

Reference Manual

Pelagic Habitat Analysis Module

*Software for the Study and
Management of Pelagic Species*

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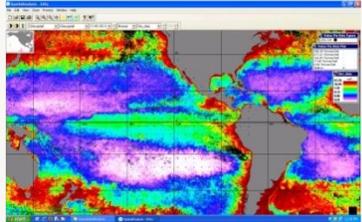
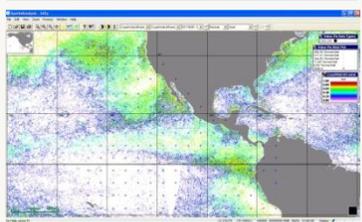
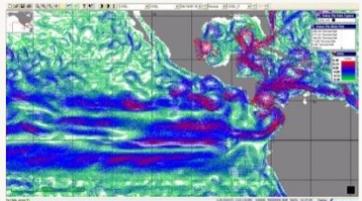
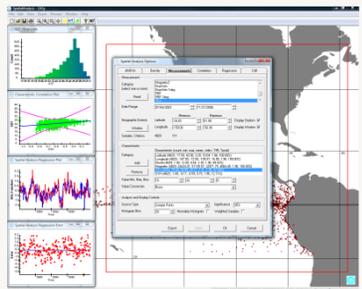
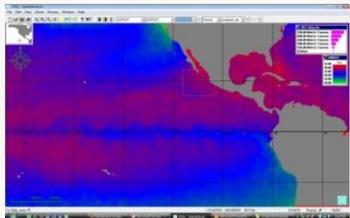
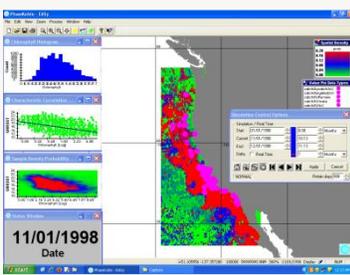
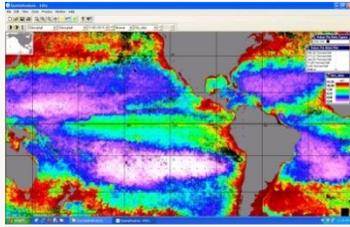


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Appendix A:

PHAM Basics

This appendix covers PHAM's Purpose, Set-up & System Requirements, PHAM Tour, Export Capabilities, and Behind the Scenes: Functionality.

A.1. PHAM's Purpose

PHAM, Pelagic Habitat Analysis Module, is a geographic information system (GIS) integrated with a variety of viewing, analyzing and data storing capabilities. Specifically designed for marine and coastal applications, PHAM has been successfully used in a wide range of applications from resource management and oceanography, to pollution studies and coastal monitoring. Unlike other GIS software, PHAM goes beyond latitude and longitude to include both depth and time. By incorporating these two extra dimensions, PHAM's capabilities provide scientists, resource managers, companies and educators with the tools to better interpret and communicate their ideas.

A.2. Set-Up & System Requirements

PHAM has been developed for use in Windows Operating systems and requires a minimum allotment of free memory (see table to the right). The installation of PHAM is automated through the website.

Basic installation will include all available services (discussed in *Appendix B*) as well as bathymetry and a practice project. When the installation finishes, you will have a folder under your C drive named *EasyPhamLite* as well as a shortcut to the application on your desktop.

System Specifications:

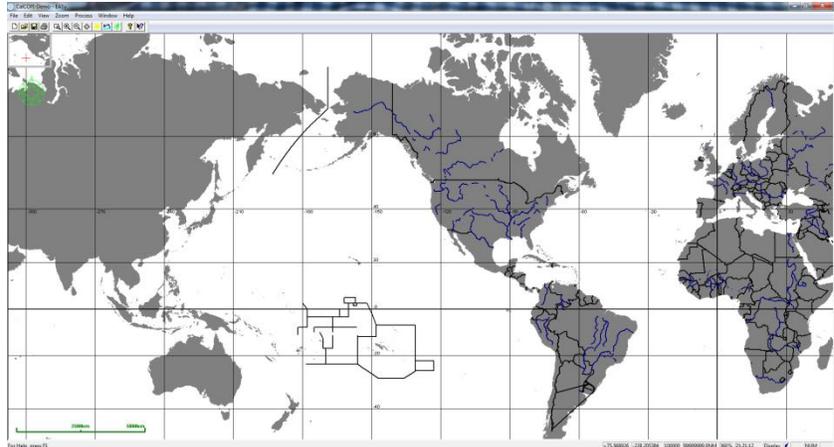
Pentium PC running at 100 Mhz
(minimum)
500 MB available disk space
(minimum)
64 MB RAM (minimum)
Windows NT 4.0 operating system
Microsoft ACCESS

A *PHAM Demo* project is also available for download. This download includes a project complete with imagery. This project is a great way to get started in PHAM. Simply, follow the step-by-step instructions included in the *QuickStart Guide* using the practice project.

A.3. PHAM Tour

Upon start up, the display consists of a map complete with an overlaid latitude/longitude scale grid, land masses, and bathymetry. A typical view of the start-up screen can be seen to below.

The **Main Menu** consists of 7 drop down menus. The first menu, *File*, contains all functions pertaining to bringing data in or saving data out. If you want to change data already in the project, turn to the *Edit* menu. Check out the *View* menu to change what and how data are displayed. *Zoom* menu contains all the zoom and centering options. To analyze the data, look in the *Process* menu. *Window* menu works to arrange any plots made within PHAM. *Help* menu holds all tips and guidelines for success in PHAM.

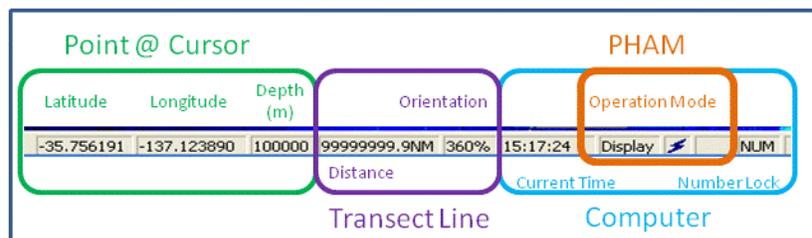


Main Toolbar Icon	Function	Key Short-cuts
	Create New Project	Ctrl-N
	Open Project	Ctrl-O
	Save Project	Ctrl-S
	Print Screen Graphic	Ctrl-P
	Zoom to draw Window Box Extent	Ctrl-W
	Fixed Zoom In	Ctrl-down
	Fixed Zoom Out	Ctrl-up
	Set New Map Center	Ctrl-Z
	Refresh Screen	
	Execute Polling Function	
	Control Simulation	
	PHAM Version Information	Ctrl-M
	PHAM Help Menu	Ctrl-A

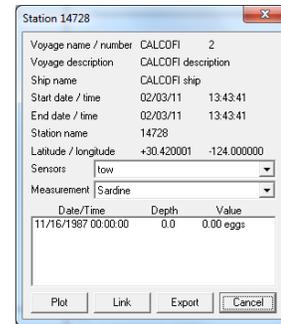
Next on the tour is the **Main Toolbar**. Situated near the top left of the application window and beneath the **Main Menu**, the **Main Toolbar** provides shortcuts to a range of commonly used tools. In many cases, these tools also have keyboard short-cuts as well. The table below provides a brief description of the tools featured in the toolbar as

well as their keyboard short-cuts. More in depth descriptions of these tools can be found in their respective appendices.

The banner along the bottom of PHAM's window contains both a **Messaging Panel** and a **Status Bar**. Information on ongoing processes or the outcome

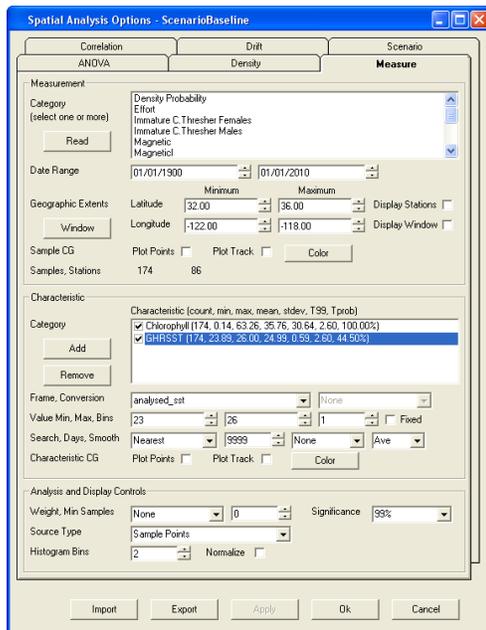


of a process can be found in PHAM's **Messaging Panel**. The **Status Bar** contains the information in the graphic at the top right of this page. Information on the data plotted (aka data blobs) can be attained by double clicking on the blob of interest (shown to the right).



A.4. Export Capabilities

A.4.1. Measurement Export



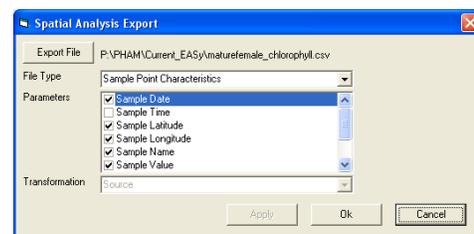
This step will take a few minutes, so please be patient. To export your data with the matching satellite imagery, navigate to the **View** menu then to **Spatial Analysis Options**.

Select the measurement type of interest by finding and clicking on it in the first **Category** box. Then manually set the appropriate date span by typing the earliest date in the first box next to **Date Range** and then the latest date in the last box next to **Date Range**. To set the geographic extents, you can either type in the minimum and maximum latitudes and longitudes in the appropriate boxes or you can hit the **Window** button and simply drag your mouse over the area of interest.

Finally, select the imagery you would like exported in the second **Category** box. For each imagery set make sure to fill out the appropriate binning to use and whether or not you would like the data smoothed.

When finished preparing, click the **Export** button. Once you click this the dialogue box to the right will appear, here you will need to select the Parameters you would like exported. To name the file, click the **Export File** button and type in the name of the file.

Then click the **Apply** then the **Ok** buttons.



A.4.2. Map Export

To export a map, select **File-Export-View**, name the file, and save. The maps can be exported in the following formats: .bmp, .gif, .jpg, .png, .tif, *.gif.

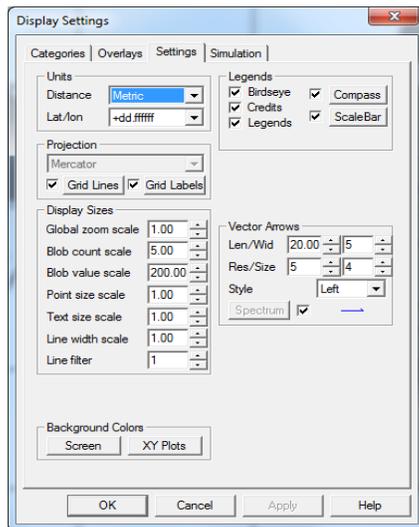
Appendix B:

PHAM GIS Services

This appendix is divided into two sections: **Map Customization** and **Services**. **Map Customization** covers **Map Settings, Overlays, and Credits**; while **Services** covers **Configure Services and Available Services & Descriptions**.

B.1. Map Customization

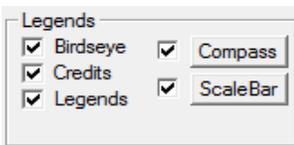
B.1.1 Map Settings



Basic map settings such as grid formats, units, turning on or off annotations such as legends, projections, etc can be found under *View-Display-Settings-Settings* tab (shown to the left). This section simply goes through all the options contained within the *Settings* tab.

Units Box

- Distances**: Option to select either metric or English units
- Lat/Lon**: Option to choose between 4 different formats of latitude and longitude: decimal degrees (dd.f), directional degrees (N dd:mm.ff; N dd:mm:ss), and radians.

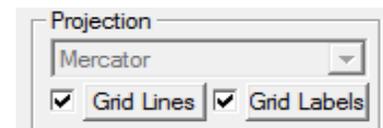


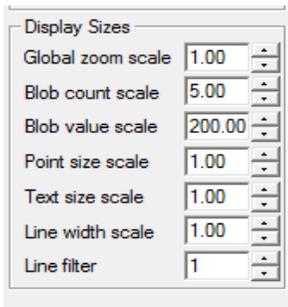
Legends Box

- Options to turn on or off *Birdseye, Credits, Legends, Compass, and Scale Bar*
- Compass**: Select color by pressing on the Compass button
- ScaleBar**: Select color by pressing on the ScaleBar button

Projection Box

- Drop Down Box**: Options include Mercator, Lambert conformal, or Arc
- Grid Lines/Labels**: Grid lines and grid labels can be displayed or hidden by checking the boxes to the left of *Grid Lines* and *Grid Label* buttons. The color of the grid lines and labels are selected by pressing the buttons



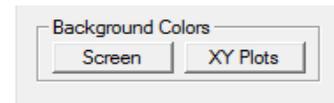


Display Sizes Box

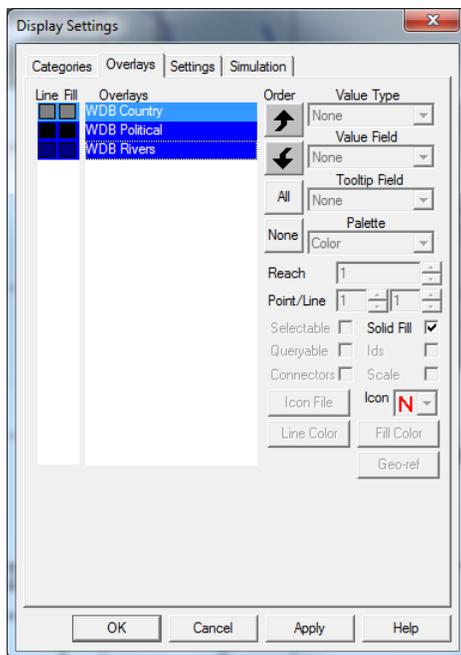
- Global zoom scale: Interval for the fixed zoom
- Blob count/value scale: Default scale of the Blob count/value
- Point size scale: Default scale of the GIS points
- Text size scale: Text size for all identifications labels (e.g. Station Ids)
- Line width scale: Default scale of the GIS lines
- Line filter: Option to decrease the resolution of the imagery in order to increase the uploading speed. This number represents the number of lines to aggregate into 1. The default value is 1.

Background Colors Box

- Screen: Option to select the color of the screen background
- XY Plots: Option to select the color of the lines on the xy plots



B.1.2. Overlays



Overlays are the map shapes and features that have been either created in or imported into PHAM. To modify the way these shapes and features are displayed go to *View-Display Settings-Overlays* tab (shown to the left).

In the example to the right, *Points* will appear on top of *WDB Rivers* with *country* as the bottom most layer. This order can be changed by clicking on the arrow buttons to the right of the *Overlays* box.

Selecting the overlays to display is done by clicking on the name of overlay. All overlays that are highlighted in blue will be displayed on the base map. To display or remove all of the overlays click on the *All* or *None* button, respectively.

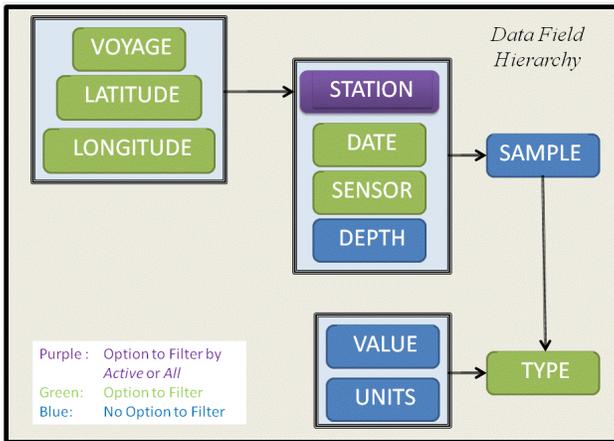
Appendix C:

Data

This appendix is divided into two sections: **Understanding the Data Fields & Display**. **Understanding the Data Fields** covers the **Data Hierarchy and Logic behind the Hierarchy**; while **Display** covers **Filters, Blobs, and Plots**.

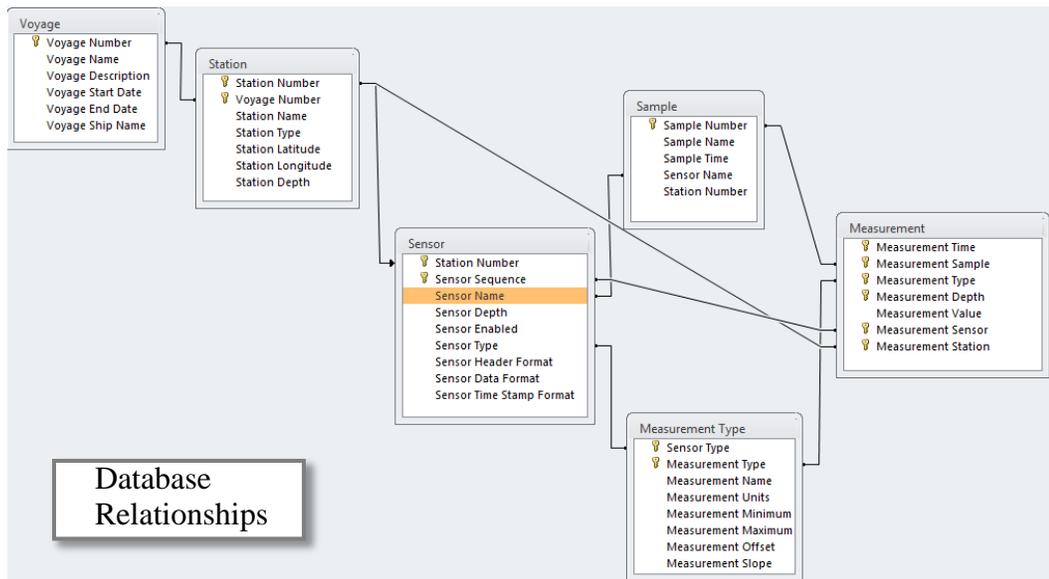
C.1. Understanding the Data Fields

C.1.1. Data Hierarchy



Within PHAM, the data is stored in the hierarchical structure shown above. When planning out the way your data should fit in PHAM, it is important to consider how many *levels* are included in your dataset and what you would like to be able to *filter* on.

The hierarchy is quite flexible as to what you include in each field. The key to success is to keep the relationships between the variables in mind when assigning data to them. The graphic below shows the Access database relationships of all the variables in the PHAM data structure. Understanding the relationships shown here is much easier if the logic behind the structure is understood. This logic is explained in the next section.



C.1.2. Logic behind the Hierarchy

When the database for PHAM was created, the designers looked at the data in the following context:

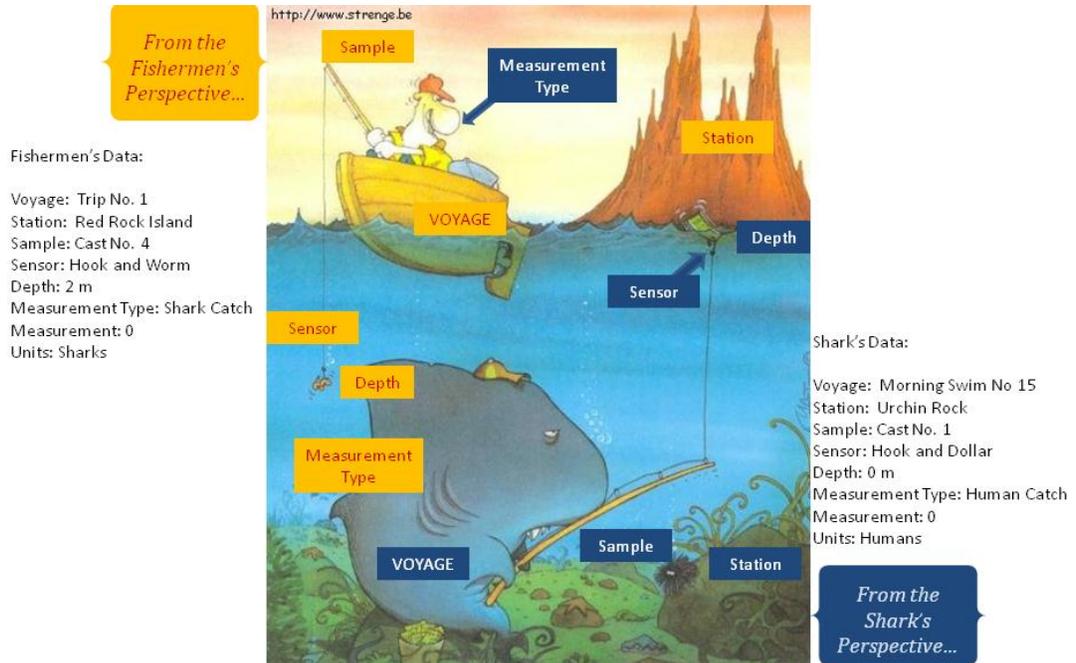


Photo Credit: <http://www.sea-ex.com/fishospeak/fishbowl.htm>

For data to be collected, a **voyage** of some kind must take place. A **voyage** can be anything as long as it is the primary source on which all the others depend (captain, observer, fishery, boat, trip, etc) or can be found (dataset, logbook, field notes, etc).

Once a voyage is established, **stations** can be visited. A **station** is simply a unique latitude and longitude where data was collected. This is an optional field in PHAM. If the locations of data sampling have special names, like Red Rock Island or Urchin Rock, then here is where you can include those names. If not, then don't sweat it- PHAM will name those places for you.

Once at a location, a **sample** can be taken. **Sample** can be equated to an attempt to collect data, in the cartoon, the fisherman was on his 4th **sample**. All measurements taken are linked by whether or not they were made on the same attempt. This column is optional as well, if you don't have special names for your attempts to collect data, then leave the column blank- PHAM will take care of it.

What are you using to collect data? This is the **sensor**. It can be a hook and worm, like in the example, or it can be a thermometer, net, or tag. This is basically whatever you are using to collect whatever information you are interested in.

The **depth** of course is simply how deep the sensor was when it collected the data. This can either be in feet or meters, but must be consistent throughout the data being imported.

What did you find? The **measurement type** is a description of whatever the sensor has discovered or was supposed to discover. The **measurement type** is a category complete with units that describes the numerical value your sensor has collected. This could be anything from number of fish eggs to temperature of the water to number of hours your sensor was in the water, and the list goes on.

To the final product... the **measurement value**...The **measurement value** is the data as described by the measurement type. This is a number and is treated quantitatively- be it a measure of effort or of catch or of temperature.

Hopefully, you now have a better understanding of how PHAM handles your data. The following table should serve as a quick reference to answer your questions as you get your data ready to be imported into PHAM.

C.1.3. Summary Table

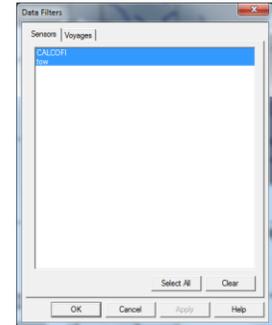
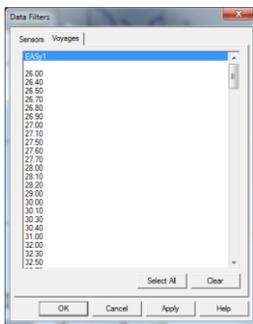
Data Field	Description	Ability to Filter On?
Voyage	Specifies the origin of the data (Example: "Observer Data" or "CA Longline Fishery" or "Humpback Abundance Survey 25")	Yes
Station	Unique Name for each combination of Voyage, Latitude and Longitude, (Example: "Block No 45"). <u><i>This field is optional. If left blank, PHAM will assign station numbers.</i></u>	Yes, option to include only <i>Active</i> stations, where a measurement was taken
Date	Date-Time measurement was taken in the format: <i>MM/DD/YYYY hh:mm:ss</i>	No
Latitude	Latitude in decimal degrees, South (-) and North (+)	No
Longitude	Longitude in decimal degrees, West (-) and East (+)	No
Sample	Unique Name for each unique combination of Station, Date, Sensor and Depth, Example: "Set No. 5"	No
Sensor	Category of Device put in the water to take the measurement, Example: "Circle Hook" or "Gillnet"	Yes
Depth	Depth at which the measurement was taken either in feet or meters- cannot be a combination of the two.	No
Type	Category of measurement taken, Example: "Swordfish Catch" or "Leatherback Standard Carapace Length"	Yes
Value	Amount or Value of the measurement taken. Must be a number	No
Units	Units associated with the measurement taken. Each measurement <i>Type</i> should correspond with only one unit.	No

C.2. Display

C.2.1. Filters

As discussed earlier, the displayed data can be a filtered version of the data in the database. Filtering is accomplished under *View-Display Filters*. This dialog box has two tabs corresponding to 2 different levels on which the data can be filtered.

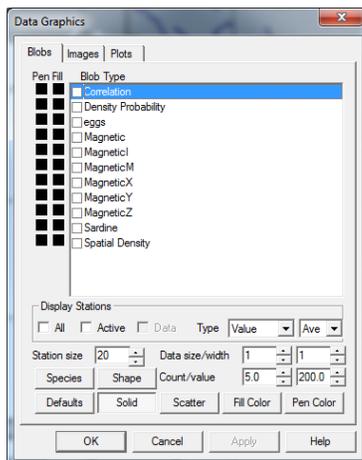
Sensors tab: The *sensors* tab filters the data at the level of the sensor. Simply highlight the sensors to display and click *OK*. The *Select All* button will include all the sensors while the *Clear* button will not include any of the sensors.



Voyages tab: The *Voyages* tab filters the data at the level of the voyage. Simply highlight the voyages to display and click *OK*. The *Select All* button will include all the sensors while the *Clear* button will not include any of the sensors.

C.2.2. Blobs

PHAM uses blobs to display the data on the base map. The tools to modify the data blobs can be found under *View-Data Graphics-Blobs* tab. Within this dialog box (shown below) is a *Blob type* window, a *Display Stations* section, *Type* drop down menu, and boxes where the size of the stations and blobs can be modified.



Blob type window: This holds all the measurement types available in the database. The checked measurement types x are the measurement types that will be displayed. To modify the measurements, the measurement of interest must be highlighted first. The colored boxes next to the *Measurement types* represent the color of the measurement type. These colors can be modified by double clicking on the color box and selecting a new color, or by clicking on the 'Fill Color' and 'Pen Color' buttons.

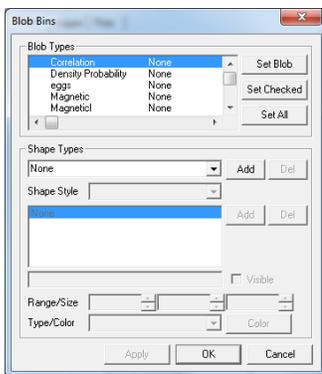
Display Stations section: Checking the box next to *All* will display all stations while checking the box next to *Active* will only show those stations that were sampled during the time period (This comes up during the simulations (see Appendix D). If one of these boxes is checked, the stations will appear on the

map as plus signs. **Data size/width** options control the size and width, respectively, of the station plus signs.

Blob type drop down menu: The options here are *Pres/Abs*, *Count*, *Value*, *Count Pie*, and *Value Pie*.

- **Pres/Abs** basically shows a blob where the measurement value is not 0 and does not show a blob if the measurement type is 0.
- **Count** will change the blob size based on how many times the measurement was made at a station
- **Value** determines the blob size by the actual measurement value. When this blob type is chosen, the adjacent drop down box will become available. You can choose whether to display the average, sum, min, or max value measured at the station.
- **Count/Value Pie** will show a ratio of the different measurement types to each other at the stations either by count or value.

Station and blob size can be changed by adjusting the values next to **Station size** and **Data size** respectively. In addition, the **Solid** button creates solid blobs rather than circles.

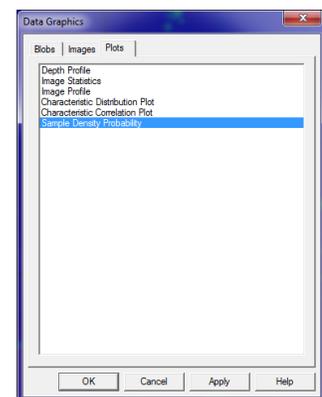


The **Shape** button allows the user to set the binning of each measurement type and to define the way each bin is represented. To set a bin for a particular measurement type, highlight the measurement type and click the add button Next to 'Shape Style'. Specify the range and corresponding size and color of the bin and then click the box next to visible when you'd like it the bin to appear on the map. ***The visibility and choice of bins could result in the misrepresentation of data in the final map.**

C.2.3. Plots

Plots can be created in PHAM through the *View-Display Settings-Plots* tab. This dialog box provides the ability to add, modify or delete X-Y graphs. Any plots created within PHAM will change through time during a simulation, displaying the relevant data for that time period (see Appendix D for simulations).

The data displayed in **Depth Profile**, **Image Statistics**, and **Imagery Profile** can be set up by pressing ctrl, clicking on the screen, and then dragging your cursor in a line. All points along this line will show up in the plot.



The data that is displayed in **Characteristic Distribution/Correlation**, **Sample Density Probability** plots is set through Spatial Analysis (see **Spatial Analysis**).

Appendix D:

Imagery

*This appendix is split in two sections: **Import** and **Display**. **Import** covers **Available Imagery**, **Configure Import Services**, and **Category**. While the **Display** section covers **Palettes**, **Browse Images**, and **Simulations**.*

D.1. Import

D.1.1. Available Imagery

The amount and quality of satellite imagery is increasing rapidly and the scientific community is scrambling to keep up with the vast number of satellite imagery formats currently being distributed. PHAM, NOAA, and NASA provide website interfaces that allow free access to oceanographic data, *NASAPHAM*, *Coastwatch*, and *OceanColor Web*, respectively. This section will go over the three websites and then supply a summary table of the most popular satellite imagery.

D.1.1.1 Website Imagery Interface

On the PHAM website imagery page (<http://phamlite.com/imagery.html>), there is a list along with links to popular satellite imagery products that have been completely set up for use in PHAM. Links to the products included in the table will bring you to the Imagery Source website where you can download the necessary files. This is a very basic interface that only includes the links to the files of imagery sets that have “pre-set” categories in the downloaded version of PHAM. To learn about these imagery sets, follow the information links also included in the table.

Category	Source	Format	Spatial Resolution	Temporal Resolution	Period
AMR	JPL_FODMAC	HDF		Monthly	2/1985 - 1/2008
Chlorophyll - CZCS	NASA_Oceans	HDF	0.1deg - 9km	8 Day	11/1978 - 6/1988
Chlorophyll - CZCS	NASA_Oceans	HDF	0.1deg - 9km	Monthly	11/1978 - 6/1988
Chlorophyll - Modis	NASA_Oceans	HDF			
Chlorophyll - SeaWiFS	NASA_Oceans	HDF	0.1deg - 9km	8 Day	
Chlorophyll - SeaWiFS	NASA_Oceans	HDF	0.1deg - 9km	Monthly	9/1997 - 9/2008

If the desired imagery is not included in this list, there is still a good chance the imagery can be used in PHAM. This will just take a little more effort and thought on your end. The *PHAM Formats* table at the end of this appendix, sections D.1.2. Configure Import Settings and D.1.3 Categories are must-reads in order to incorporate imagery off this list.

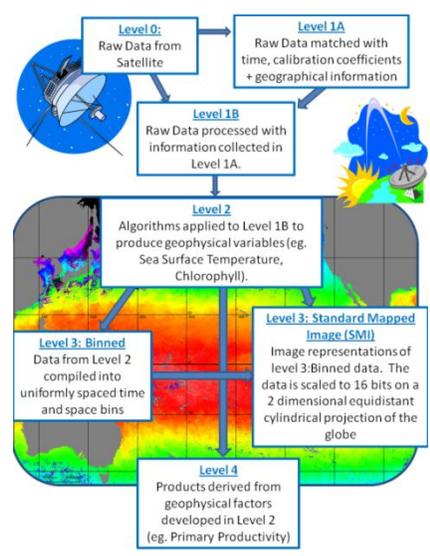
D.1.1.2. NASA Website

NASA's products are available at *Ocean Color Web*, developed by the Ocean Biological Processing Group (<http://oceancolor.gsfc.nasa.gov/>). The *Ocean Color Web* page is a "one stop shop" for information on NASA satellite data collection, processing, and products. Navigating the site can be a bit overwhelming if you're unsure of exactly what you want. The data is organized by mission, or satellite instrument, and by the level of processing the data has undergone, rather than by end product.



Mission	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010		
CZCS																																			
OCTS																																			
SeaWiFS																																			
AquaMODIS																																			
TerraMODIS																																			
MERIS																																			

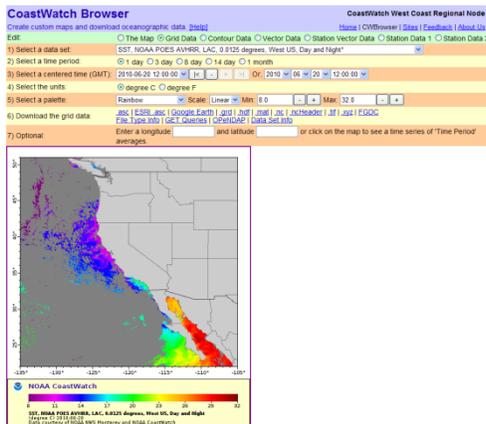
The main NASA missions are the Coastal Zone Color Scanner (CZCS), the Ocean Color and Temperature Scanner (OCTS), the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), Moderate Resolution Imaging Spectroradiometer (MODIS), and Medium Resolution Imaging Spectrometer (MERIS). There are many factors to take into account when choosing an imagery set such as spatial and temporal resolution. While all the missions are global, they are binned at different spatial resolutions (4 km and 9 km bins) and the dates of the missions vary as shown in the above table. Only Aqua MODIS and CZCS have the option to choose from 4 km or 9 km resolution. The rest of the missions only supply the 9 km spatial resolution. Information on the products and the algorithms used to produce them can be found on the website under *Documents-Data Products-L2 Products*.



NASA provides links to the data at different levels of processing so that the scientist has the option to use their own algorithms to produce the geophysical variables or to bin these variables. The data levels are described in the figure to the left. PHAM accepts imagery from levels 2 and higher.

Once a level has been decided upon, the data can be downloaded either from the *Data-Data Access* drop down menu in the menu or from clicking on *Data Archive* found in the *Data Access* box on the homepage.

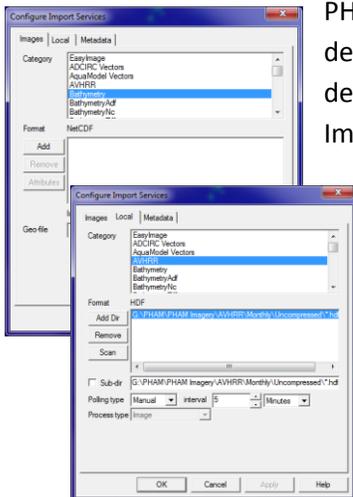
D.1.1.3. NOAA Website



NASA's products are available at *Coastwatch* (<http://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowser>). This browser is a bit more straight forward and definitely easier to use (unless you have a long timeseries). Available datasets can be found in the *Select a data set* drop down menu. The names provide the following information (from left to right): variable, instrument, spatial resolution, geographic region, and temporal resolution. Location, spatial and temporal resolution, as

well as file format are customizable. If the longitude and/or latitude are not specified, the data corresponding to the entire area in the map will be exported. The map extents can be changed by clicking on the links at the bottom of the page. For help in choosing the file format, check the *PHAM Formats* table at the end of this appendix for the formats that PHAM is already set up to accept.

D.1.2. Configure Import Services



PHAM's Imagery wizard works as a type of Rosetta stone that can decipher over 50 satellite imagery formats (*PHAM Formats*) and deliver the desired data in a familiar, readable form to the scientist. Imagery can be imported into PHAM through the Configure Import Services dialog box shown to the left. Within this dialog box, there are 3 tabs: *Images*, *Local*, and *Metadata*. The *Images* tab is specifically for single images, while the *Local* tab is for importing many images located in a folder on your computer.

Each image or set of images is defined by a category. The category contains information on the file format and the pixel to data value relationship of the imagery. If the imagery set of interest was downloaded from the PHAM website, then it will

already have a built in category found in the *Category* box located at the top of the *Configure Import Services* window. The category name that corresponds with the imagery can be found on the *Imagery* tab on the website (<http://phamlite.com/imagery.html>) in the category column.

D.1.3. Categories

Each imagery set is paired with a **Category** which is set up under *View-Display Settings-Categories*. The top box contains the names of all the previously set up categories. The *Edit* button opens the legend and scaling fields for editing.

Category: name of category.

Image Format: format of the imagery

Import type: applies only to EOF data and zipped Modis files.

Measurement type: name given to the imagery.

Palette/Orient: imagery color scheme and color scheme orientation.

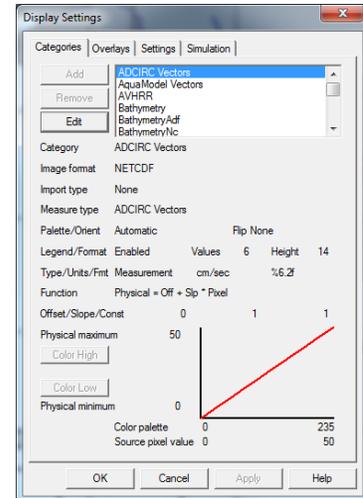
Legend/Format: Disable the legend by clicking on the *Enable* button (or vice versa), customize the number of *Values* to include in the legend scale, and define the *Height* of the legend box.

Type/Units/Fmt: describes the imagery. *Type* can either be measurement, depth, or elevation. *Units* field is a user defined field, meaning any unit can be typed into this box as is appropriate (meters, deg C, etc).

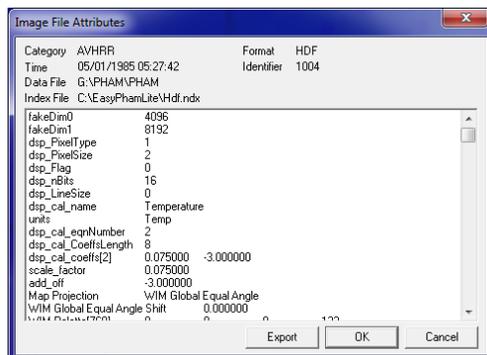
Function: the equation used to convert the pixel value to an appropriate measurement value for the imagery.

Offset/Slope/Con: the values for the variables in the *Function* box. The first is the y-intercept or offset; the second is the slope of the line.

Scaling can be found along the axis of the graph at the bottom. ***Pay close attention to the scaling. This must be returned to the original scale prior to running Spatial Analysis.**



D.1.4. Image Attributes

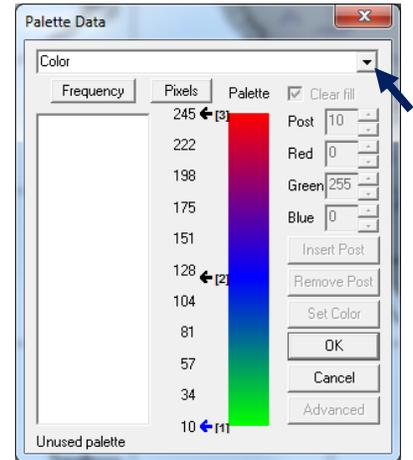


Information on a displayed image can be seen by selecting *View-Image Attributes*. This will bring up a dialog box (see left). The dialog box lists all the metadata for the image file, and includes an option to export the imagery metadata to a .csv file.

D.2. Display

D.2.1. Palettes

Each imagery set has a unique palette created to best display the imagery. These can be selected by going to **View** menu then **Palette**. The preset palettes can be selected by clicking on the drop down button at the top right of the screen indicated by the blue arrow.

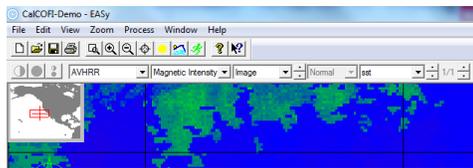


To customize your own palette, you can change the colors of posts by either double click on the black arrows, called posts, or change the values manually by putting in the post number and changing the values in the boxes next to **Red**, **Green**, and **Blue**. To add and remove posts simply click on

the **Insert Post** and **Remove Post** buttons. The location of the posts can be changed by clicking on the black arrows and dragging the post to the desired location.

The values next to the color bar can be either *Pixels* or *Values*. This can be changed from one to the other by clicking on the box above the numbers (either *Pixels* or *Values* button).

D.2.2. Browse Images

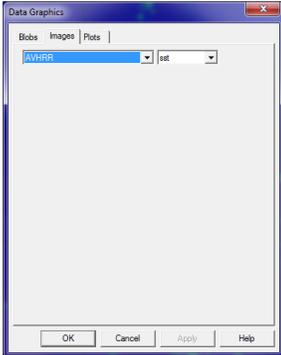


the first box's dropdown button. Then scroll to the desired date by clicking the third box's dropdown button.

The option to 'browse' through the imagery is one way to view the imported imagery. *Browse Images* is a static view of the imagery at a certain date. Click on *Process-Browse Images* and the toolbar to the left should appear. Choose the desired imagery by clicking

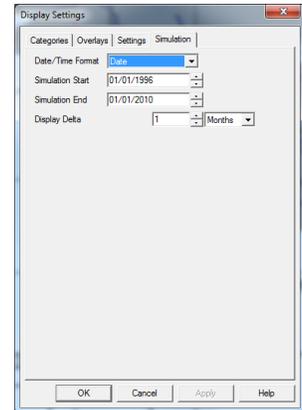
the first box's dropdown button. Then scroll to the desired date by clicking the third box's dropdown button.

D.2.3. Simulations

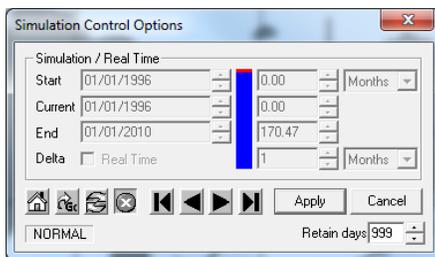


Before you can run a simulation, there are a few set up steps that you must complete. First, you need to select one of the imagery sets to display along with the data. This can be done under **View-Data Graphics-Images** (see left). Select your imagery by clicking on the dropdown arrow next to the top left box.

The simulation start and end times are set up in the **View-Display Settings-Simulation** tab (see right). The **Date/Time Format** drop down menu allows you to select either **Date** or **Date/Time**. The **Simulation Start** is the date(/time) of the first simulation frame. The **Simulation End** is the date(/time) of the last simulation frame. The **Display Delta** is the amount of time in between frames. The units on this time can be anywhere from seconds to years.



To show the time and date of the current frame, select **View-Status Window** from the main menu. While the simulation is running, the *Status Window* will show the time and date of the current frame of data and imagery. Whenever the simulation is not running, the *Status Window* shows the time and date from your pc clock.



The simulation is run through the control panel under **Process-Simulation Controls** (see left). The play button starts the simulation. The stop button stops the simulation. The fast forward button steps forward frame by frame. The home button resets the simulation and returns everything back to normal function mode. In order to return to normal functions, it is essential that this button be clicked whenever the simulation is over. The Retain days value at the bottom of this dialog box represents the number of days that PHAM will look backwards in time for an available image to display with the data.

Appendix E :

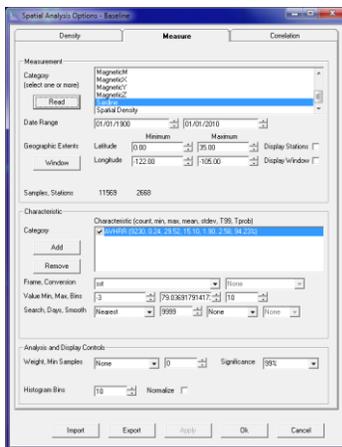
Spatial Analysis

The Spatial Analysis tool within PHAMLite provides a method of collecting and analyzing environmental data for statistical associations with study data. Where associations are found the tool can be used to analyze habitat and make predictions of habitat based on environmental parameters. This tool can be accessed through **View-Spatial Analysis Options**.

Data Collection / Measurement Tab

Sampling data loaded into EASy appears in the first list box of the **Measurement** section. The list box allows for selection of more than one measurement type at a time. If more than one measurement type is selected the data sets are grouped together and treated as the one data set in the subsequent analysis.

Date, Latitude, and Longitude can be filtered by setting the desired Date and Location ranges. Imagery to be compared is added into the **Characteristic** box.



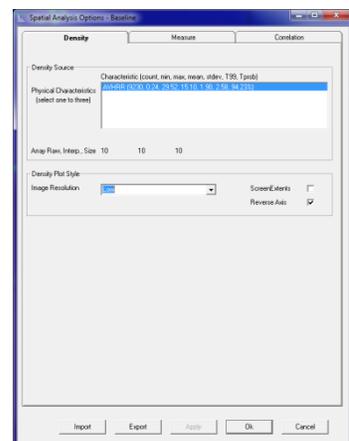
The following values should be set only after considering the temporal, spatial, and value ranges of your data and the imagery associated with your data.

- **Value Min, Max, Bins** = The minimum and maximum value of the imagery to include as well as the bins over which the imagery should be grouped.
- **Search, Days**=How PHAM should search for the imagery data for each record, number of days of search radius of imagery
- The **Analysis and Display Controls** box has options to weight the measurement values, set the histogram bins, and normalize the data.

The EASy Spatial Analysis program provides a capability to calculate spatial density images. These images represent the relative geographic and temporal likelihood of finding the measurement types selected based on the associated imagery data.

A density preference array is then compiled for one, two, or three user selected physical characteristics. The array accumulates catch measurements into user defined bins. The accumulated measurements in the density preference array cells are then scaled between zero and one.

To plot these density arrays select the **Density Plot** (see and customize the plot using the **Spatial Analysis Options-Density** tab.



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