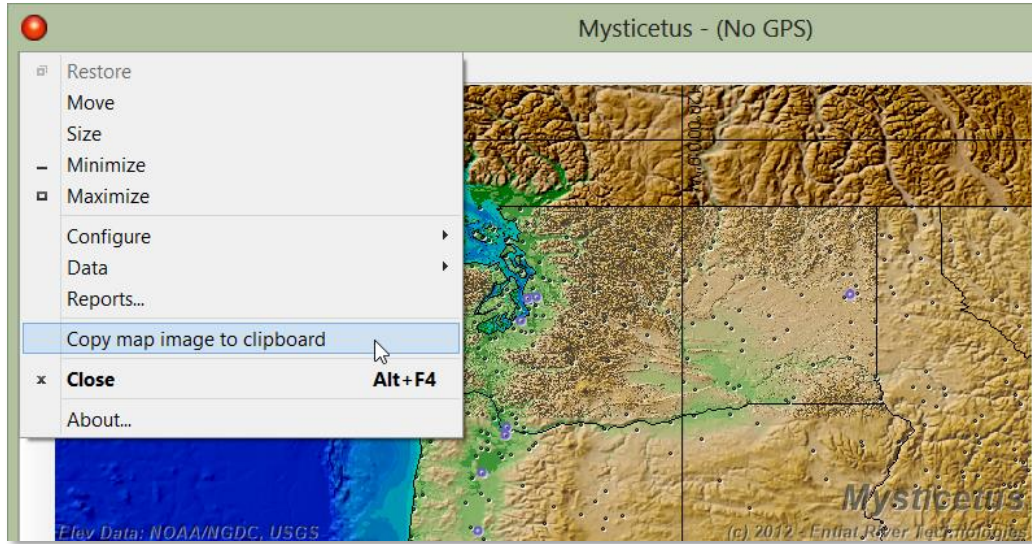
Date/Time of observation - ("now" or "x" will stamp with current time)

Of note, the "Time" field and "Type" field. As we configured it in this example, Mysticetus will scan through those fields to color the GPS track line



8.3.11 Copying a Map Image

One of the most useful features for creating presentations, or even just emailing information around, is the Copy Map Image to Clipboard menu item:



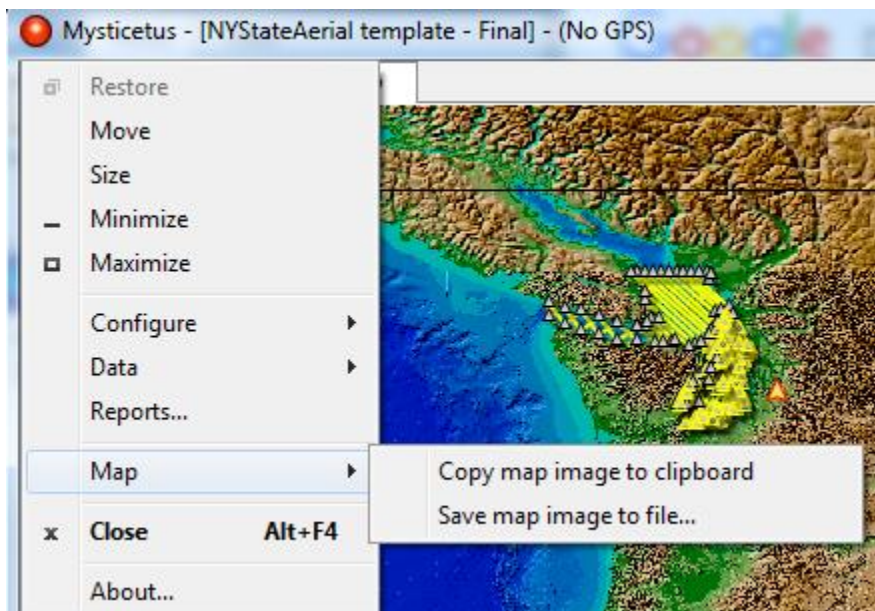
This will capture the contents of the Map Window, including all bathymetry, shapefile maps and geo-spatial objects (plans, GPS tracks, sightings, etc.) and copy it to the clipboard, where it can be pasted into any other Windows application.

8.4 Map Copy and Save Options

The map image can be used in other programs via two options:

- 1) Copy the current image into your clipboard
- 2) Save the map image to a .png file

These operations should be obvious to you. Option 1 is equivalent of a *'ctrl+c'* command which you can then insert in another place via *'ctrl+v'* (cut and copy). The second will create a .png file in a location of your choosing.



9 Reports

Mysticetus provides a powerful suite of automatically-generated reports. You control what is output, you control where the input fields come from. You send an invoice for many, many hours of grunt work that Mysticetus did for you – and go hiking instead.

Reports are generated in Mysticetus by selecting the “Reports...” menu item.

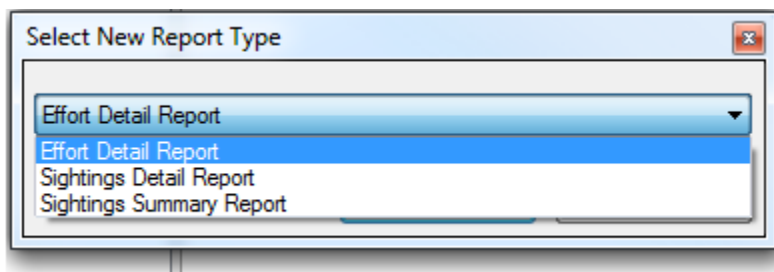
NOTE: Something to consider when working with your data – always back up your raw data. Always. Back up merged data when you’ve got it right. Copy all that precious data into a separate folder appropriately named: ‘Backups’. LPT

It is always reasonable to export your data to a CSV file or Google earth as explained elsewhere in this guide to manage your reports. One can also highlight all the data, copy and paste it into a spreadsheet program such as Libre Office or Excel. The problem with the copy and paste method is you will get false additional rows of data if your comment fields are long. It is always best to use the Mysticetus data export feature.

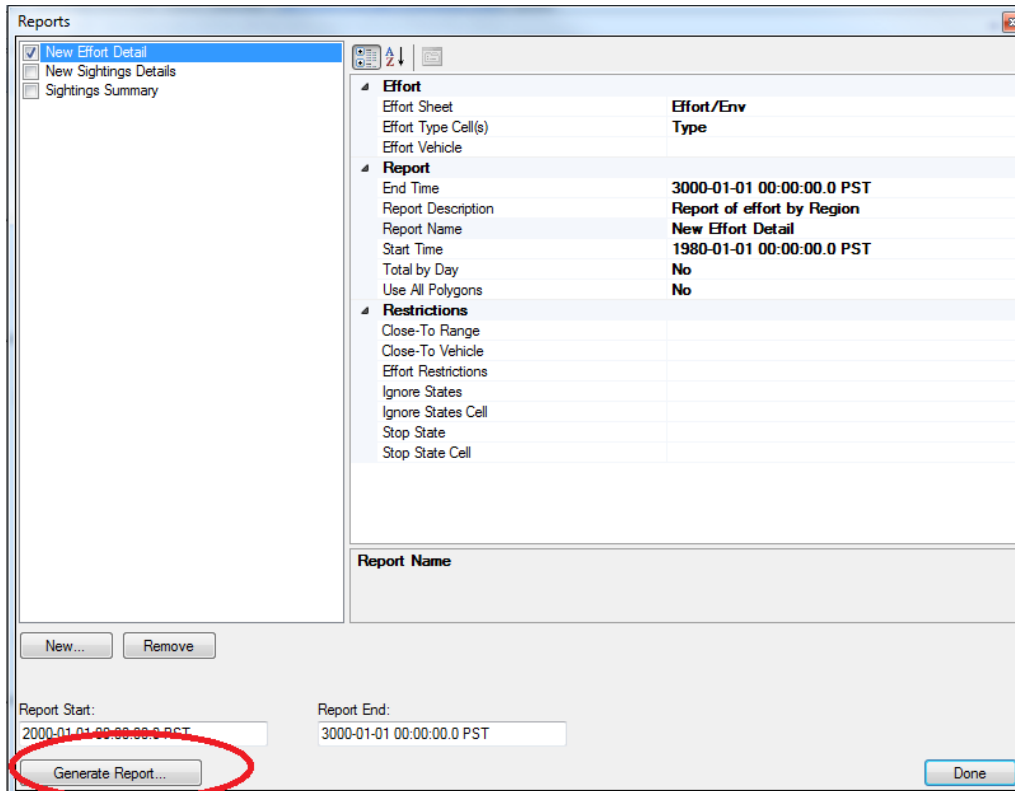
9.1 Report Types

There are three types of reports that can be generated:

- Effort Detail Report – details the times and distances spent On Effort over a survey.
- Sightings Detail Report – details the sightings counts, species and observers
- Sightings Summary Report – Summary of the sightings observations



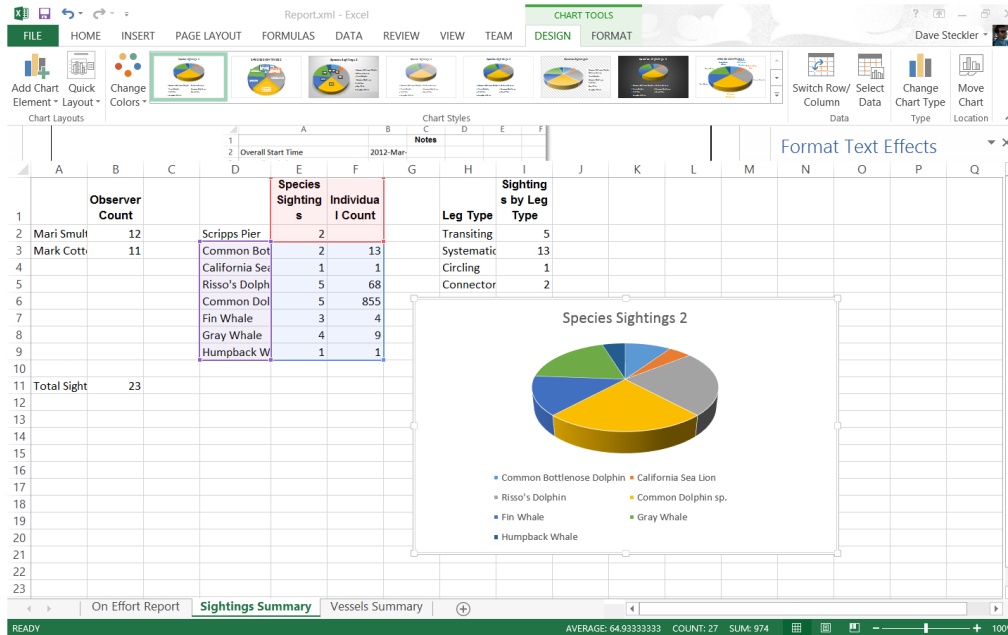
Assuming everything is configured correctly per the below sections, check the reports you want to run, click Generate Report button, and an Excel XML file (a special type of Microsoft Excel file) will be generated, with a tab for each report type.



	A	B	C	D	E	F
1			Notes			
2	Overall Start Time	2012-Mar-				
3	Overall End Time	2012-Mar-				
4						
5	Overall Survey Minutes	189				
6	Overall Trackline Distance (km)	571.7174				
7						
8	Overall On Effort Minutes	172				
9	Overall Off Effort Minutes	17				
10	Overall On Effort Distance (km)	540.5270				
11	Overall Off Effort Distance (km)	31.1904				
12						
13	Effort Start Time	2012-Mar-	Start of first On-Effort			
14	Effort Stop Time	2012-Mar-	End of last On-Effort			
15	Effort Minutes	172				
16	Effort Off-Effort Minutes	0	Off-Effort within Effort			
17	Effort Off-Effort Distance (km)	0.0000				
18	Effort Total Trackline Distance (km)	540.5270				
19						
20						
21						
22						
23						
24						
25						

At this point, you can easily “spruce up” the report with graphs if you like (or perhaps insert a screen shot, as described in *section 8.3.11 - Copying a Map Image*). Simply select the cells in the spreadsheet and select Insert

3D Pie Chart (or whatever chart you want). In the following example, the Sighting and Species Count cells are charted.



9.2 Report File Type

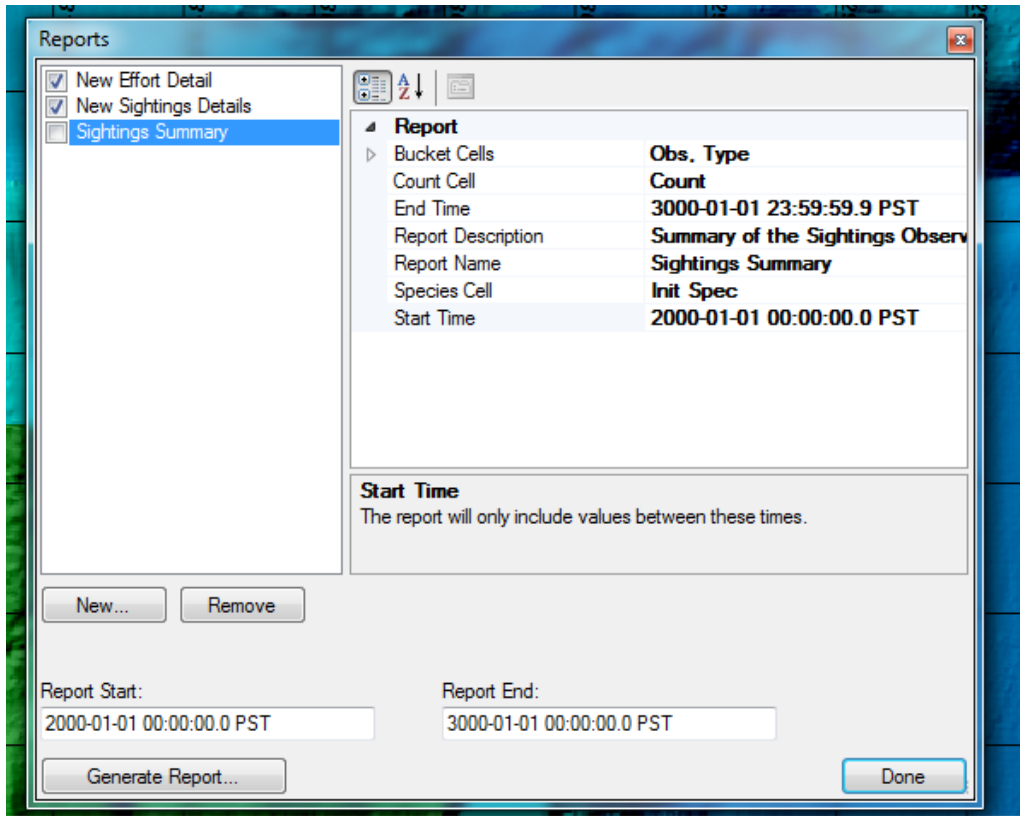
Since Mysticetus creates reports using Excel XML, the default file extension is XML – the default report name is Report.xml. When you save your edited report (with charts, screenshots, etc.) you should save it as an Excel Workbook (for example, ThisReport.xlsx).

9.3 Report Configuration

Like most things in Mysticetus, reports are highly configurable in terms of the fields they key off of. For the reports to work properly, Mysticetus needs to know which fields to draw information from. In the main report dialog, this information is contained on the right side for each report. Select the report you are configuring, and make sure all the cell names are correct for your setup. Mysticetus starts with some defaults that apply to the Sample.Mysticetus template file found on the Mysticetus website (<https://mysticetus.com/mysticetus-downloads/>).

If your entry sheets have different names, or differently named fields, you will need to update these configuration values to match.

You can configure or tune your report via the bucket cells.



Mysticetus allows all reports to be date and time restricted. That is, if you only want to see sightings or effort reports for certain time ranges, you can enter that in the following fields seen here: 'Report Start' and 'Report End'. This allows running Mysticetus constantly for long periods of time, but extract the sighting, vessel or effort reports for specific time periods as needed.

Some further examples:

=====

Effort:

=====

For example, to slice things by both Visual Effort and Bft, you will need to use both the Bucket Cells (say, Bft) and a Restriction (say, Thrusters On). Rinse, lather, repeat for NVD. Then IR.

It will help to create new reports for each item, and then save the report settings in the file for future reference. That is, on the Reports page, click the New button, select Effort Detail report. Set up all the Buckets and Restrictions, change the Name to something useful and Save the Mysticetus file. Note that We've already added a separate "Inside 500m" report to the template, with different config/filters than the default Sightings Detail report.

=====

Sightings

=====

Create a new Sightings Summary report. Name it something useful (like "Sightings Summary - Inc Thruster Status"). Add "Thruster Status" to the Bucket Cells.

For example:

The screenshot shows a 'Reports' dialog box with a list of reports on the left and a configuration panel on the right. The 'Sightings Summary - Inc Thruster Status' report is selected. The configuration panel shows the following details:

Report	
Bucket Cells	Thruster Status, Obs, PSO, Type
Count Cell	Count
End Time	3000-01-01 00:00:00.0 UTC-8
Report Description	Summary of the Sightings Observa
Report Name	Sightings Summary - Inc Thruster
Species Cell	Species
Start Time	1980-01-01 00:00:00.0 UTC-8

Below the report details is a section for 'Bucket Cells' with the text: 'Cells in the sighting sheet that you want to bucket by. Default is 'Leg Type'.'

At the bottom of the dialog, there are buttons for 'New...' (circled in red), 'Remove', 'Report Start:' (with a text box containing '2000-01-01 00:00:00.0 UTC-8'), 'Report End:' (with a text box containing '3000-01-01 00:00:00.0 UTC-8'), 'Generate Report...', and 'Done'.

When you generate the report, it will bucket by that cell in the Sighting tab:

	A	B	C	D
1	Species	Sighting Events	Individual Count	
2	Fin Whale	1	1	
3	Humpback whale	3	3	
4	Minke whale	1	2	
5	North Atlantic right whale	1	1	
6	Short-beaked common dol	22	168	
7	Unid dolphin	13	13	
8	Unid dolphin or porpoise	9	48	
9	Unid whale	10	12	
10				
11	Thruster Status			
12	Low	20	48	
13	Medium	3	8	
14	Off	29	181	
15	Other	1	2	
16	Variable	7	9	
17				
18	PSO			
19	<blank>	18	52	
20	[REDACTED]	6	68	
21	[REDACTED]	8	21	
22	[REDACTED]	17	84	
23	[REDACTED]	5	10	
24	[REDACTED]	1	1	
25	[REDACTED]	5	12	

Mysticetus can pull reports based on data points inside vs. outside of the survey area.

Sgt Pos	GeoPosition	Location of Sighting
Sgt Lat	Real	Sighting Latitude
Sgt Lon	Real	Sighting Longitude
Pad	Distance	Perpendicular Sighting Distance
Depth	Elevation	Depth (negative) or Elevation (positive) at Sighting Position
Slope	Angle	Slope at Sighting Position
Aspect	Angle	Slope Aspect at Sighting Position
Shore Dist	Distance	Distance to nearest shoreline from Sighting Position
Bathy Res	Text	Bathymetry Resolution in Degrees at Sighting Position
Map Info	Text	Map and Bathymetry Information at Sighting Position
Region	Text	Region the sighting was within
Plan	Text	Closest Plan
Plan Leg Num	Text	Closest Plan Leg Number

Field Attributes	
Alias List	
Auto-Complete List	
Auto-Complete Source	
Auto-Position Others	
Auto-Time Others	
Column Style	
Default Value	
Export Format	
Formula	
...	

Inside(Sgt Pos)

Formula: Inside

Argument(s): Position: Sgt Pos

Inside

Determines which container(s) such as Polygons a position is inside.

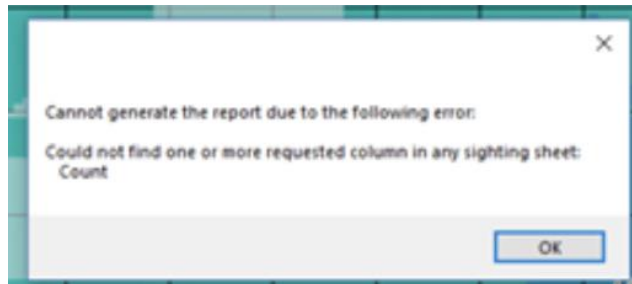
- Position: Column specifying where (GeoPosition) to determine containment.

Microsoft Sans Serif, 8.25pt

{ Export: False, Field: *, Single Point: True, Boolean Format: YBI
Inside(Sgt Pos)

Some things to ponder (a very common error we see):

Reports only report on the fields you've defined and entered data into. If you try to run a report on a different field other than you used you'll get an error like this:



More detail:

Mysticetus has no clue what has actually been defined during data collection, mainly because everyone thinks somewhat uniquely to their needs.

While many use min/max/best count, others think that is madness (I tell you!) and use one cell to represent the number of animals in a sighting group. Even then, while some say, "Count", others say, "Count of Animals", "Individual Count", "Number", "Group Size", "Cnt.", etc. You must think about reports in terms of how you've defined your data collection columns in the template file.

Thus, for reports, you've got to tell Mysticetus, "Hey, the name of the field that contains the count of animals is [whatever it is]".

Report

Bucket Cells	Obs. Type
Count Cell	Count
End Time	3000-01-01 23:59:59.9 EST
Report Description	Summary of the Sightings Observ
Report Name	Sightings Summary
Species Cell	Species
Start Time	2000-01-01 00:00:00.0 EST

Count Cell
Cell in the sighting sheet that contains the best count for this sighting. Default is 'Count'.

When importing data for reporting Mysticetus does not automatically rerun formulas as we don't want to accidentally over write anything. Formulas must be explicitly rerun*.

*Remember to recalculate your data when importing data.

Mysticetus
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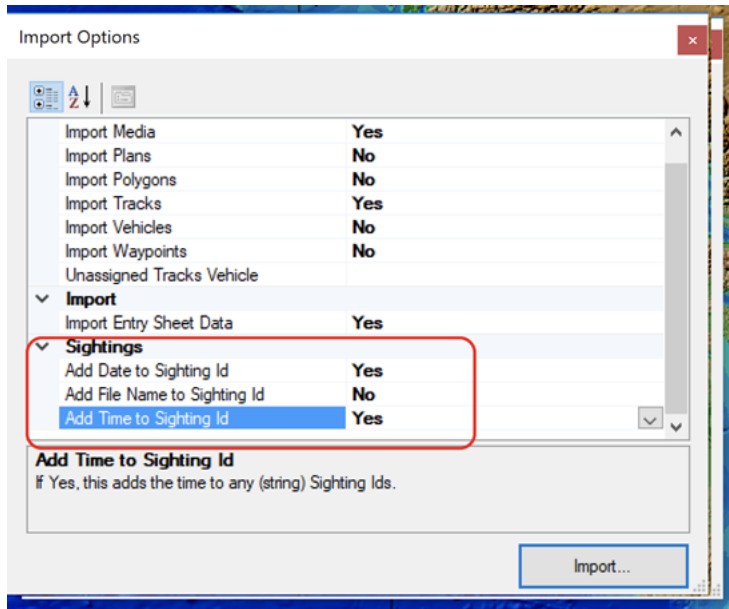
Leg Type	LBft	RBft	Photos Init	Frame Num	Photos	Video	Cin
Circling	3				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Recalculate Formulas for Column
- Delete Rows Containing ▶
- Delete Rows NOT Containing ▶

9.4 Merging Reports

As a project is completed there is often a need to merge your days all into a single database. Some projects reset ID's every day. For them it is important to not allow day to day sighting ID's to link to another day's sighting ID's. This can be addressed when importing with various options.

When you choose Data -> Import from Mysticetus, it pops a screen like the below where you can, for example, tell Mysticetus to insert the date (and/or file name and/or time of day) in front of the sighting id.



This is an important step to acknowledge in your merging your day to day observations into a single, common database.

A few things to consider with this approach:

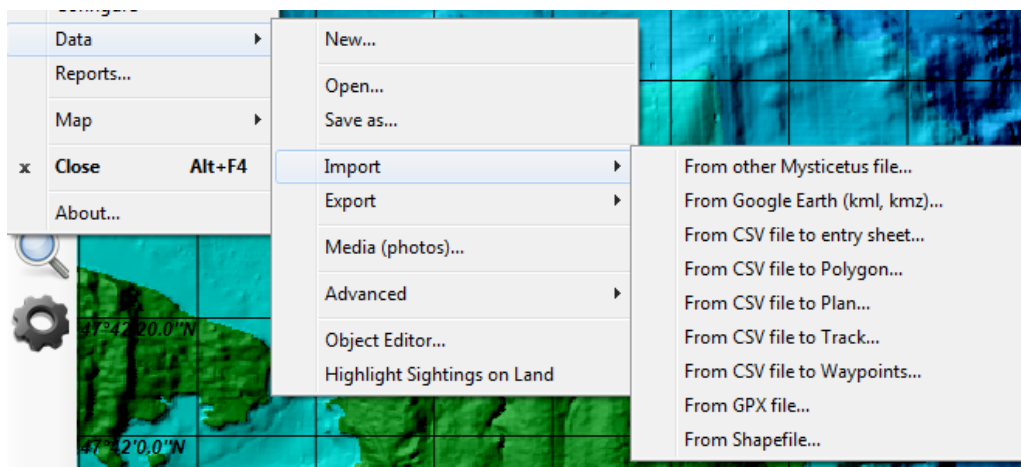
One downside of this practice is adding all that information to the front of the sighting id can create data problems. Especially around time in the case of re-sights. Plus, date in the case of re-sights that go across midnight. So be mindful in reviewing your data.

10 Data Import

Mysticetus can import data from a number of different formats, including CSV, Shapefiles and Google Earth™ and media content (photos)

Import of data is a method for either (a) bringing data previously recorded or created into the Mysticetus system or (b) using an application better suited for the particular data creation task and then bringing it into Mysticetus for further analysis.

All Data Import is triggered from the **Data -> Import** menu item:



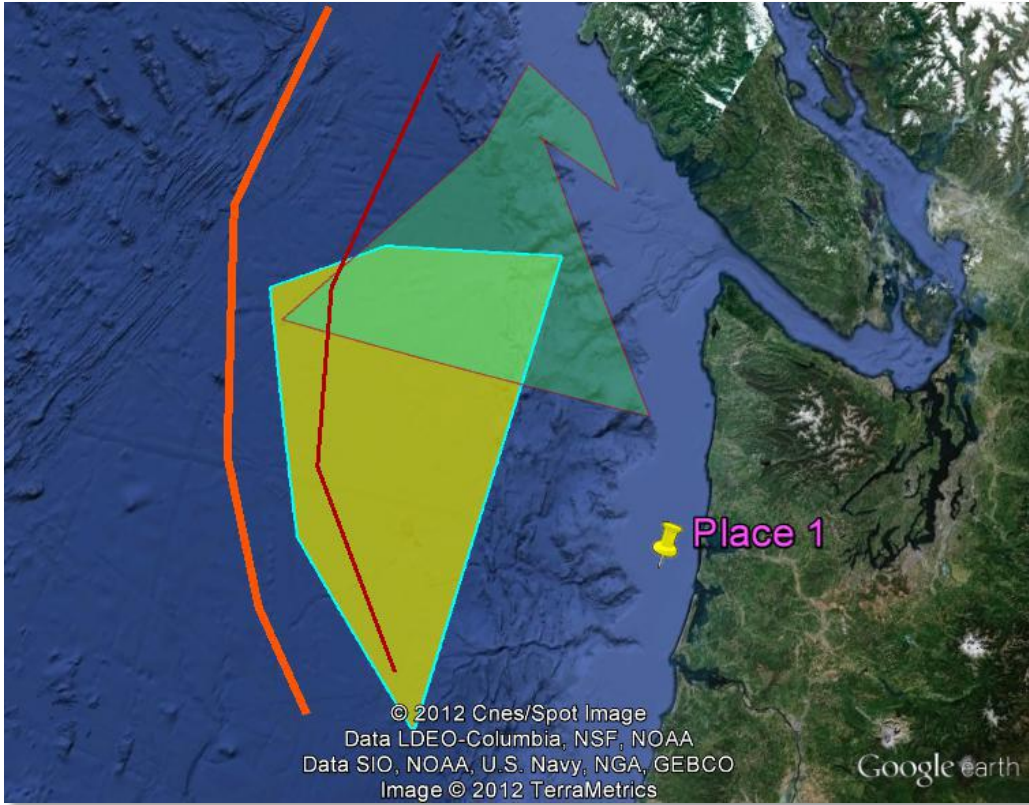
All data objects can be managed using the Object Editor from the **Data -> Object Editor...** menu item. This includes managing shapefiles such as deleting obsolete files.

10.1 Mysticetus file

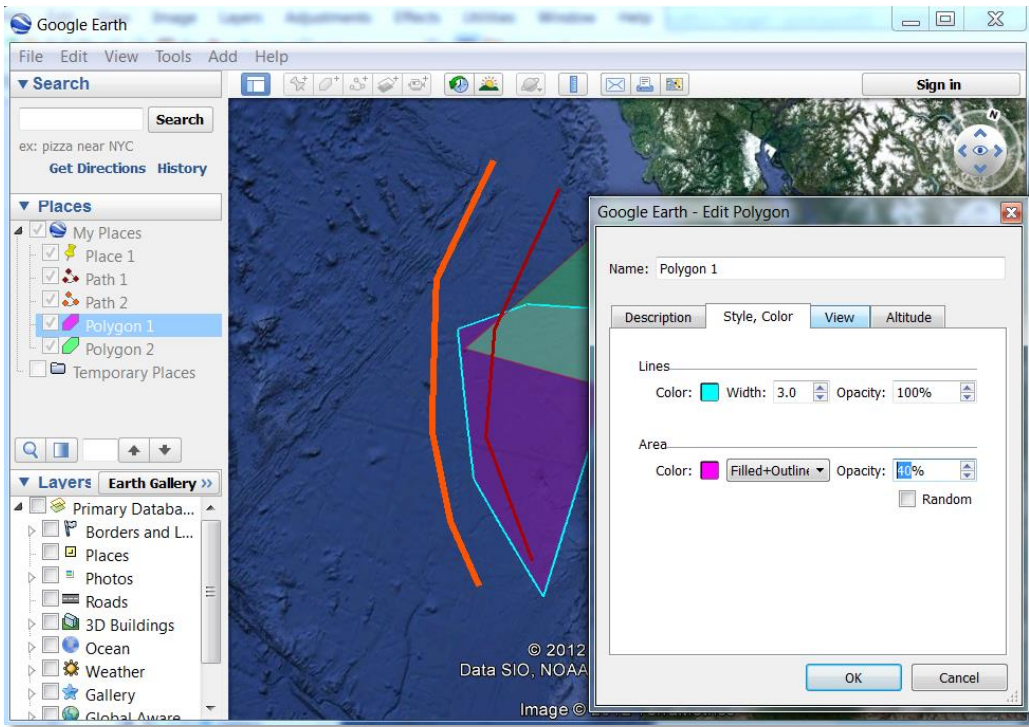
You can easily read in Mysticetus files for manipulation, analysis, review, and reporting. It is possible to merge Mysticetus files for analysis.

10.2 Google Earth

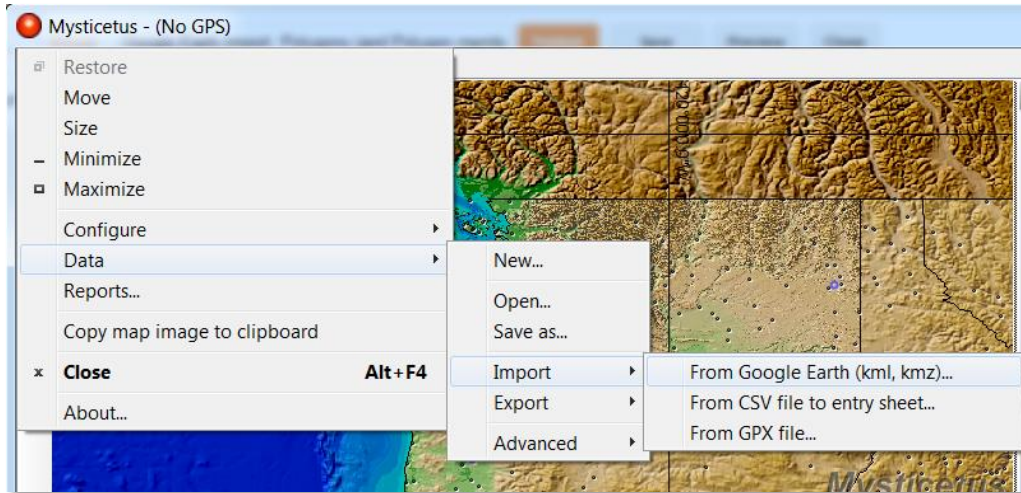
Mysticetus can import all standard Google Earth shapes, including Paths, Places and Polygons. For example, create whatever you want in Google Earth:



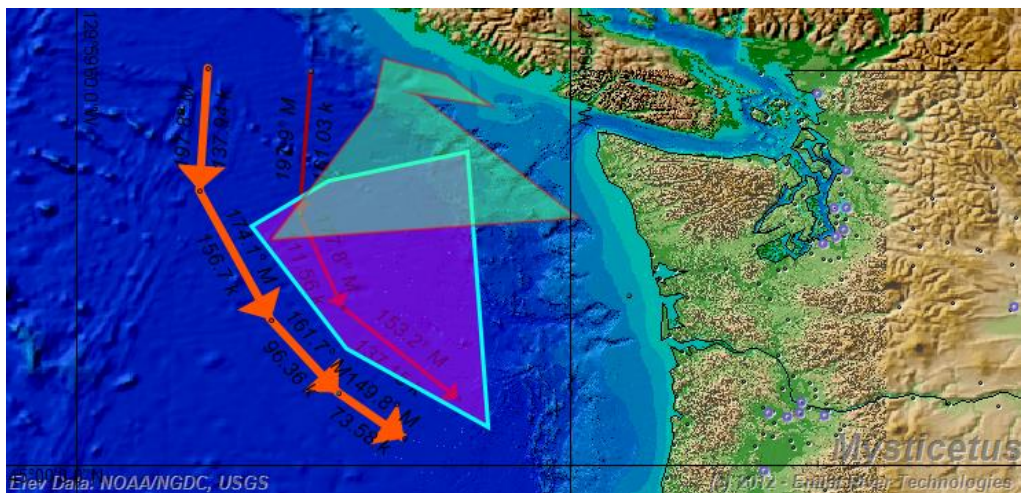
You can set colors, line widths, etc.



Save your places as either a KML or KMZ file. In Mysticetus, choose **Data -> Import -> From Google Earth**.



Select your KML or KMZ file and Mysticetus will bring it into the Mysticetus system:



10.3 CSV (Comma-Separated Value) File

Comma-Separate Value is a very common tabular interchange data format. It contains a header row that specifies the columns, and then rows of data. Each column is separated by a comma. Excel, Access and every GIS system on the planet can output tabular data in this fashion. Similarly, it can be imported into Mysticetus' entry sheets.

For example, say you wanted Mysticetus to calculate the depth at sighting position for a previously entered set of geographic positions. The first step is to create an entry sheet with the appropriately named columns. For example,

Name	Type	Description
Id	Integer	Observation Id
Observation	Text	What was observed.
Species	Text	The animal observed.
Position	GeoPositi...	Where the observation was recorded.
Time	DateTime	Date and time where observation was recorded.
Depth	Elevation	Depth at Position
*		

Field Attributes	
Alignment	NotSet
Auto-Position Others	
Auto-Time Others	
Default Value	
Export Format	{ Boolean Format : YBlank, Angle Include Degree Symbol
Formula	

Next, make sure the Depth column uses the Elevation formula (see *section 7.1.19* for more information on this formula).

EntryManager		
Name	Type	Description
Id	Integer	Observation Id
Observation	Text	What was observed.
Species	Text	The animal observed.
Position	GeoPositi...	Where the observation was recorded.
Time	DateTime	Date and time where observation was recorded.
Depth	Elevation	Depth at Position
*		

Field Attributes	
Alignment	NotSet
Auto-Position Others	
Auto-Time Others	
Default Value	
Export Format	{ Boolean Format : YBlank, Ang
Formula	Elevation(Position)

This creates an empty entry sheet

Observations						
+	Id	Observation	Species	Position	Time	Depth

Assuming the columns in your CSV file match this (if not, rename things so they match), choose **Data -> Import -> From CSV File to Entry Sheet**. For this example, I used the following made-up CSV file:

```
Id, Observation, Position, Species, Time
99, Blow, 23.34 N 117.12 W, Blue Whale, 1:02:03
```

888, Fluke Up, 12.34 N 17.24 E, Gray Whale, 3:04:05

Which leads to the following representation in the Entry Sheet after Import:

Observations							
	+	Id	Observation	Species	Position	Time	Depth
		99	Blow	Blue Whale	23°20'24.0'...	2013-J...	-13077 ft
		888	Fluke Up	Gray Whale	12°20'24.0'...	2013-J...	991 ft

Yes, that Gray Whale has apparently (d)evolved, very rapidly, some feet. ☺ Recall that this is just some made up data, so a Gray Whale at 991' above sea level isn't that strange.

10.4 GPX (GPS eXchange) File




Tracks can be imported from GPX files. This is handy if you want to re-run environmental reports from old data, and you have GPS tracklines stored in a GPX file. Choose **Data -> Import -> From GPX File...**, select the GPX file to import and Mysticetus will bring in the track data

10.5 From Shapefile

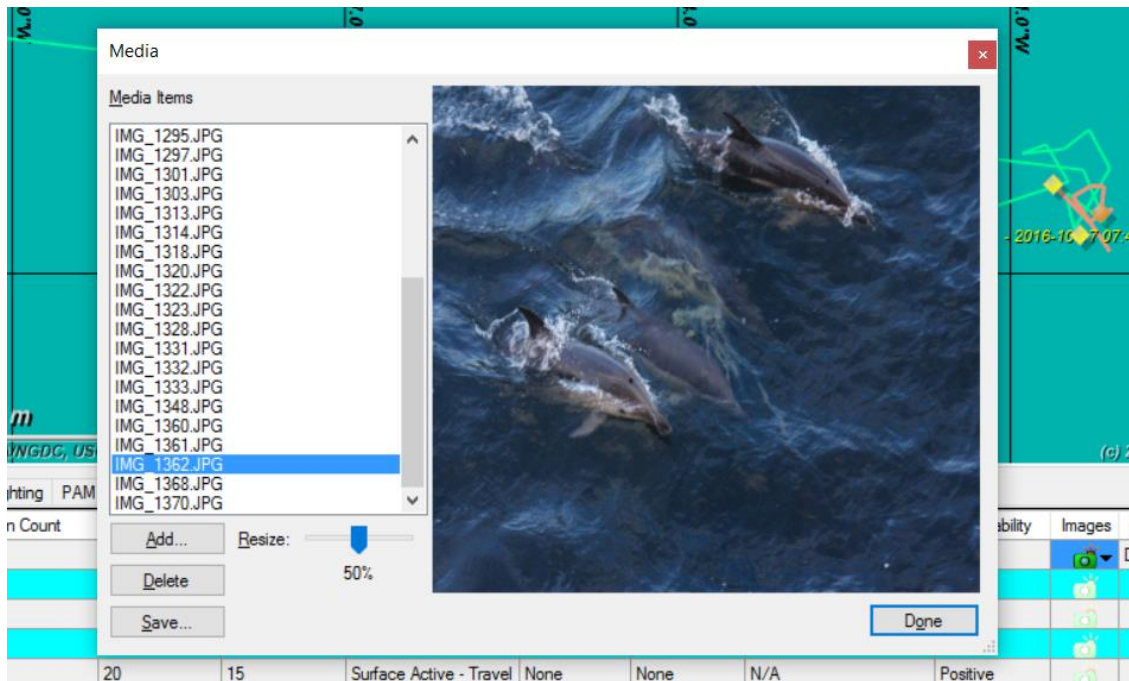
Shapefiles are imported here and rendered on the map display.

10.6 Importing Media (pictures)

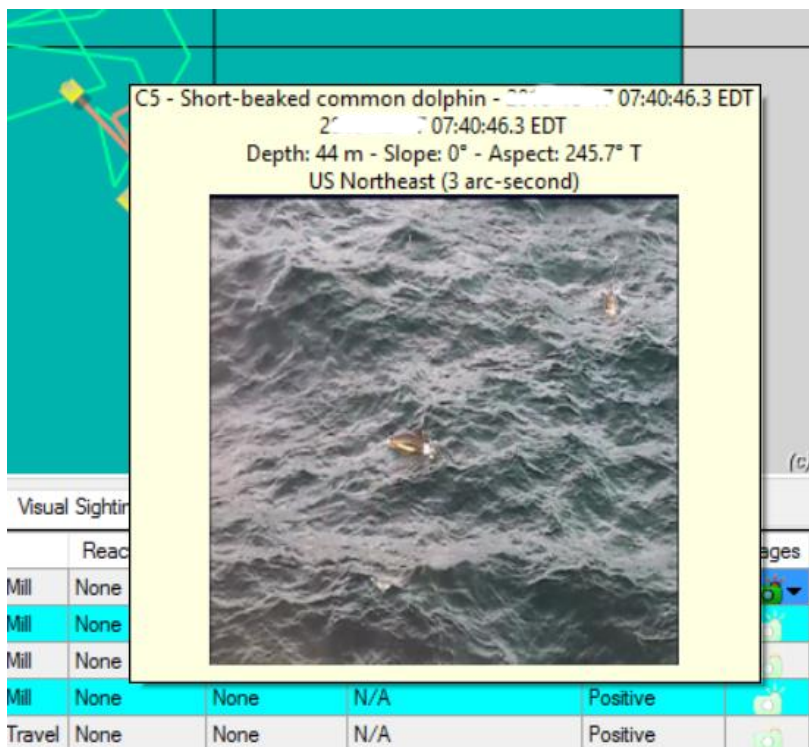
Media can be imported and associated with your sightings. There are two ways to import data. The first allows you to insert directly to a record. A column must be added to your template to allow for this as per the below.

	Mitigation Response	ID Reliability	Images	Image Credit	Notes
m	Powerdown	Positive		David Steckler	PAM Detection - visually cofirmedTook quite a while to
m	Powerdown	Positive			Been here a long time,lots of social-ish and/or feeding
m	Powerdown	Positive			Still hanging out a lot less active. Numbers seem lower

Clicking on the image column allows you to select an image to insert.



This will directly insert the selected image(s) to the sighting record and associated meta data will be tied to the photo including sighting data.



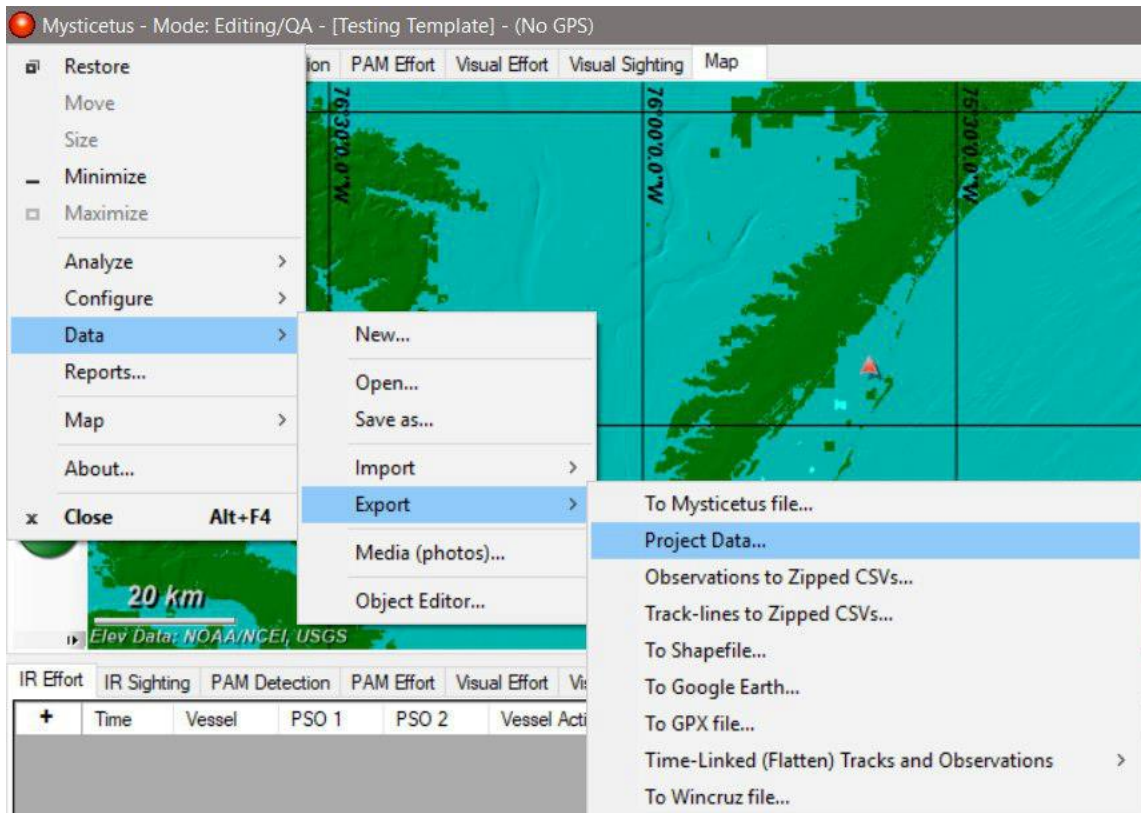
Mysticetus also allows you to import data through data import feature. It will then attempt to use the meta data associated with images to tie them to your most recent sightings. Make sure your

camera's date and time information is very correct as Mysticetus uses that information in attempts to associate an image to a particular sighting record. Matching entered media content to sightings is the default behavior as seen in the below images.

11 Data Export

Mysticetus can easily output your data into a number of different formats, including Microsoft Excel™, ESRI Shapefiles, GPX, and Google Earth™

Exporting your data allows you to manipulate it in other programs that can provide even more advanced editing and/or analysis techniques. Leverage the data export feature so your data will be correctly parsed for other programs to consume. See section 5.5.11 “Export Format” which discusses naming field names for export.

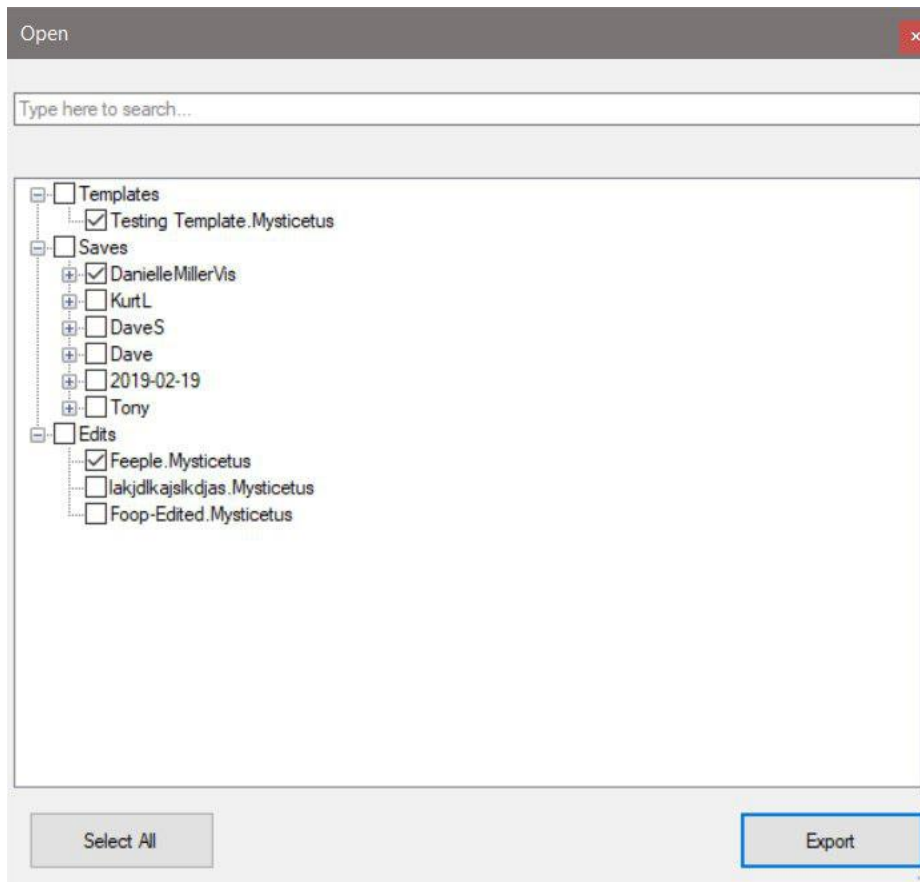


11.1 To Mysticetus file

Export data to a Mysticetus file.

11.2 Project Data

Allows you to export specific parts of your project to a zipped Mysticetus file.



11.3 Spreadsheet Compatible CSV's (Observations)

Export saves all current data in all entry sheets to an csv formatted file compatible with most spreadsheet programs such as Excel or google sheets. Each entry sheet becomes a sheet in an CSV file. Simply chose **Data - > Export -> Obervations to Zipped CSV's**, choose a filename to save into and Mysticetus will do the rest.

11.4 Spreadsheet Compatible CSV's (Track Lines)

In this case, Mysticetus exports all GPS track lines to a zipped CSV formatted file.

Choose **Data -> Export -> Track-lines to Zipped CSV's**.

11.5 Google Earth

Mysticetus will export all Planned Routes, Polygons, Waypoints/Sightings and GPS track lines to a Google Earth KML (Keyhole Markup Language) file.

Choose **Data -> Export -> To Google Earth**.

11.6 ESRI Shapefile

Mysticetus will export all Planned Routes, Polygons, Waypoints/Sightings and GPS track lines to an ESRI shapefile. In addition, if configured (see *section on Shapefile Environmental time field*), Mysticetus will add appropriate environmental information about each GPS track mark into the track's attribute table. In this way, GPS track marks in exported shapefiles can be loaded into other GIS applications and analyzed with respect to environmental conditions such as survey leg type, Beaufort Sea state, etc. at the time of that track mark record.

Choose **Data -> Export -> To ESRI Shapefile**. Note shapefiles have a ten-character limit on file names, longer names are truncated. This is not a Mysticetus limitation.

11.7 GPX

Mysticetus will export Planned Routes, Waypoints/Sightings and GPS track lines to a GPS eXchange (GPX) file. This file is a standard format used by many GPS's, especially Garmin, to exchange information.

This is the ideal way to send a Planned Route from Mysticetus to your GPS.

Choose **Data -> Export -> To GPX File**.

11.8 WinCruz

WinCruz export

Some people have data processing tools that require input in WinCruz format (WinCruz is an older, no-longer-maintained data gathering tool) - you can now export your Mysticetus data in this format.

Choose **Data -> Export -> To WinCruz File**.

11.9 Time-Linked (Flatten) Tracks and Observations

Export "time linked" data.

Sighting data is correctly lined up with effort data and GPS track lines. This was originally created to match US Navy requirements, but it turns out a lot of folks like their data represented this way. Formats supported are CSV, Access MDB, and Shapefiles.

Choose **Data -> Export -> Time-Linked (Flatten) Tracks and Observations**

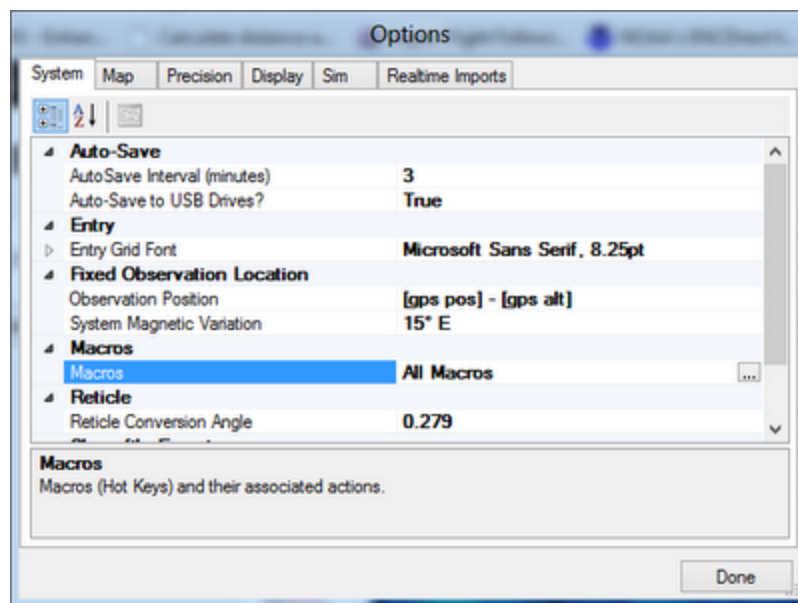
NOTE: One can also highlight all the data, copy then paste it into a spreadsheet program such as Libre Office or Excel. The problem with the copy and paste method is you will have false additional rows of data if your comment fields are long. This practice is discouraged due to this issue with the spreadsheet programs. It is best to use the Mysticetus data export feature.

12 Macros

Macros allow the user to perform complex operations at the touch of a single key. By assigning a "Hot Key" to a macro, Mysticetus can automatically fill in large quantities of entry data, simplifying data entry even further.

Macros are configured in the *Configure -> System Options* page, in the Macros area.

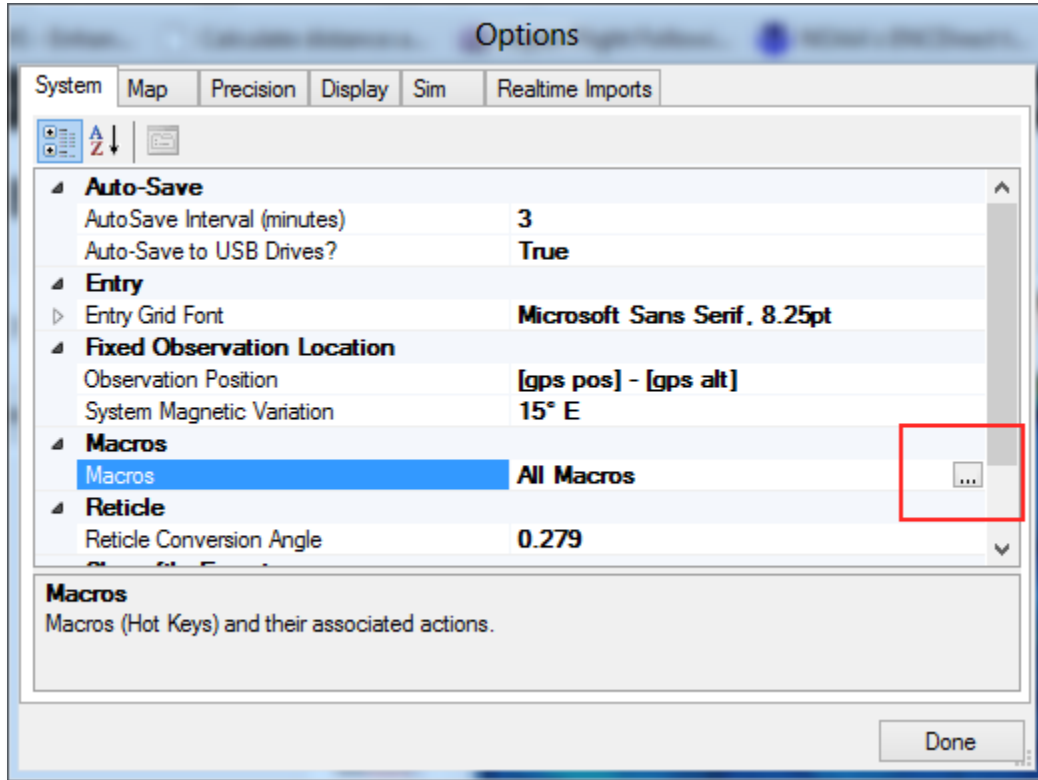
12.1 Macro Configuration



A Macro is a sequence of events that happen when you press a "Hotkey". A Hot Key is a pre-defined key press, for example by holding down the Ctrl key and the 'L' key at the same time (denoted "Ctrl+L"), it causes Mysticetus to do something useful, like record the position of a sighting. Macros and Hot Keys in Mysticetus can be configured to do just about anything you want.

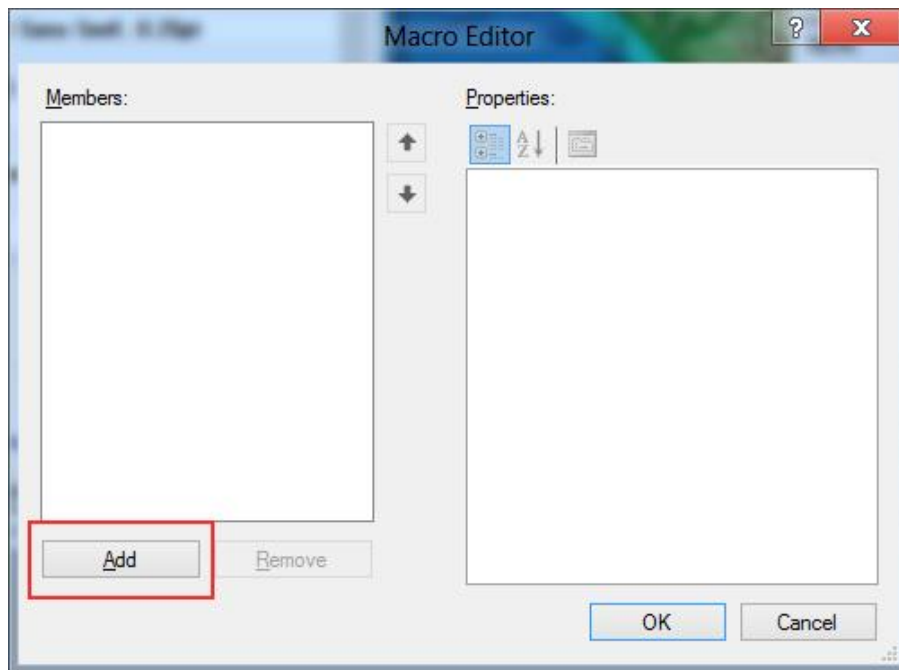
NOTE: Hot Keys are global on windows, if you assign a hot key to a common action such as Ctrl+C (copy) or Ctrl+V (paste) this will over ride Windows definition for the hot keys while Mysticetus is running. This may cause some confusing behavior as some have found out.

To configure Macros, press the ellipses on the right side...

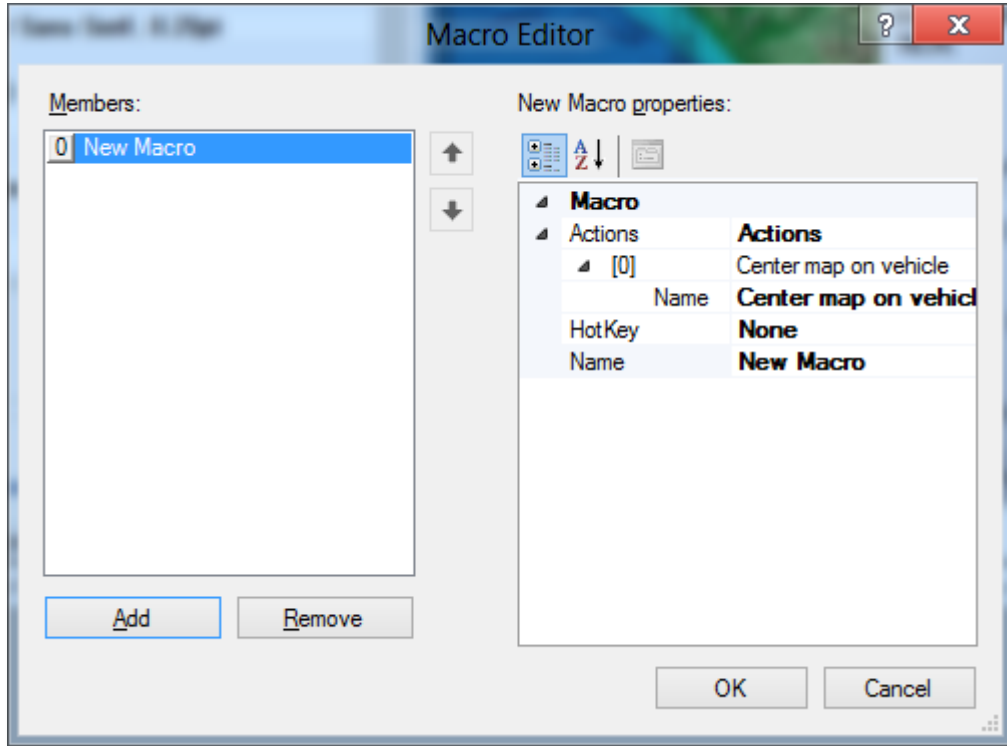


12.2 Macro Editor

Here is the Macro Editor that pops up. Press the Add button to create a new Macro:



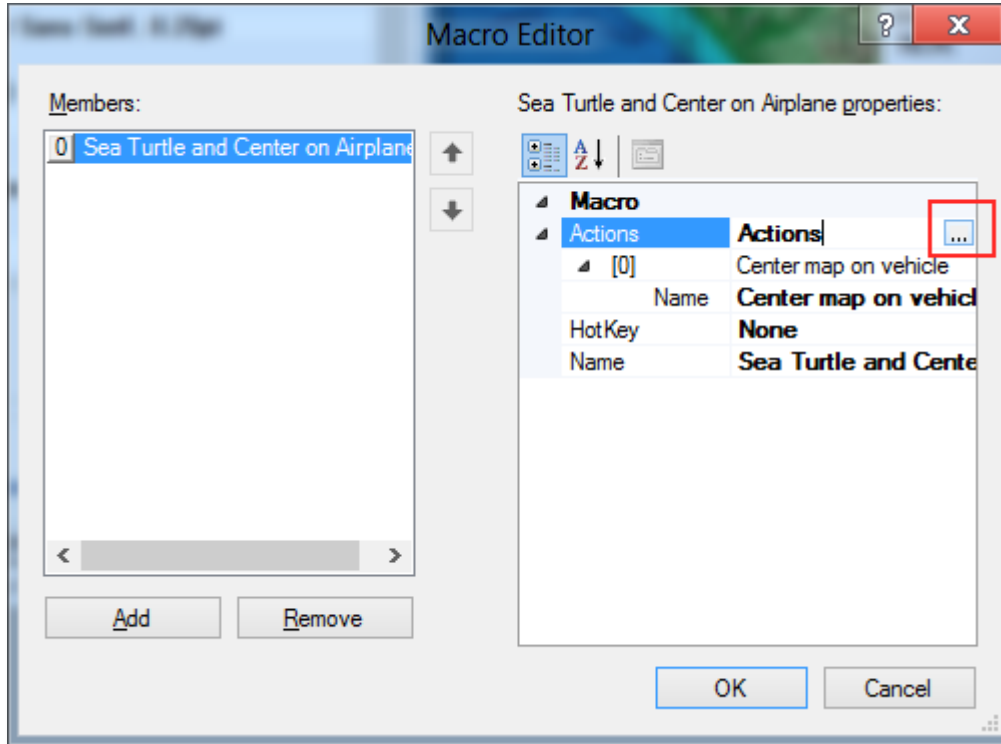
The Macro Editor controls the functions of the Macro and its associated Hot Key:



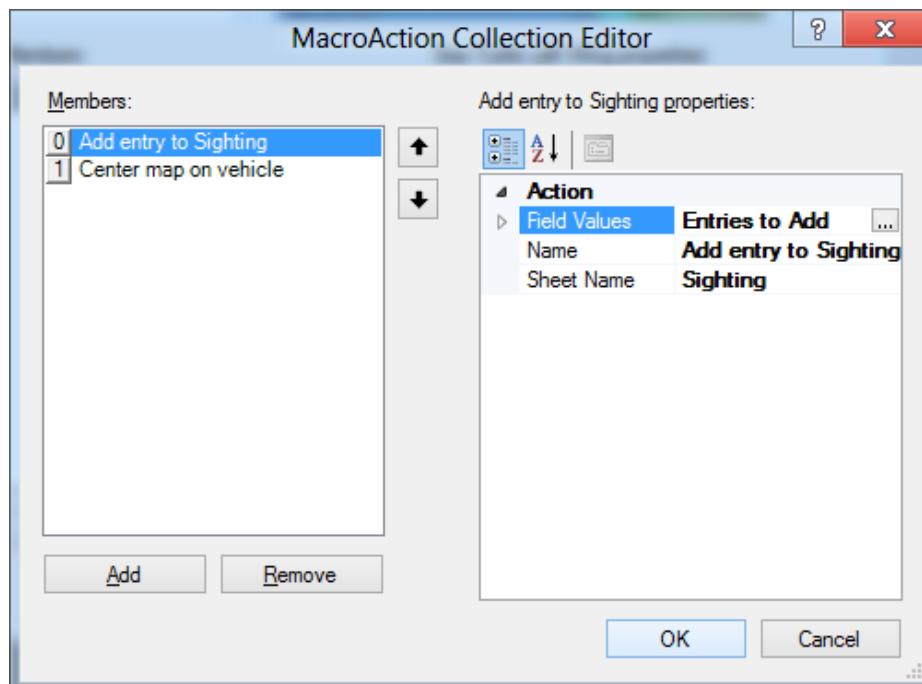
Next, you need to change the fields to tell Mysticetus what you want to do and which Hotkey you want associated with this sequence of actions. You can specify multiple actions (1 or more) that happen each time you press a Hotkey.

12.3 Macro Creation Example

In the following example, we're going to perform two actions: add an entry for Sea Turtle off the left wing to the Sightings page, plus Center the Map display on the Vehicle. We've already changed the "Name" field, now we're going to change the Actions that happen:

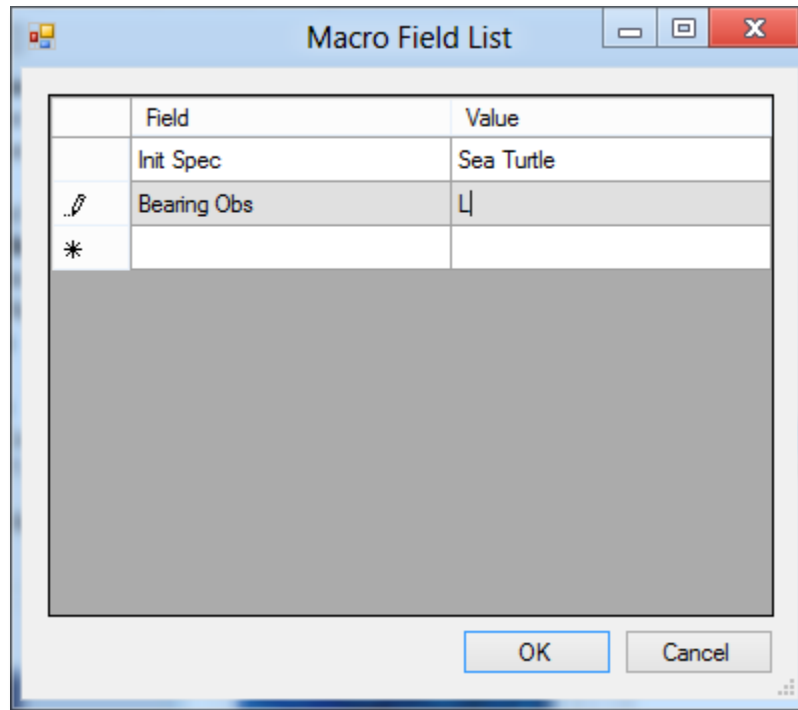


Clicking on the ellipses next to Actions pops up the Actions editor, where we define two actions for this Macro. One to add a Sea Turtle sighting, and another to center the map on the vehicle:

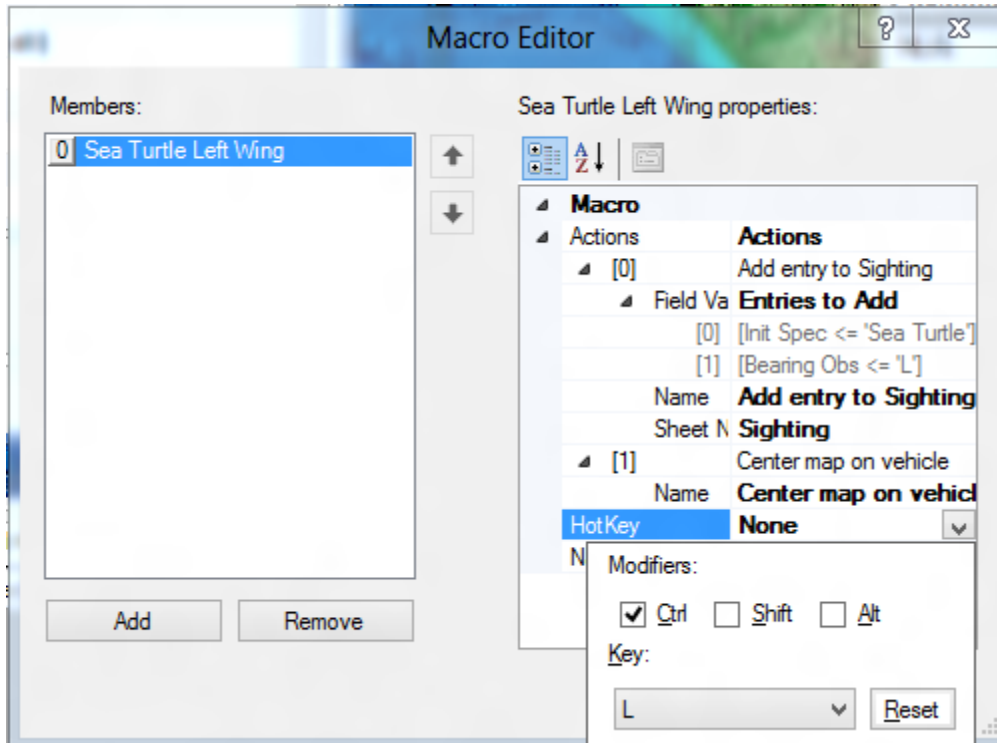


For the Sea Turtle sighting action, we define the fields we want to add. In this example, we want the Species to

be "Sea Turtle", and the Observed Bearing to be L (for "Left" - Mysticetus will subtract 90 degrees from the vehicle's heading).



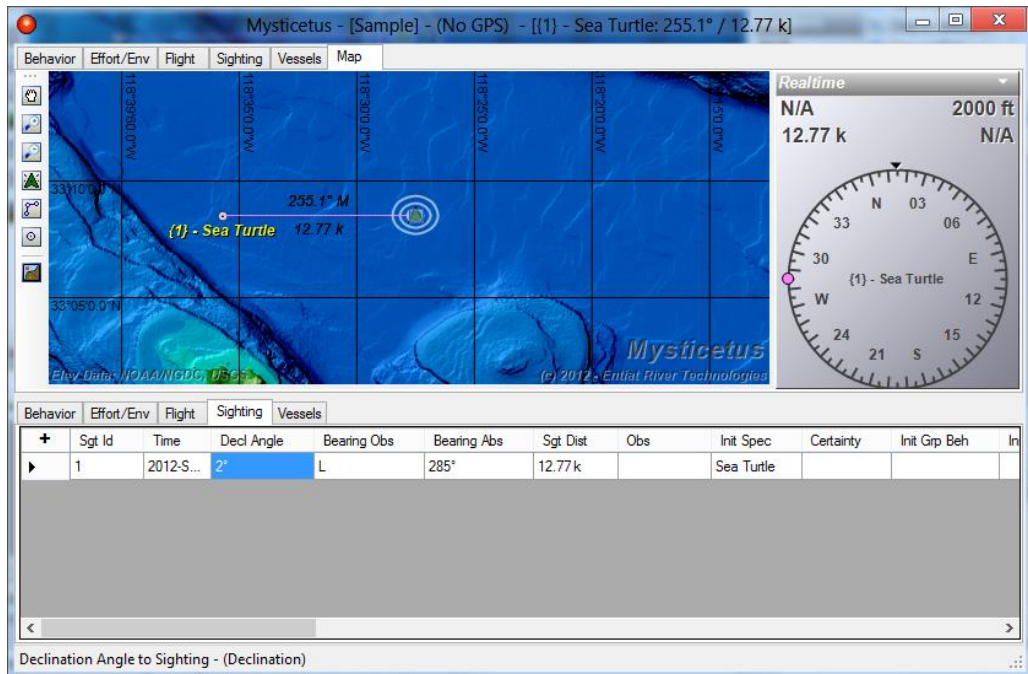
The final product in the Macro Editor looks a little complicated - it is actually a "language" of sorts - that tells Mysticetus what to do and when to do it. In this case, when the user presses CTRL+L, Mysticetus will add a Sighting entry for a Sea Turtle, and it will be 90 degrees to the left of the nose of the vehicle. In addition, the map window will be re-centered on the vehicle.



Now that we have all this set up, the recorder in the airplane (in this example – it works equally well in a vessel, and for other data types) can simply click Ctrl+L and:

Behavior	Effort/Env	Flight	Sighting	Vessels						
+	Sgt Id	Time	Decl Angle	Bearing Obs	Bearing Abs	Sgt Dist	Obs	Init Spec	Certainty	
▶	1	2012-S...		L	285°			Sea Turtle		

A new sighting record with all the fields filled in is created. In this example, we just need to type in the Declination Angle to the sighting and the observers can move on to the next Sea Turtle, or whatever else swims by. Here is the Sea Turtle sighting as Mysticetus creates it on the map:



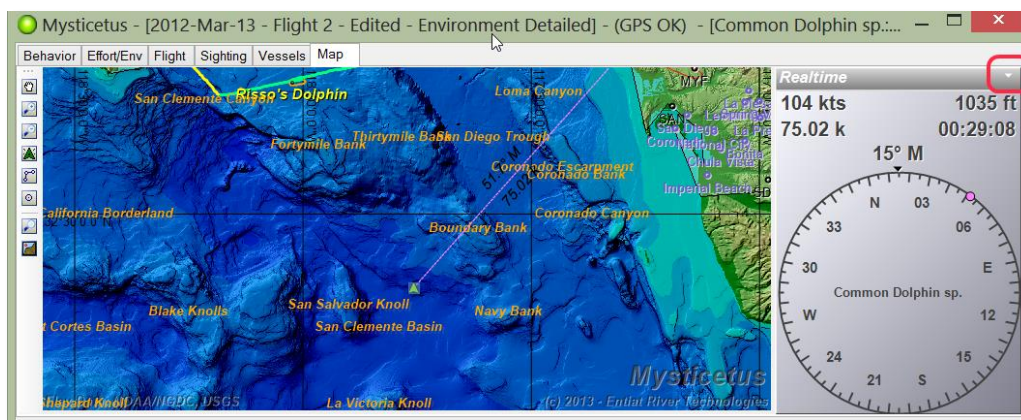
(yes, if you can see a sea turtle almost 13 kilometers away from 2000' in the air, you've got super-eyes...this is just for illustrative purposes...)

As you can see, this significantly reduces the number of keystrokes necessary to record information in Mysticetus. The possibilities of what can be filled in with HotKeys/Macros is endless.

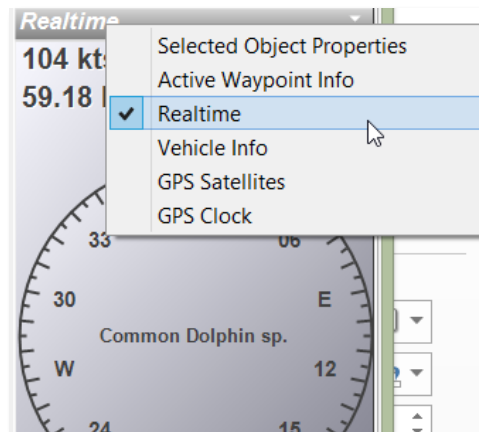
13 Data Panel

The Data Panel is a set of controls off to the side of the Map Window – you can select the display that makes the most sense for your current needs.

Data panel elements are selected by clicking the dropdown arrow in the upper right corner of the panel.



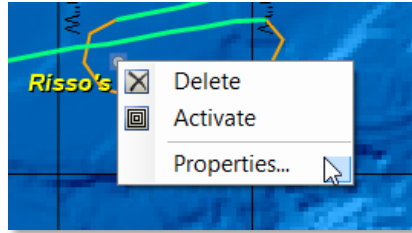
From there you can select a number of different panels to display.



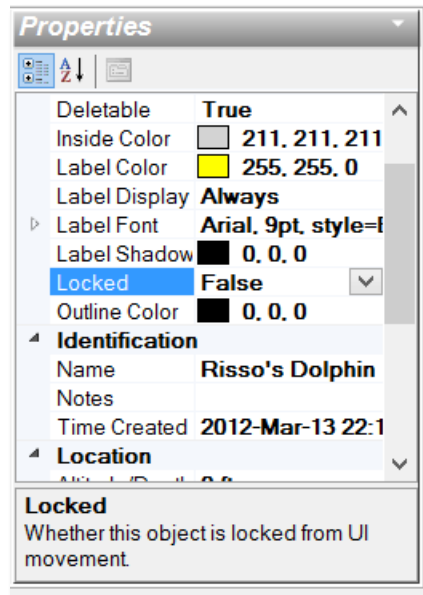
13.1 Selected Object Properties

The Selected Object Properties panel displays information about the last object clicked on in the Map window.

Alternatively, you can right click on an object in the Map window, choose “Properties...”

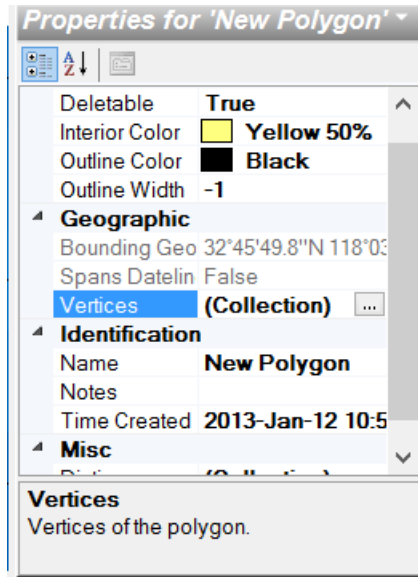


and Mysticetus will switch the data panel to the Selected Object Properties for that object

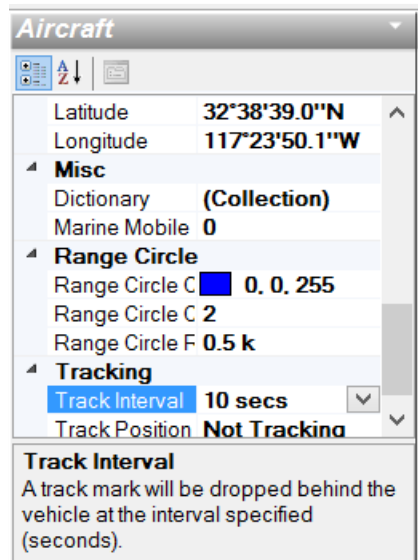


Use the Selected Object panel to control the display of the object, including individual label color, font, whether range circles are display, and so on. (To control settings for all objects, use **Configure -> System Options -> Map** as discussed in *section 4.2*)

Note that different objects will have different properties that can be set. For example, polygons have their set of vertices that can be precisely configured:



And when a vehicle (aircraft, vessel) is the Selected Object, you can control things like Tracking Options



13.2 Active Waypoint Info

The Active Waypoint Info panel displays graphical information about the Active Waypoint (if any).

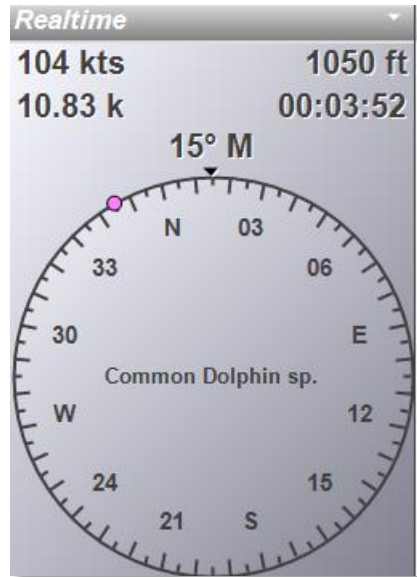
Active Waypoint Info	
SOG	104 kts
VMG	98.9 kts
COG	1° M
XTE	7.18 k R
RNG	23.17 k
BRG	33.1° M
TTG	00:07:35
ETA	11:06:57 AM

Items displayed include

- **SOG** - Speed Over Ground
- **VMG** - Velocity Made Good (speed over ground vector in the direction of the Active Waypoint)
- **COG** - Course Over Ground
- **XTE** - Cross Track Error (either from the planned route, if the active waypoint is part of the active plan, or from a temporary route created when a standalone waypoint is activated).
- **RNG** - Range to the Active Waypoint
- **BRG** - Bearing to the Active Waypoint
- **TTG** - Time to Go to Reach the Active Waypoint at current Velocity Made Good
- **ETA** at the Active Waypoint at current Velocity Made Good

13.3 Realtime

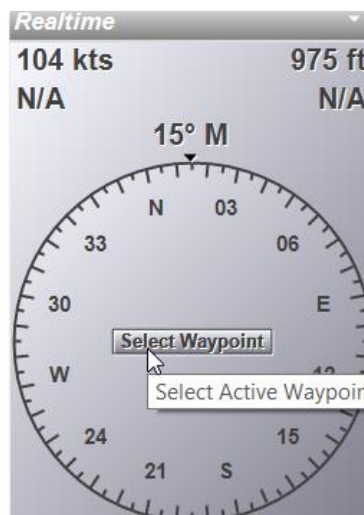
Realtime is the default panel displayed. It contains a quite a bit of information.



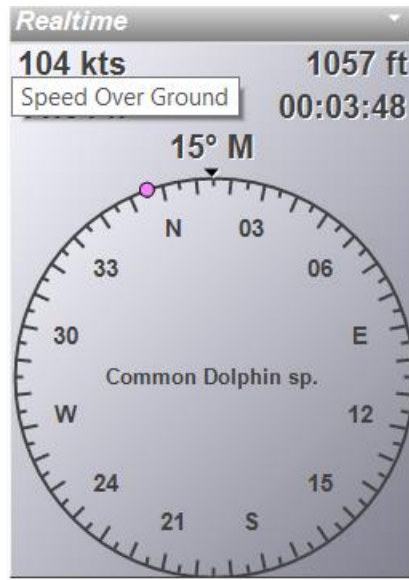
This panel displays

- Speed Over Ground
- Altitude
- Range to Active Waypoint
- Time to Go to Active Waypoint
- A compass rose indicating current heading
- A “heading bug” to indicate bearing to the active waypoint
- Name of active waypoint (in the middle of the compass rose).

You can select the active waypoint by clicking on the active waypoint name in the middle of the panel. If no waypoint is active, it will display “Select Waypoint” – either way, a dropdown with all waypoints (and sightings) will allow you to select the one you want.



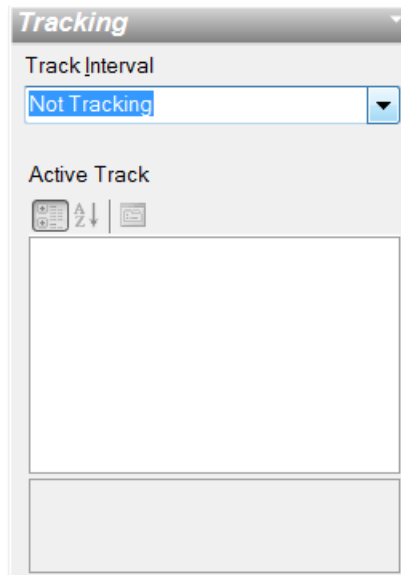
Holding your mouse over any part of this panel will display a tooltip with information about what you are pointing at



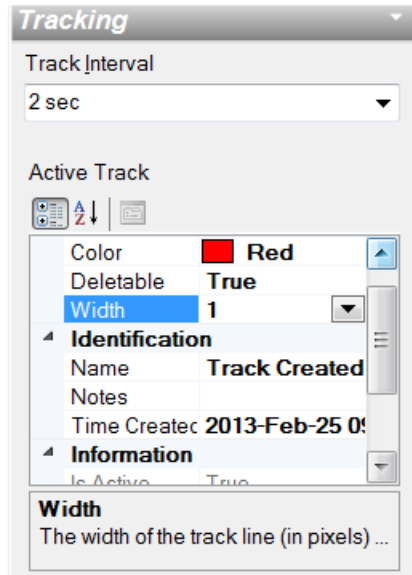
13.4 Tracking

Tracking controls your track settings, including how often to drop a track mark and what color and width the track displays.

The initial display will look like this (tracking is not enabled):



Pull the dropdown to select a tracking interval. Once tracking starts, color and width parameters can be entered:



Other information, such as the current length of the trackline is displayed in this window.

13.5 Vehicle Info

Vehicle Info contains the same information you would get by right clicking on the Active Vehicle (vessel/aircraft) and choosing “Properties...” – this is a shortcut for that.

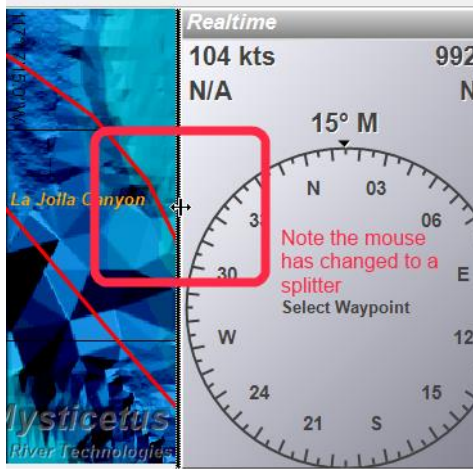
13.6 GPS Satellites

The GPS Satellites panel displays information about the satellites in view by your GPS, including signal strength, where the satellite is, and when information from that satellite was last received.

Id	Signal	Name	Azimuth	Elevation	Last Signal
48	38 DB (Good)	Galaxy 15 (WA...	South-Southwest	Halfway up from the horizon	<1 second
29	35 DB (Good)	GPS 2R-18	West-Northwest	Halfway up from the horizon	<1 second
25	33 DB (Good)	Navstar 2A-03	West-Northwest	Almost directly overhead	<1 second
10	24 DB (Moder...	Navstar 2A-17	East-Northeast	Halfway up from the horizon	<1 second
31	24 DB (Moder...	GPS 2R-15	Northwest	Near the horizon	<1 second
12	22 DB (Moder...	Navstar 59	South	Almost directly overhead	<1 second
2	21 DB (Moder...	Navstar 56	East-Northeast	Almost directly overhead	<1 second
5	21 DB (Moder...	Navstar 2A-13	Southeast	Halfway up from the horizon	<1 second
4	0 DB (None)	Navstar 2A-14	Northeast	Near the horizon	4 seconds

Note that some GPS’s do not send satellite information, so this panel may be blank, even if your GPS has a valid position.

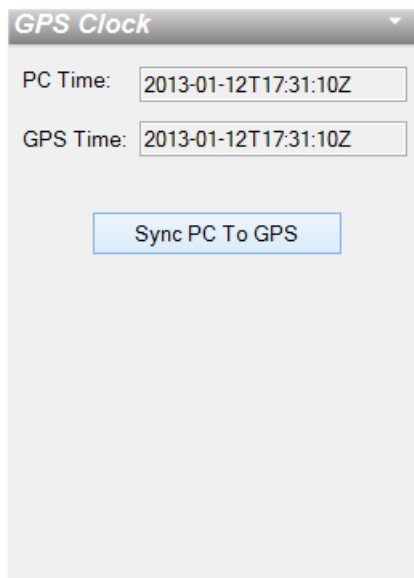
In order to see all the information presented in this panel, it may be necessary to expand the panel via the splitter control just to the left of the Data Panel. As mentioned elsewhere in this document, all panels in Mysticetus can be resized by simply clicking on the resize splitter and dragging:



13.7 GPS Clock

The GPS Clock panel displays two pieces of information: the PC System Clock time, and the clock time from the GPS, if the GPS has a fix. You can also direct Mysticetus to synchronize the PC clock from the GPS clock if they are out of sync.

Pro Tip: Setting your PC clock requires Administrative privilege. If you are not running as an administrator (and you should NOT be), Mysticetus will prompt for an administrative password before synchronizing PC to GPS time.



14 Acoustics

In progress...

15 Theodolites

IMPORTANT NOTE: Make sure you are running the latest version of Mysticetus!

15.1 The Basics

As of version 1.8.0.98 (long time ago) Mysticetus now fully integrates all sightings from all optics on a single-entry sheet as you might want it to. You can access setting up a theodolite through the options dialog.

Configure your theodolite under the Systems Options dialog's **Theodolite** tab.

The screenshot shows the 'Options' dialog box with the 'Theodolite' tab selected. The 'Type' dropdown is set to 'Sokkia Query (such as DT510)'. The 'Theodolite' section contains a table with the following data:

Theodolite	
Horizon Distance	
Theodolite Altitude	
Theodolite Eye Height	0 m
Theodolite Location	Undefined
Theodolite Name	Theodolite

Below this table is a text field for 'Theodolite Name' with the description: 'Name of the theodolite. This is use to display theodolite location on map.'

The 'Reference (Horizontal Zero) Point' section contains a table:

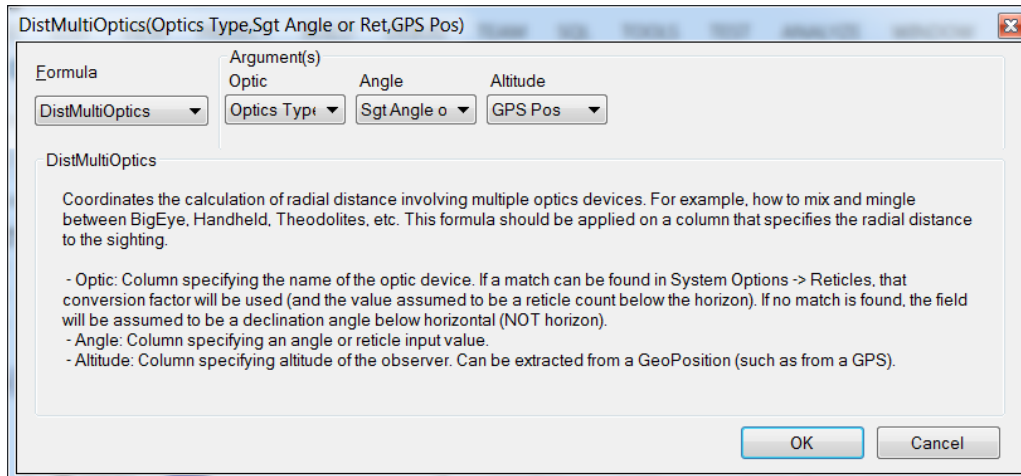
Reference Point	
Bearing	N/A
Location	Undefined
Name	
Range	

The 'Tides' section contains a table with columns 'Time' and 'Height':

	Time	Height
*		

Buttons at the bottom include 'Pos Wizard', 'Alt Wizard', 'Test Theo', and 'Done'.

You can combine your theodolite sightings, binocular sightings, and even inclinometer-based sightings (say, from an orbiting plane communicating via AIS) to all show up in a single data entry sheet and, coupled with the Resight formula which calculates sighting speed and heading, create a unified display and record of your sightings. To achieve this, the latest version of Mysticetus includes a new formula: DistMultiOptics.



This, along with some creative re-orienting of existing Theodolite formulas – serves as the cornerstone of enabling selection of any optics device. There is also a “Sample Templates. Mysticetus” file on the download page that shows how all these formulas interact. It is highly recommended that you start with this template as the formulas get more and more inter-twined as you add more optics options. (Or just give us a call and we’ll step you through your specific setup – getting this right is very important for you).

The DistMultiOptics formula (see chapter on formulas) specifies three things: a column for angle or reticle, a column for selecting optic type, and a column for selecting the observer’s altitude (which also be derived from a GeoPosition field such as that obtained from a GPS or altitude override).

The output is radial distance to a sighting – all while considering the curvature of the earth, angle between horizontal and horizon if you are using a reticle-based device, and so on.

The sheets end up looking like this:

SgT Id	Time	Optics Type	Read Theo	Sgt Angle or Ret	Bearing Obs	Init Spec	Sgt Dist	Obs
1	2013-...	Handheld	<input type="checkbox"/>	3°	30l	Blue Wh...	0.86 k	Dav...
2	2013-...	Bigeye	<input type="checkbox"/>	2°	45r	Risso's ...	3.24 k	Dav...

For theodolite operations, it is usually the best idea to create a number of different fields in your sightings sheet. The Theodolite sheet in the Sample Template shows a nice way to do this. Advanced users can change this up, name fields anything they want as long as the appropriate formulas are applied

- A Boolean field named Read Theo (name doesn't matter - you can call it anything). This field has the TheoInfo formula applied to it and points at other fields that receive information from the theodolite (TheoPos,TheoAlt,RawHorz,RawVert,ConvHorz,ConvVert). These theodolite raw values are provided by the theodolite, you do not hand enter them if the theodolite can be automatically read.

- If you have a theodolite that can be automatically read, clicking on this Read Theo cell (or pressing the spacebar) the theo will be queried and the values placed in the appropriate cells in the current row.

- If your theodolite can not be automatically read then you should enter it in the window that pops up when you press Read Theo. That will automatically enter the data in Raw Horz, Raw Vert => all of which leads to a Conv Horz, Conv Vert and eventually a Sighting Position.

NOTE: When manually entering data Raw Horz and Raw Vert numbers need spaces in them to work. For example "90 30 20", rather than "903020". That's how Mysticetus knows to break up Degrees, Minutes and Seconds. Otherwise, Mysticetus interprets 903020 as that many degrees (Nine hundred three thousand twenty). That's an invalid theodolite angle, so Mysticetus throws it away.

As another example, consider the horizontal value "140240". Since horizontal angles can have up to three digits for degrees...where do we split that? "140 2 40"? Or "140 24 0"? We need the spaces to delineate degree/minutes/seconds clearly.

- If your theodolite cannot be automatically queried, Mysticetus will pop up a dialog that asks for the angles - and will then populate those other cells appropriately.

- Note that the main goal of all of this is to gather: Altitude. Bearing, Angle, Theo Pos.

From these items Mysticetus will calculate the Sighting Position. You can look at the SightingPos field in the Sample Template and see it uses the RelPosDist formula to do this, and incorporates all those other fields that were filled in by the Theo Read field triggering the TheoInfo formula.

To dive a little further into the details, the Raw Horz and Raw Vert cells are for the raw values that come from the theodolite. Raw Horz is the basic horizontal angle (from 0 to 360) that the theodolite is reading out. When you type something like "123 30 30" in the window that pops up when you press "Read Theo", Mysticetus will convert this to the appropriate angle. That is, 123 degrees 30 minutes 30 seconds becomes 123.50833333 degrees.

Mysticetus will add the angle to the bearing to your horizontal reference point (in Configure -> System -> Theodolite) and put that value in Conv Horz. This is the true (converted) bearing to your sighting.

Raw Vert is the basic vertical angle (from 0 to 180) that the theodolite is reading out. Mysticetus will subtract 90 from this value and put that into Conv Vert. This is your declination angle below horizontal to the sighting (because theodolites are at 0 when pointed straight up and 180 when pointed straight down).

Mysticetus then takes that bearing, declination angle below horizontal (note: *not* horizon), in addition to the theodolite eyepiece height and calculates sighting position.

Net-net: you should be entering data in the window that pops up when you press "Read Theo", not in the Vert and Horz cells. Mysticetus needs to do a bunch of conversions and calculations to (a) turn values like "123 01 45" into the appropriate angle and (b) turn the raw values into converted (true) values that point at the sighting.

Let us know if you have any questions/suggestions/help setting this up for your survey. We welcome comments and do provide a setup service and associated training.

IMPORTANT NOTE: Make sure you are running the latest version of Mysticetus!

15.2 Adding a New Theodolite:

In order to add a new theodolite (vehicle), you will need access to the Advanced Data menu. In order to get that, you will need to do the following:

0. Open your blank template
1. Choose Configure -> System Options -> Toolbar Buttons (click ellipses)
2. Add the "Menu" button.
3. Click the Menu button now on the toolbar, choose Data -> Advanced -> Add New Vehicle at Map Center.

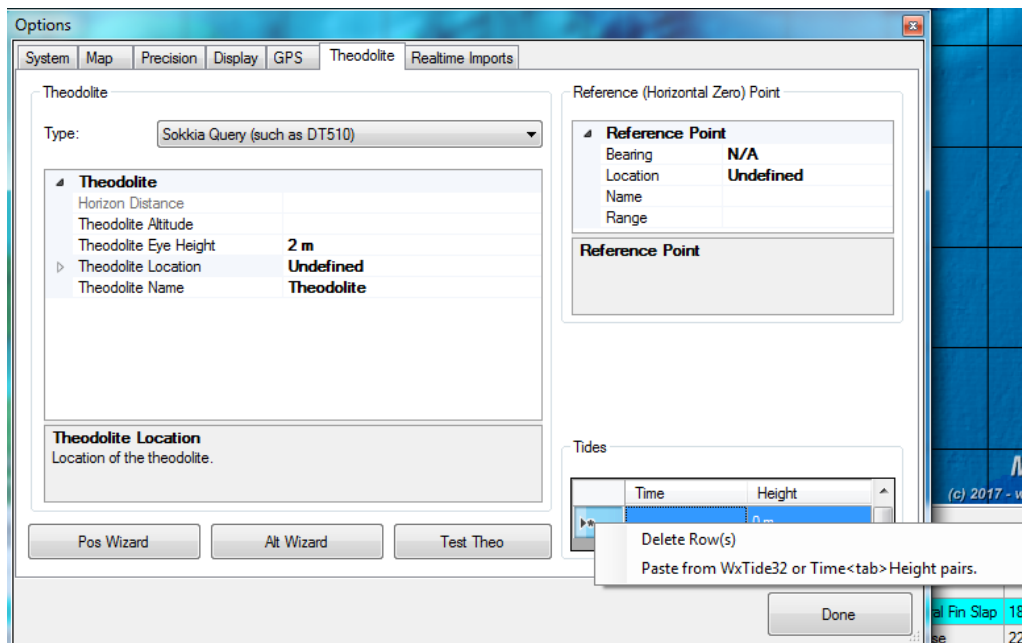
4. Right click your new vehicle, choose Properties.
5. Set the latitude, longitude, name, icon, color, etc.
6. Save to the template. (Hold the CTRL key while saving to save into a template)

15.3 Entering tide levels

You can add Tide levels in one of three ways:

- 1) Enter by hand (gets old very quickly)
- 2) Copy from Excel (create two columns, one for date/time, one for tide height - if you don't include units for height, Mysticetus assumes meters). Copy and paste into Mysticetus.
- 3) Copy from WxTide32 (<http://wxtide32.com>).

Right click in the Tides window, and choose the Paste option.



Mysticetus understands Copy and Paste from both Excel and WxTide32 (a great freeware Tide prediction program that supports thousands of stations around the world). If you copy from WxTide32, make sure you configure WxTide32 with the following settings:

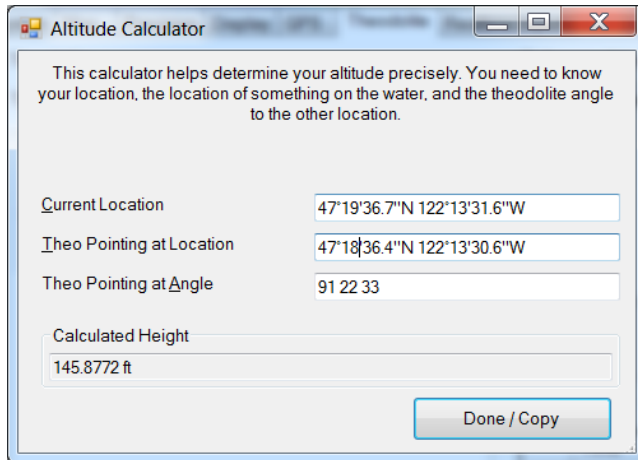
Use Meters rather than Feet.

Display times in 24 hour format

Use Short Date/Time

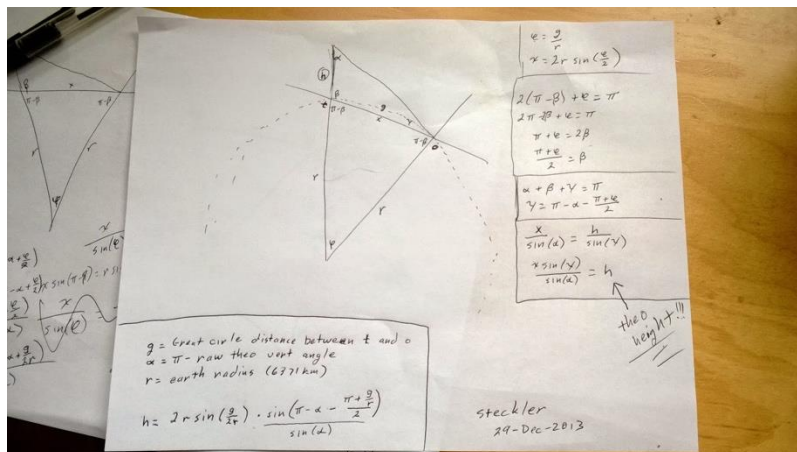
Tell WxTide32 to create a set of tide values for the station you care about (I like using 5 minute increments - because everything is automated, it doesn't matter if you have thousands of tide records), then copy and paste the values from WxTide to Mysticetus.

15.4 Theodolite Altitude Assistant



Above is a new window to help you calculate the exact height of your theodolite. If you know your location (use the previously released Location Wizard), and you know the location of something at the water line, you can just point your theodolite at the other thing (boat, person standing at shoreline, etc.) and Mysticetus will do the rest to calculate your height. This Wizard is found in the Theodolite settings page.

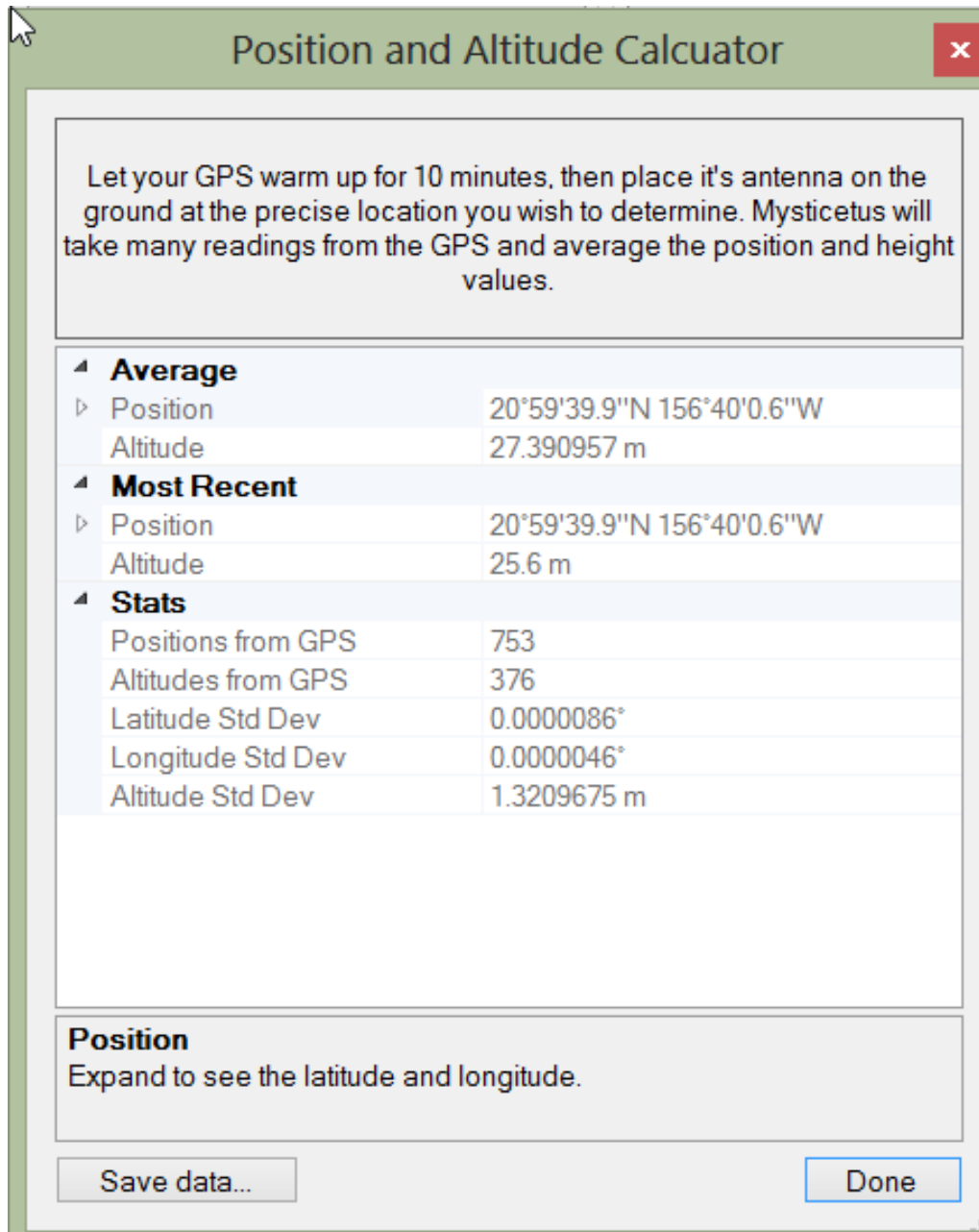
Here is a picture of our derivation of the formula. Yes, Dave's handwriting sucks. It happens after spending the last 35 years of your life glued to a keyboard :-)



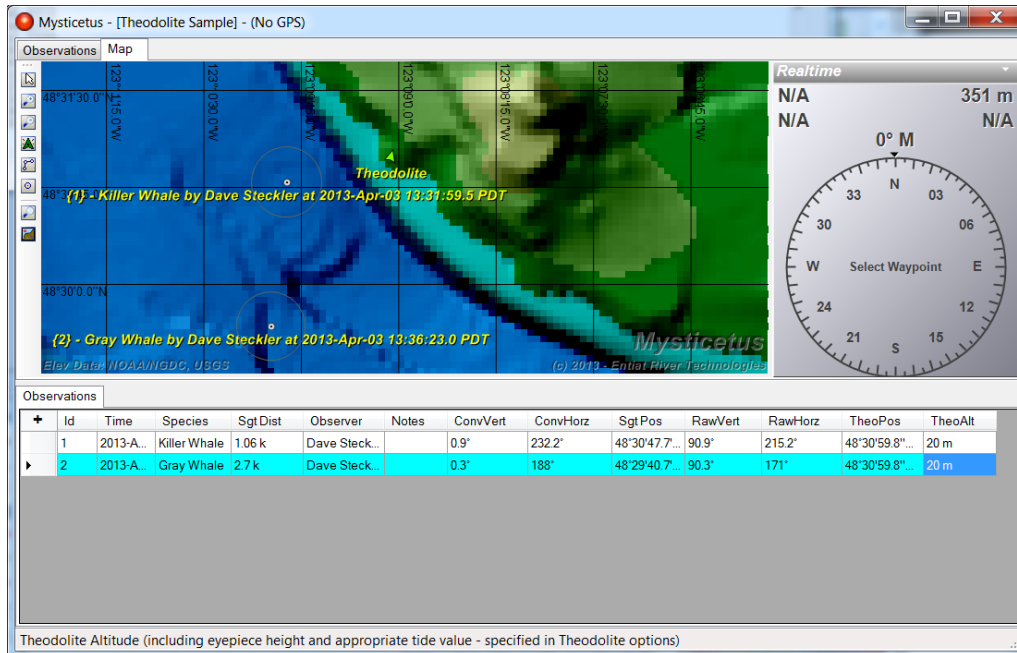
15.5 Position Assistant:

This assistant continuously reads your GPS and provides average position and altitude, as well as letting you know the standard deviation of all your readings. In the above example, my GPS was partially obscured from

the sky and, with a standard deviation of 1.3 meters, I don't think we want to trust this particular GPS altitude very much. This gives you one more tool to help figure out where your ground station is located, and/or double check other calculation mechanisms.



Now you can see the theodolite position in your map view and in your data sheets. There are multiple formulas you can use in support theodolite sightings.



15.6 Display Distance Based Error

We've added the ability to show sighting error rings on the theodolite settings. This feature is a result of customer request.

Below is a screenshot of error circles around sightings in Mysticetus, plus some of the configuration windows. This feature shipped in version 2.0.0.39 released August 2017.

This was coded to associate sighting error settings (configured by the project PI) with each "Observation Platform". In the case of the screenshot this example Platform is a Fujinon 7x50 on a boat, but this can be applied to anything: theodolites, aerial inclinometers, big eyes, naked eye estimation, etc.

Mysticetus does its best job at matching a sighting's actual parameters (platform, eye height, and distance to sighting) and then applies the appropriate error percentage or fixed amount.

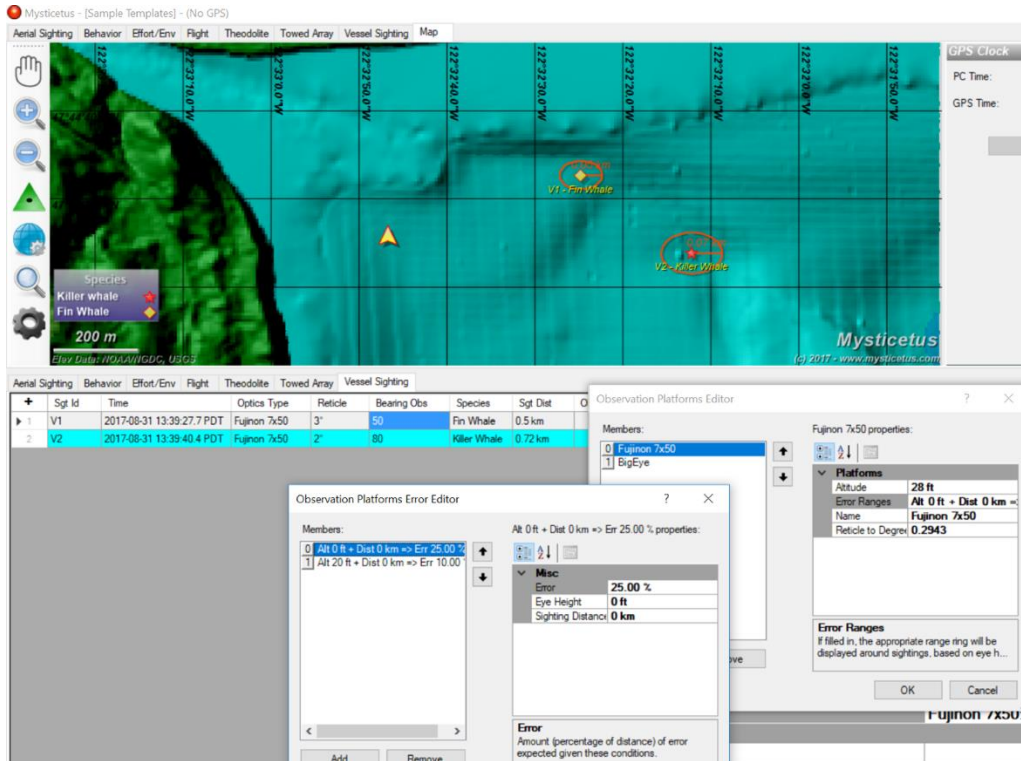
The error percentage (if used instead of fixed error) is defined as a percentage of distance to sighting.

In the case of this example, the defined errors from the Fujinon near sea level at 25% of distance, and sightings from near 20ft above sea level at 10% of distance. **These estimates are just for demo purposes.** We hope to settle in on a more realistic set of error ranges and pre-program them into Mysticetus for general use in the future.

The PI can also decide on fixed error amounts for various platform eye heights and varying sighting distances. These are not shown here.

We will continue to evaluate this method of implementation and may refine it based upon feedback. Let us know if you think this is a good way to go. With this iteration it was desired to keep it as flexible as possible to allow scientists to modify error estimation and display parameters based on the evolution of knowledge about sighting error distances. The map display of error rings was designed to be dead obvious for MMOs who might have to make mitigation decisions.

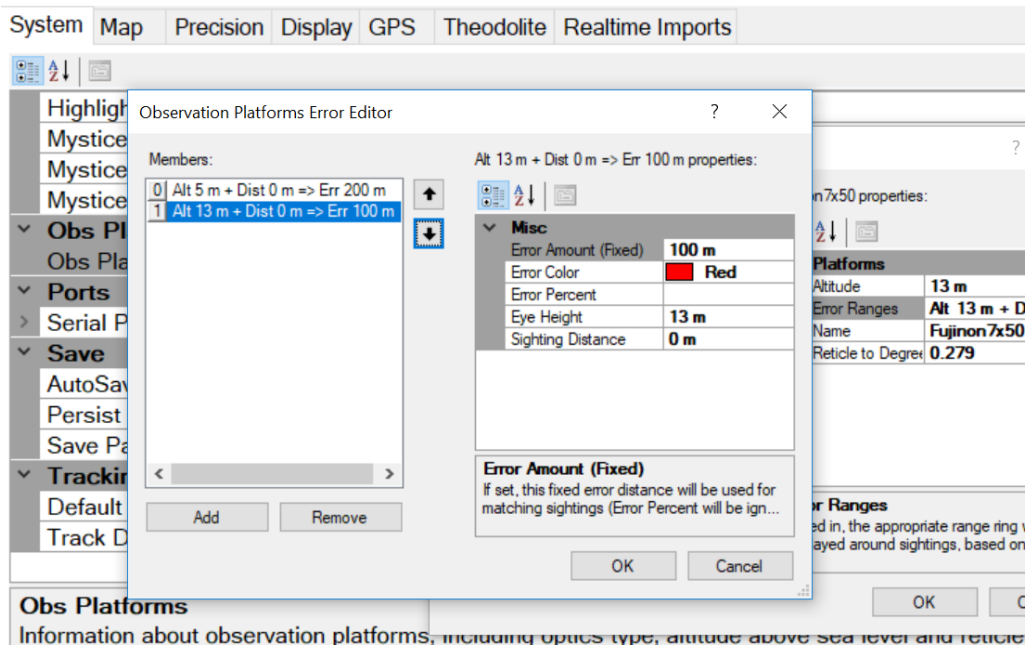
Feedback is always appreciated.



Below is an example of configuring a Fixed Error amount in Mysticetus. In this case, it's set to 100m for stations at 13m eye height and 200m for stations at 5m eye height. Mysticetus compares actual eye height at time of sighting, grabs the configured setting with the closest eye height and distance.

This example sets "match distance" to 0 so it matches all sighting distances - and assigns that error ring to the sighting. The project PI can add as many eye heights, percentages, fixed values, colors, etc. as they want to most accurately match their situation.

Options



15.7 Calculating Absolute Bearing to a Sighting

Mysticetus calculates absolute bearing to sighting in a couple different manners, depending on what data is available:

1. If there is a Bearing in the Horizontal Reference Point in the Theodolite settings, Mysticetus will subtract that from any horizontal angle retrieved from the theodolite to calculate absolute bearing to animal. In this case, Mysticetus assumes the theodolite has been zero'd at that bearing.

- This Bearing can be entered one of two ways:

(a) hand entered, if the observers know the true bearing to an object (if you need to use magnetic, make sure the MagVar setting is correct, and enter with an "M", eg "243M" and Mysticetus will convert to true)

(b) calculated, if the observers know the location of an object (hand enter the lat/lon, or select a Waypoint from the dropdown). Mysticetus will use the location of the theodolite and location of Reference Point to calculate an accurate true Bearing.

2. If there is no Bearing in the Horizontal Reference Point, Mysticetus assumes angles from the Theodolite are true bearings and uses those as-is.

=====

Practical Applications:

1. If you know the location of something you can zero your theodolite on, use that. The further the better (GPS/Glonass error leads to angular error - this error is reduced with distance, subjectively I'd say at least a few hundred meters).

Enter that location in the Horizontal Reference Point field, Mysticetus will calculate the bearing to that object. Raw angles from the theodolite will be adjusted appropriately. Don't forget to Zero your theodolite on that object somewhat frequently (a few times a day, or if someone bumps it, or at the end of a long focal, etc.)

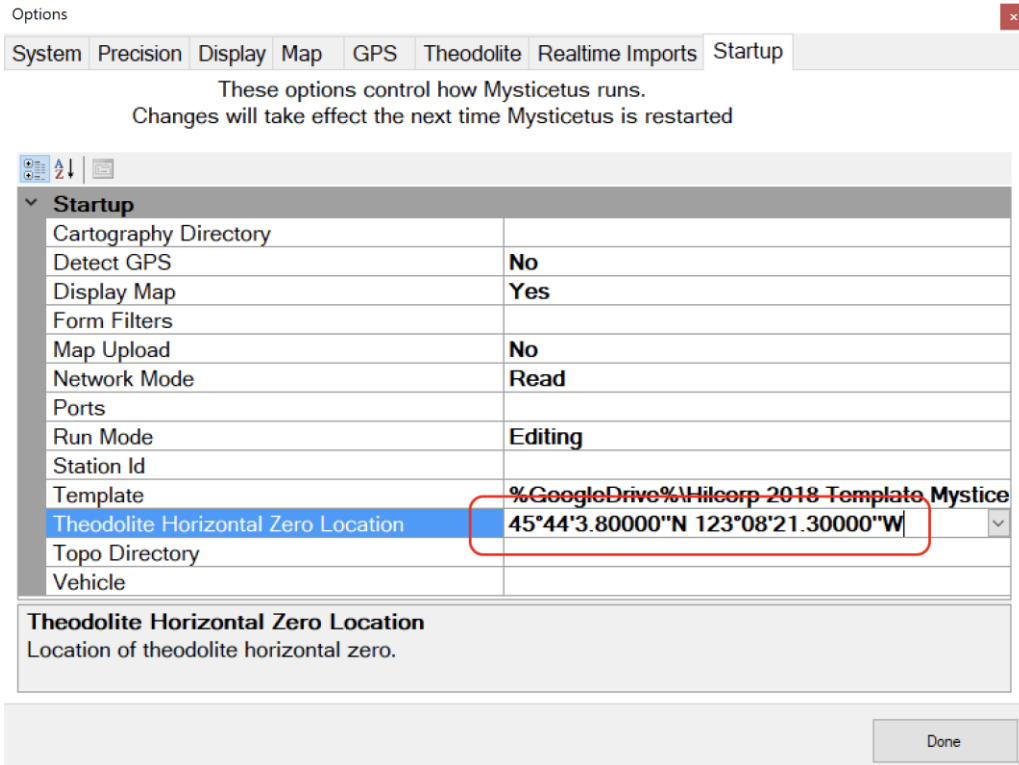
2. If you know the bearing to something you can zero your theodolite on, use that. Doesn't matter how far. Be careful with True vs Magnetic. Same advice about zeroing theo occasionally.

3. Failing all that, you will need to know how to zero the theodolite on True North. Leave the Bearing (or Location, from which Bearing is derived) fields blank. Mysticetus will use the raw angular values as True Bearings.

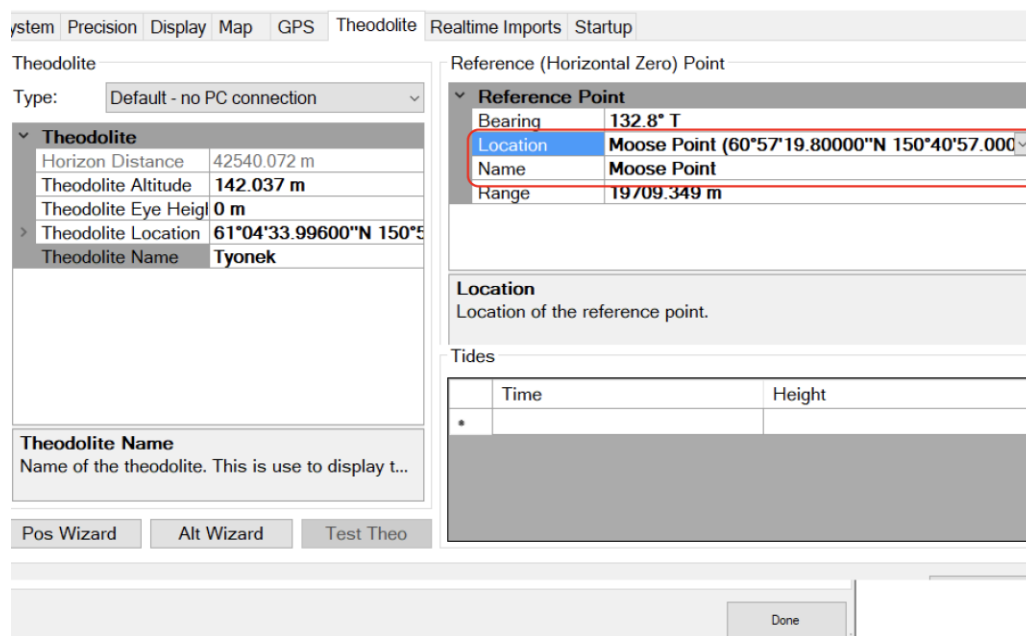
15.8 Theodolites – Setting Horizontal reference points

Some projects may interconnect multiple theodolites, this section is written with that in mind. The concepts are the same even for a single theodolite. We need different horizontal reference points for each station. Previously Mysticetus only supported a single reference point, stored in the Template.

Mysticetus has been updated Mysticetus, build 394, to deal with multiple theodolite stations, each with their own Horizontal Zero location. The latitude/longitude of the reference point should be entered in the Startup Settings, which apply to each individual machine. Note that Startup Settings are only available in Editing Mode (not Data Collection mode).



Anything entered in the Startup settings will automatically populate the Theodolite Horizontal Reference Point setting, and if there is an associated Waypoint, Mysticetus names it as well:



As you can see, Mysticetus will automatically calculate the bearing and distance to that location. This bearing will be added to all horizontal angles read from the theodolite.

If you have waypoints defined for the horizontal reference point, you can select them from a dropdown.

Station Id	
Template	%GoogleDrive%\Hilcorp 2018 Template.Mystice
Theodolite Horizontal Zero Location	Steelhead (60°49'53.00000"N 151°36'7.00000"W)
Topo Directory	Land Station - Clam Gulch (60°14'22.80000"N 151°23'56.70000"W)
Vehicle	Bruce (60°59'54.00000"N 151°18'4.00000"W)
Theodolite Horizontal Zero Location of theodolite horizon	Land Station - K Beach (60°26'52.87200"N 151°16'55.99200"W)
	Granite Point (60°57'24.84000"N 151°19'39.72000"W)
	Steelhead (60°49'53.00000"N 151°36'7.00000"W)
	Moose Point (60°57'19.80000"N 150°40'57.00000"W)
	OSK Dock (60°44'35.13210"N 151°18'34.29502"W)
	Moose Point (60°57'19.80000"N 150°40'57.00000"W)
	Moose Point (60°53'48.00000"N 151°34'45.00000"W)

To define Waypoints, add the Waypoint Tool in Settings:

Options

System Precision Display Map GPS Theodolite Realtime Imports Startup

Display

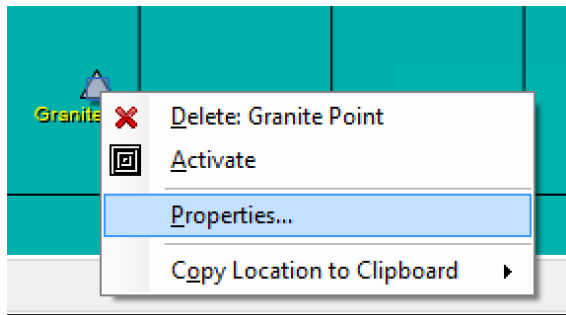
Current Mode	Primary
Grid Cell Style	[X] [FONT: Name=Microsoft Sans Serif,Size=7
Modes	[Primary - *]
Tool Bar Button Size	40
Tool Bar Buttons	TogglePan, ZoomIn, ZoomOut, FollowVehicle

Export

Export Units to Column Header True

- New Plan
- New Polygon
- New Waypoint
- New Label

Click on the toolbar button for New Waypoint, then click on the map to place it. Right click on the Waypoint, choose Properties to set the exact lat/lon of the waypoint:



Properties	
Marine Mobile Service Identity (MM)	0
Name	Granite Point
Notes	
Station Id	PF
Time Created	2014-05-06 12:00:53.4 AKDT
Location	
Altitude/Depth	0 m
Latitude	60°57'24.84000"N
Longitude	151°19'39.72000"W
Media	
Media	(Collection)

Here is more explanation of why you want your horizontal reference point as far away as possible:

When you measure latitude/longitude of your position, and the lat/lon of the position of a horizontal reference point (or if you take it from a map - which has been measured with GPS/Glonass) there is error. GPS can be up to 10m on both sides (average is in the 2-3 range, but can hit 10m on a bad day). Glonass is slightly less accurate, with averages in the 4-5m range with 20m on a bad day.

If the distance between you and your reference point is small (say, 100m), this 10m on both ends translates into a 20% angular error. Ouch! Even on the best GPS day, you're looking at a 6% angular error.

But if your reference point is 10km away, those 20m translates into a max 0.2% angular error. (and on good GPS day, 0.06%). If you are lucky (e.g. Cook Inlet) and you can, say, get a volcano at 100km, we're looking at 0.02% maximum angular error, which is better than the theodolite can do. Woot! (as Bernd would say :-)

NOTE: This does not have anything to do with using a pre-calculated Bearing to something. If you know the Bearing (because you measured it with, say, a properly calibrated Directional Gyro Compass), then it doesn't matter how far away it is. This is the case where you enter that bearing and it is as accurate as...it is.

P.S. Yes, I realize my given angular error percentages are actually imprecise - in reality they are trig based, not linear. But they are in that range and this thought process provides the reason why a far-away Horizontal Ref Point is a Good Thing (tm). :-)

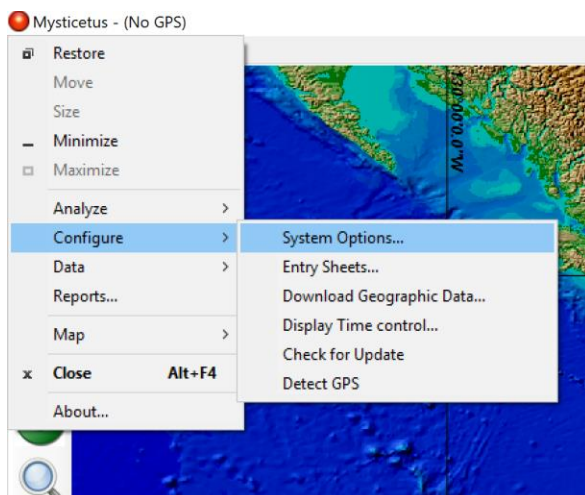
15.9 Theodolites – Will Mine Work with Mysticetus?

Theodolite manufacturers today are increasingly locking up their data behind proprietary interfaces or changing their data protocol. We have, to date, had little luck finding devices where this is not the case. In general, we know that Sokkia DT5 and DT10 and derivative units by other producers do support providing data via a RS232 connection. We continue to look for newer units given the ongoing needs of the Mysticetus community. We would appreciate any guidance on newer units and their data protocol that we can share with all.

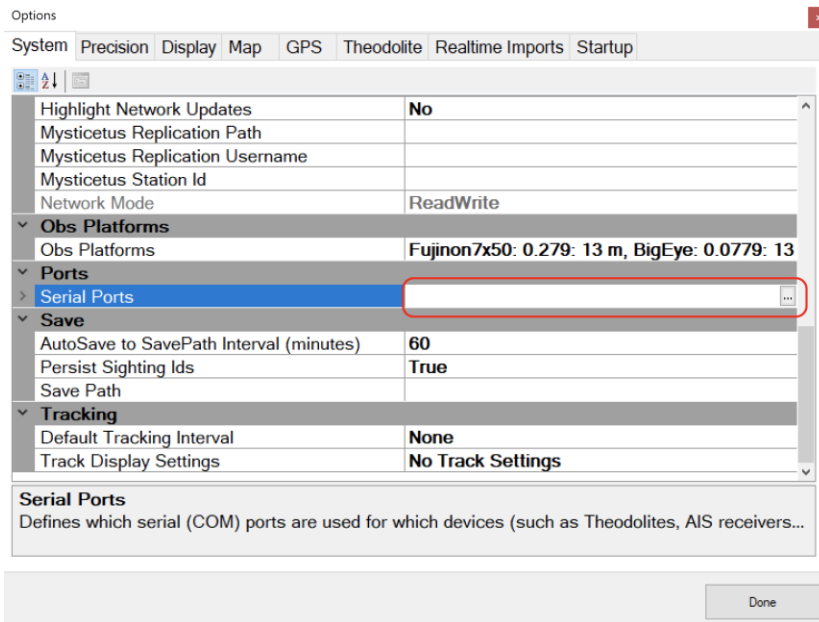
Below are instructions on how to validate a theodolite as functional with Mysticetus. As usual we are here to help. If a newer unit talks to Mysticetus and it looks like we just need to write an interface for the manufacturer's stream let us know.

Plug the theodolite RS232 cable into the PC (via the converter to USB - thence into the USB port). Keep track of what Windows tells you about which COM port was configured automatically (some popups should happen on success). If no popups, let me know and we can troll deeper into Windows to figure out which COM port the theodolite attached to.

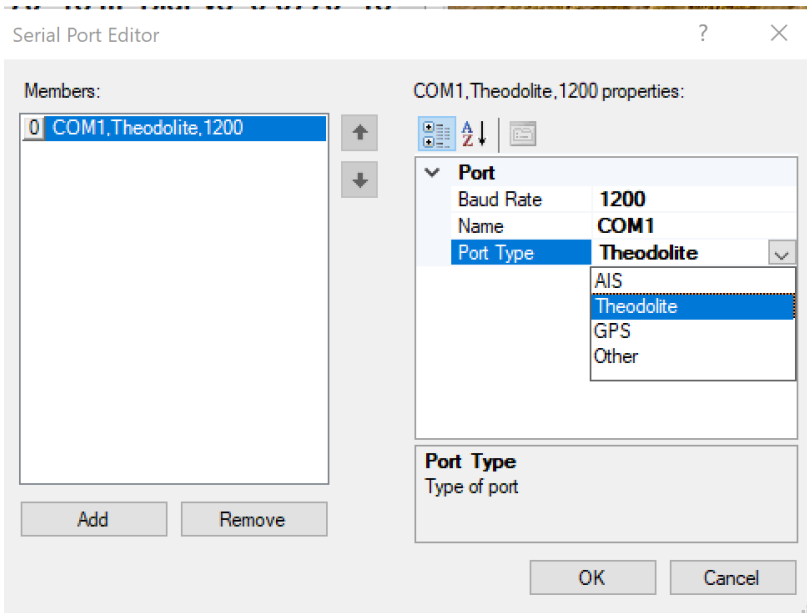
- Start Mysticetus.
- Click the little ball in the upper left corner.
- Click Configure -> System Options



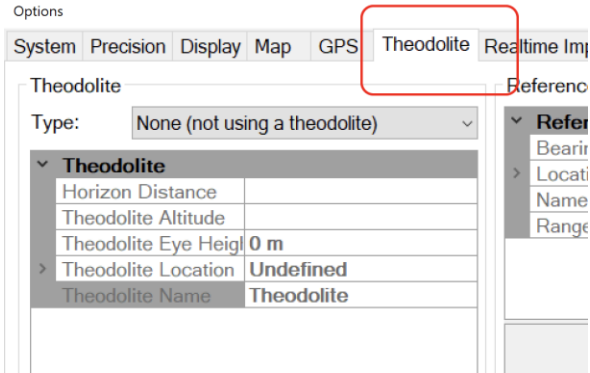
In the System options, scroll down to Ports. Click the little ellipses in the Ports setting:



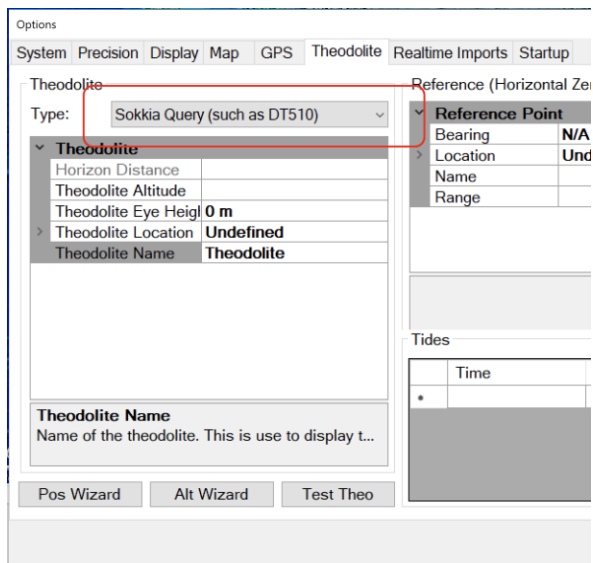
Click Add to add a port, configure it appropriately (you will need to know which port the theodolite is in). Generally 1200 baud, but check with the theodolite manual. Alternatively theodolite values can be set in the startup tab under system settings.



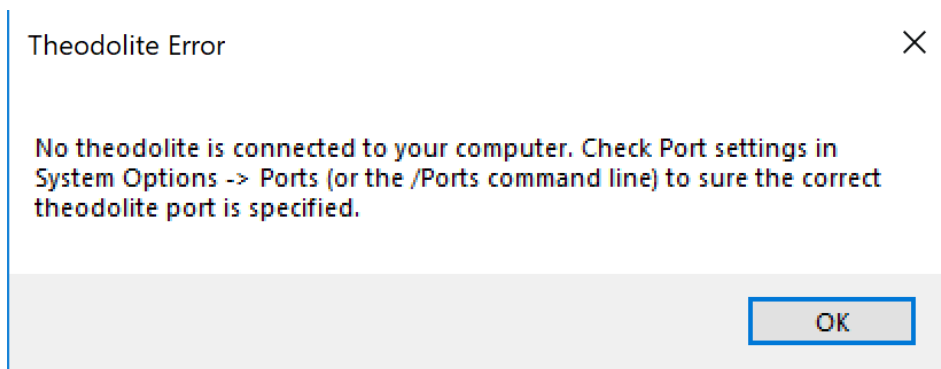
Select the Theodolite Tab



Configure the theodolite to Sokkia Query:



Then press Test Theo. If it works it will say something about Success (and some numbers). Failure looks like:

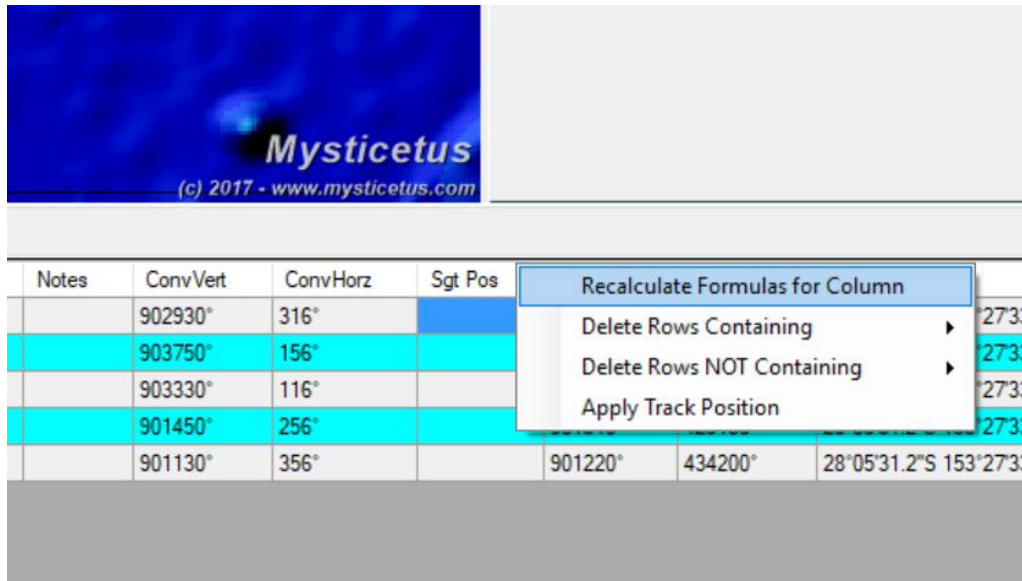


Chances that this will work perfectly the first time are ... small, but greater than zero.

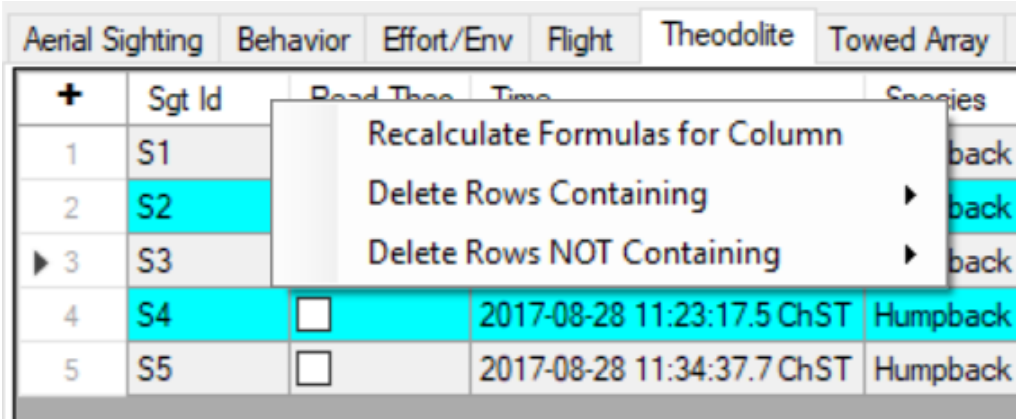
15.10 Fixing up bad entries

So you've made few early mistakes. Once you have fixed up your data you'll need to recalculate.

Once you get those issues fixed, you can right click on the top of the Sgt Pos column and choose "Recalculate Formulas for Column".



Then do the same on the Sgt Id column - this triggers a recalc of all sightings.



IMPORTANT NOTE: Make sure you are running the latest version of Mysticetus!

16 AIS – Multi-Vessel Tracking

Mysticetus can leverage AIS (Automated Identification System) to track multiple survey vessels.

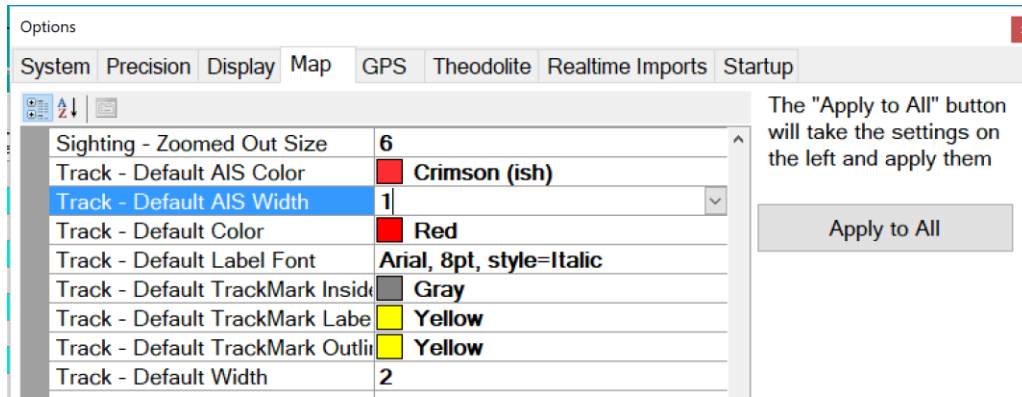
A

IS is very easily used in Mysticetus. Simply hook up the AIS device to a USB port on your machine. Mysticetus will detect the AIS data stream and plot any position updates it receives.

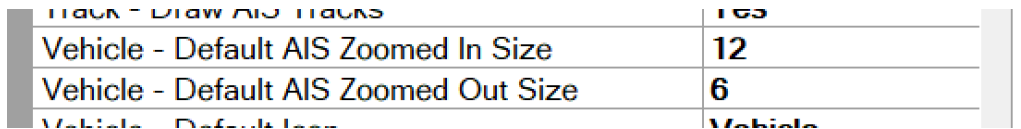
The only configuration options are if you would like to change the color of the other vessels. Simply right click on them on the map, choose "Properties..." and change their color in the Selected Object Properties data panel.

16.1 Settings for AIS vehicle tracks

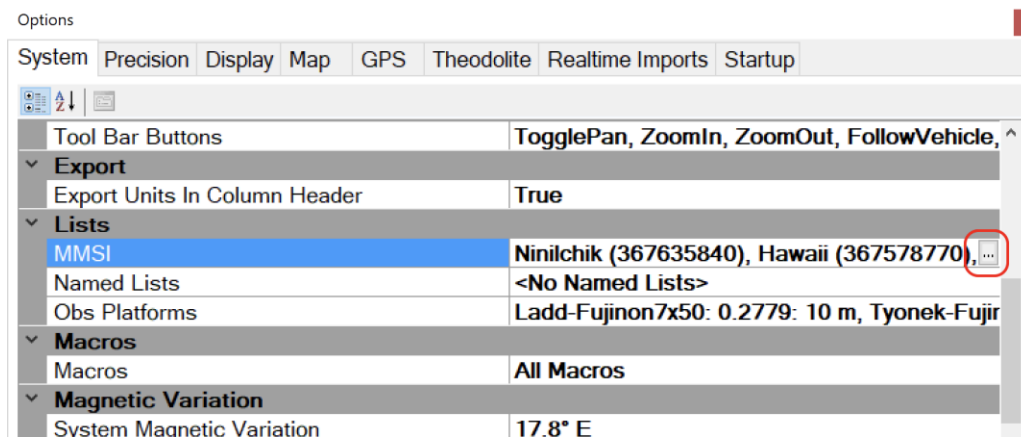
Settings to control AIS track color and width. In editing mode, you can click Configure -> System -> Map and change the width and color of the ais tracks. Note that if you are editing old data, you will need to click 'Apply To All' because the older tracks may be transparent.

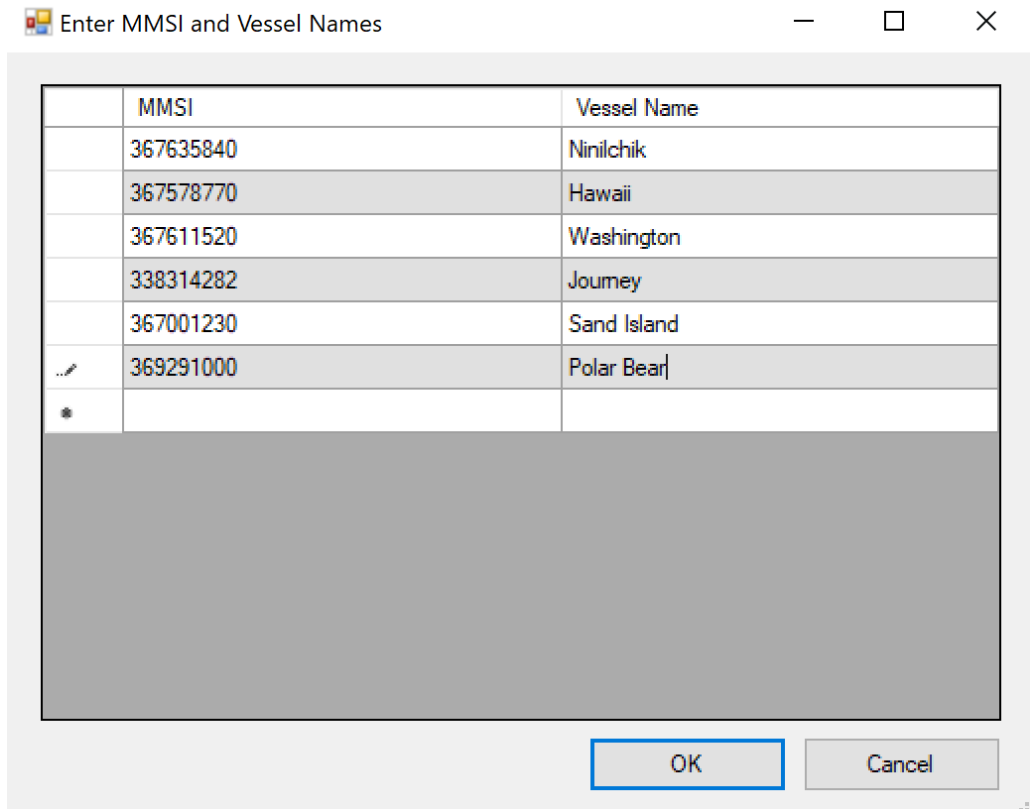


New settings to control AIS vehicle sizes, same place, editing mode only, scroll down some:



MMSI lists you can find them here in the template. Please double check that you've entered the MMSIs correctly.





17 Typical PSO Responsibilities with Mysticetus

17.1 PSO Responsibilities

- Record data as described in this user guide and/or as instructed during training.
- Maintain equipment: check and regularly replace/recharge batteries as needed e.g., in the handheld GPSs, charge devices (e.g., laptops), organize and inventory items daily.
- Ensure all raw and edited Mysticetus™ files and handheld GPS files are backed up and uploaded to cloud storage (if used) and the thumb-drive that should always be plugged into the laptop operating Mysticetus.
- Provide the Lead PSO with clarifications about data entries when requested.
- Communicate any concerns to the Lead PSO.
- Familiarize the team with special operating procedures or changes in protocol, as needed, given specific site or operational conditions.

- Abide by all Health, Safety and Environment (HSE) protocol and procedures specific to the project and operations team and client/vessel.

17.2 Lead PSO Responsibilities

The Lead PSO has these additional responsibilities:

- Prior to the start of observations, communicate daily PSO monitoring plan to the other PSO, and other personnel as required.
- Have knowledge of the project operations and PSO visual protocol.
- Perform daily data QA/QC checks and provide feedback to the PSOs to increase consistency in data recording.
- Maintain a logbook of daily operations (activities, results, problems). This log will be used for the final reports and could also serve as a tool to help plan future surveys.
- Ensure data are recorded correctly and data is backed up to the external HD and uploaded to the cloud using an internet connection on the vessel.
- Compile a draft Daily Report (to include BOTH visual and PAM summaries) using Mysticetus, post QA/QC, and submit this report to the Project Manager as appropriate via email using the vessel internet
- Oversee the equipment and data inventory. Ensure the following equipment is available to PSOs, in working order:
 - Office Supplies: binders/folders for documentation, pencils, pens, etc.
 - Monitoring equipment health.

18 FAQ and Scenarios

Mysticetus use is very flexible. Enough so that there are “best ways” you can leverage it. Here we discuss many such scenarios or FAQ’s that have come up in recent years.

Aerial Surveys: *We sometimes have multiple 2+ flights in one day, is it safe to assume that we can just save and close out after the first one and then reopen the same file and start tracking to add on?*

It is recommended creating two separate flight files. Start a new one each flight. Then aggregate them later for combined analysis. Keeping them together will create a weird "lunch" time in your single trackline, rather than two nicely separate tracklines. You can import one Mysticetus file into another via Data -> Import -> From Other Mysticetus File. Then save as "2017-01-17 - Combined. Mysticetus" (or something like that...we always recommend starting file names with the date in ISO 8601 format: https://en.wikipedia.org/wiki/ISO_8601).

GPS Functionality, it's not working Jim: *Sometimes it seems that my backup NMEA capable GPS isn't working.*

First off, sometimes the government is shutting down the GPS for government reasons. We've seen that many times in the recent past. There are websites dedicated to tracking such trying times.

Hang-up points with your GPS include:

1. NMEA Out setting on the 76CX. Mysticetus doesn't care about baud rate, but make sure it is spitting out position data. It is possible the 76CX only outputs NMEA data if it has a fix (maybe).

2. Cable is actually functional (like all electronics, cables fail too). Failures can manifest themselves in step (3) but if you have another cable, simply try that.

3. USB-to-virtual-COM-port driver successfully installed. Any number of weird little things (like failed cables or PC errors) can get in the way of this. To check, do the following:

- Unplug the 76cx from PC.

- If you're running Franson GPSGate, disable and exit the app. Correctly configured, Franson can help with certain situations. It can also get in the way in others.

- (on PC) Start Button -> "Device Manager"

- Look at "Ports (COM and LPT)". This may not be there yet depending on BT device, and any attached printers. See screenshot below for an example of what to look at.

- Plug Garmin into PC. The PC will go "Bing!", screen will flash, and a new COM port should be created. This new COM port should *not* have a yellow warning flag. (if it has a yellow warning flag...let me know and we can debug that - you may need an internet connection the first time you connect the GPS to let Windows automatically download the proper driver).

4. Run Mysticetus. Mysticetus should auto detect that COM port as a GPS. Whether or not GPS has a fix, you should be able to see "GPS Raw Data" in the Data Panel (click the little dropdown and select that).

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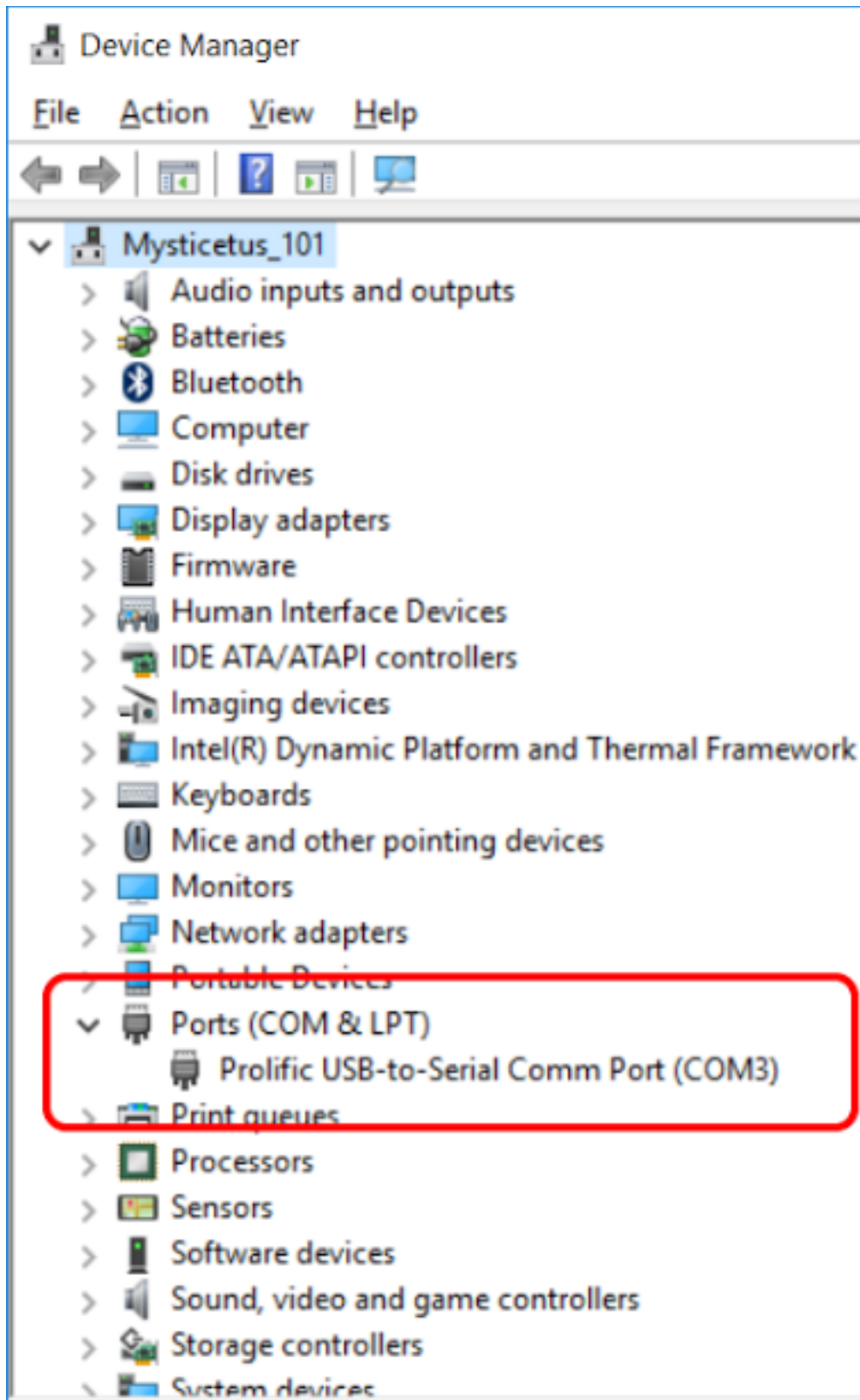
To further debug, you can use Franson GPSGate. Mysticetus is pretty darned good about dealing with flaky GPS situations - but Franson is the gold standard.

If Franson can't detect it and show you NMEA data streaming in, something else (GPS, Cable, COM drivers, wrong phase of the moon, etc.) is broken.

If you don't already have it: http://gpsgate.com/products/gpsgate_client

=====

Example of Device Manager with a USB GPS attached. The Garmin will probably say something slightly different than "Prolific..."



How difficult would it be to use Mysticetus to calculate distance off the line for the sightings post-survey?

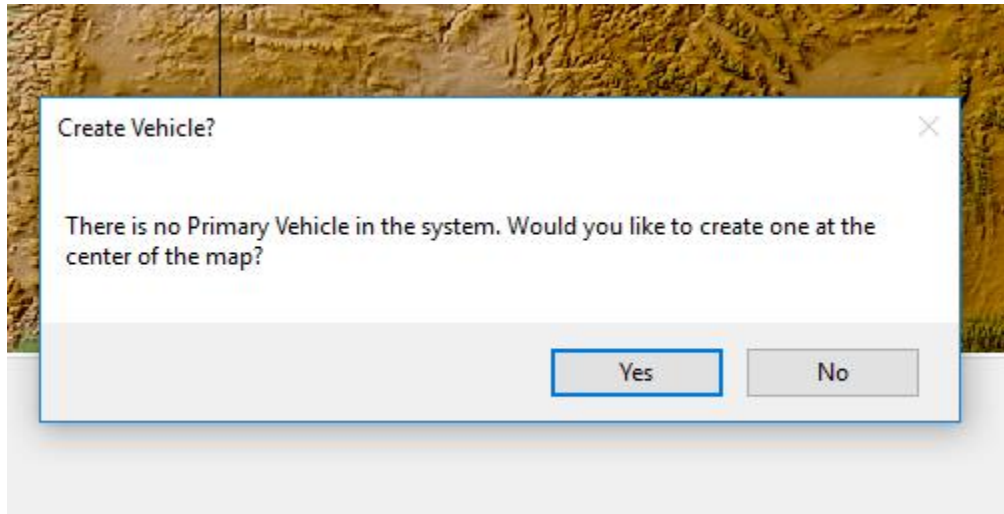
“I’m interested in potentially being able to use our dataset to estimate densities in the future. It’s so expensive to get out on the water and collect data, that I believe we have a responsibility to try and get the most out of this dataset as possible. And so for that reason we’re giving some thought to where we place our track lines. How difficult would it be to use Mysticetus to calculate distance off the line for the sightings post-survey? I imagine it should be quite possible given that we’ll have the ship track in the mix. “

Yes, Mysticetus already calculates perpendicular sighting distance for each sighting. This is done by adding a distance field to the sighting record and using the PSD formula. If we have a GPS track Mysticetus uses that. If not Mysticetus projects the current course over ground into the future and derives PSD from that.

And is there a button to press so we can center the map on our location? Just to check GPS has got us where we need to be.

Yes, press the Center On Vehicle toolbar button to keep the vehicle near the center.

**We're getting this when we connect to GPS.
What should we say here?**



Are you loading your template? If so, it will use the appropriate vehicle. This should be done from a shortcut on the desktop for consistency. I can help with a remote desktop session if necessary.

Can we get local time to display – it's defaulting to UTC. PC Time and GPS Time both have the same thing displayed.

Local time will be displayed in the various data fields, and in the taskbar at the bottom of your screen.

The GPS clock sync windows will display UTC.

I am getting red flashing after telling me to create a vehicle with plugging in a GPS?

“I connected to GPS first and then got the create vehicle message.

But if I load the template first, and then connect the GPS, then I don't get that message.

For kicks I tried connecting to GPS and then pressing <yes> to create vehicle. And then this part of the screen flashed red – in a very alarming way.

It does stop with the red flashing.

Do I need to make adjustments here to start tracking? “

The template controls a lot of options, such as default vehicle and when to start tracking. The template also specifies how and when to save your data. With the template a lot of things are setup for you to make life easier.

Without a template Mysticetus needs some help from you to figure out what to do. Like, do you want a vehicle (yes usually...but not if you are just peeling at something offline) and the red flashing thing is Mysticetus trying to remind you to turn on tracking when it finds a GPS ("Hey! You! Yes you! I see you've got a GPS plugged in but you aren't recording anything... Are you sure that's correct?"). You also need to explicitly save your changes when running without a template.

My sightings are not updating?

"This version of the software has a bug with the real time display. When you go to select a sighting all you get is a list of dates and times. No sighting information which makes it fairly useless."

This is most likely a formula issue.

More info: Because everyone wants things completely different from everyone else, Mysticetus allows you to name fields however you want, and create field dependencies and formulas however you want. You can put fields in any order, and make them dance any way you want. Think Excel formulas that depend on many other cells. The template then enforces this for the duration of the survey.

For example, the reticle cell (whatever it is named) is referenced by the Sighting Id cell (whatever it is named) along with the Vessel Position cell (whatever it is named) and Observation Platform cell (whatever it is named), linked to an appropriately defined Observation Platform (in system settings, whatever the platform is named) to obtain height above water. When all this is linked up, Mysticetus can determine distance to sighting. (and you can name anything whatever, and order it however)

But with this power comes the chance that things are not hooked up correctly. If anything is pointed at the wrong field, or mis-labeled, Mysticetus cannot determine distance to sighting. A common typo is to point Mysticetus at the wrong Position field (sighting pos vs vessel pos). But there are others.

We'd be happy to take a look at your template and see what's happening (or not happening as the case may be).

Sighting labels on the map?

"The map is not plotting labels for the species. Is there a feature where if you hover over the sighting it will show you sighting information rather than the map details?"

Sighting names are controlled in your template by clicking Ball -> Configure -> Entry Sheet -> Default Sighting Format.

In there, you can control the icon color and shape. This is done by clicking the ellipses and adding a Condition for each species you want a unique icon or label for. For example, you can specify that when a field named "Species" Equals "Humpback whale", Mysticetus will draw a Red Square with Yellow Outline of Size 13 when zoomed out and 23 when zoomed in.

This is also where you can tell Mysticetus when to display a label on your (in this case) Humpback. You can choose, Always, Never or Zoomed In.

The format of the name is also controlled in the Configure -> Entry Sheets -> Default Sighting Format. Here you enter a string that may look like:

[Sgt Id] - [Species] - [Time]

The items in brackets are column (field) names in Mysticetus. The above assumes your Sighting Id field is named "Sgt Id", and that you have other fields named "Species" and "Time". If you have changed those (say, your time field is named "Sighting Time") you would need to change your Sighting Id Format appropriately. Again, you can put anything you want in there, to make it look however you want.

When this label is displayed is (again) controlled per-species (look a few paragraphs up).

USB backups vs. AutoSave?

"The autosave to USB: I created a cml to open Mysticetes with the cml for autosave then opened the template. This didn't work on day two. How can I make the shortcut just open my exact survey file with the autosave feature?? It dabbles on this in the manual but it remains unclear to me "

Auto-Save is completely different from Auto-Backup. Unless all heck breaks loose, you should not even know your Auto Backup files exist. You should only use them in case of emergency.

Auto-Save, however, is the stuff I talk about earlier, it is triggered by both /save on the command line, as well as use of the AutoSave Time and AutoSave Path settings in your template (Configure -> System Options -> Auto Save)

Thus, Auto Save only happens when running in Data Gathering mode. These are the files you actually do stuff with (as opposed to Auto-Backup files).

Auto-Backup, on the other hand, runs every three minutes. It saves a copy of your current data into two (or more) locations:

1. AppData\Local\Mysticetus\AutoSave
2. All USB Drives named "MYSTICETUS" (that is, Mysticetus scans your system for every attached drive named "MYSTICETUS", and writes a copy of your latest data there)

Auto-Backup is your Last Ditch backup system when heck breaks loose. In general, you can ignore it...but the data will be on your thumb drive if, say, your PC's hard disk completely crashes.

Note that your AppData\Local\Mysticetus\AutoSave folder **only** contains a single file - all other auto-backups are deleted after the latest one is saved.

Your USB drive, though, will contain all copies of your data as long as the file name changes - which is why I recommend using the %Time% macro in your Auto-Save path (to change the file

name with time when running in Data Gathering mode). Your thumb drive will contain a copy of every file you've worked with.

Again, these are **not** the files you typically use for **anything**. They just sit there on the USB drive until the zombie apocalypse happens and the zombies have eaten your computer's (other) brains. Auto-Backup is your backup-backup system for seriously bad news end-times.

After your survey, once you are certain your data has all been nicely backed up to your servers - you can delete the AutoBackup folder on your USB drive(s).

Question: I'm adding Bft to the Sightings sheet, but I'd like to tell Mysticetus to look at Lft and Rt and choose the higher value. Is this possible?

This is not currently supported.

Errors on Startup

Hi Dave,

I have an error message:

*"Setting 'Save Path' is empty and this will lead to data loss.
Please correct this setting in your Mysticetus template, Startup Settings or Startup Shortcut.*

Mysticetus will now exit."

I am not sure why we have the issue and it seems to fix by itself after few minutes.

Running into this error message few times now.

The error means the Save Path in the Template was not set correctly. There are a few reasons for this:

1. The template was not loaded correctly. Templates can be specified on the Command Line or in the Startup Settings. Generally, we prefer Startup Settings for templates since they are generally the same template (in your case).

- a) Check that that Shortcut you are clicking does **not** specify the template. As a reminder: Right click your shortcut, choose properties and look at the Target. A template is the parameter that does **not** start with a forward slash. (recommend you remove template from shortcut if it is present)

- b) Check that the Template Startup Setting is correct. (again, this is prob where the template should be specified, not the command line).

2. The Save Path is indeed empty in the Template. After the template has been loaded, Check Configure -> System -> Save Path.

As a reminder: you can only check these settings in Editing Mode (not Collection Mode). You have 5 seconds at startup to click on "Editing" mode before it launches in Collection mode. This user guide has more discussion on these points in the body of the document.

We have major issue with the cloud synch where it is consuming a lot of bandwidth in the field. The cloud drive is synching everything including the template file which has grown to 25000 MB every 15 min. This has become a major issue on bandwidth.

It is important to collect data only in 'Data Collection' mode and not in edit mode. Using edit mode and saving updates your template with your sighting data which depending on what all you are saving (e.g. pictures) can substantially increase your template file size. Restore your original template and assure all observers are only working in Data Collection mode.

19 Credits and Thanks

Mysticetus was created by Dave Steckler. Entiat River Technologies is his Washington State Sole Proprietorship. Entiat River Technologies has been supplanted by the forming of Mysticetus LLC in January, 2016. All rights have been transferred.

Mysticetus is currently many tens of thousands of lines of (mostly C#, some C) code and continues to evolve over the last 8 years to meet demands of research and industry. Mysticetus continues to consume hours of sweat and lost sleep to develop it from initial concept, through many iterations (some successful, others not so much), into the commercial-grade product it has become today.

Of course, there are a number of other people and entities that deserve thanks and credit for help and encouragement over the early years as Mysticetus evolved to form the basis that it has become today. If I missed anyone, feel free to send me (Dave) a nasty piece of flame mail and I will not only profusely apologize and include you in the next version of this document, I will buy you a drink next time I see you.

Original idea, first customer, ongoing support and feedback: **Mari Smultea**. Without Mari's input and guidance, this project would have never been started, never (quite literally) gotten off the ground, and would never have progressed to the complete system Mysticetus is today. I could almost imagine naming this software "Mari-cetus" in her honor...almost.

Initial prototype testers include **Bernd Würsig**, **Kate Lomac-MacNair**, and **Jenelle Black**. Critical feedback provided in the early stages of a project of this magnitude helped shape the overall direction Mysticetus has taken. **Bernd**, in particular, has continued to provide additional guidance over the years Mysticetus has been under development.

As Mysticetus matured into a solid product, **Tom Jefferson**, **Tom Norris**, **Mithriel MacKay**, **Mark Cotter** and **Cathy Bacon** all provided much needed support, feedback and help with ideas and bugs. **Cathy** deserves a specific shout out for surviving some of the early bugs in the system.

Various Navy personnel, including especially **Chip Johnson** and **Joel Bell**, have provided incredibly valuable feedback, suggestions and guidance.

HDR employees, notably **Dan Englehaupt** and **Kristen Ampela** deserve many thanks for support, suggestions and guidance.

NOAA's **Barry Eakins** deserves a nice glass of wine or two for his help as I stumbled through displaying various types of topographic/bathymetric data.

Mysticetus leverages the DotSpatial library for its GPS interactions as well as certain shapefile loading and saving operations. A shout out to the open source development community at <http://dotspatial.codeplex.com>.

Mysticetus is living software that continues to evolve. A recent example might be the inclusion of North Atlantic Right Whale dynamic management areas (DMA) in all Mysticetus map displays in use. Mysticetus ongoing mission is to support industry and research both. Software development today focuses on creating both expanded functionality to meet evolving needs and to improve the ease of use along with robustness to managing the realities users face in the field. This latter challenge is daunting in that the goal is to reign in paths that might cause data loss, mis-configuration, or general frustration in its use. We continue to lean on you, our users, to learn and adapt Mysticetus to accomplish these goals. There are many of you who have been generous with your time in this capacity when you don't have to. Our sincere thanks to each and every one of you.

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