



SinBiota – AtlasBiota

Interactive Mapping in CRIA

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1. Aim

To examine the SinBiota – Atlas Biota; to make comments on the interface and useability from a general user's point of view; and to make recommendations for possible modifications to the interface.

2. Method

- a. Examine SinBiota's Atlas Biota
- b. Examine comparable Atlas sites

3. Comments on existing Atlas Biota (<http://sinbiota.cria.org.br/atlas/>)

A brief examination of the Atlas Biota elicited a number of comments. The Atlas is based on Mapserver (<http://mapserver.gis.umn.edu/>) technology from the University of Minnesota. MapServer is not a full-featured GIS system, nor does it aspire to be. It does, however, allow for basic mapping on the internet, has the advantage of being Open Source software, and provides the ability for wrapping with Java, Javascript, Perl and more recently PHP MapScript (see comments below).

The Atlas is a good start, and carries out what it does quite well. One of its strengths is the extremely quick redraw time. It could be extended, however, to include more flexibility and useability from a users point of view. Any comments here are not meant to be negative, but are provided in a spirit of improvement.

A general comment is that the use of the Mapserver technology restricts considerably the flexibility and useability of an on-line mapping facility. As mentioned above, it is not a fully-functional GIS system, but it is not a bad system for a very simple on-line mapping facility with limited flexibility. The incorporation of Javascript, Java, Perl and PHP Map Scripting (<http://www2.dmsolutions.on.ca/gmap/gmap75.phtml>) with the Mapserver software allows for greater flexibility. Atlas Biota could be enhanced by extending these wrappers to provide for collapsible lists, infinite zooming, and a range of other features.

The technology has recently moved on considerably, however, and quite sophisticated on-line mapping systems can now be developed with high functionality. Two good examples of fully integrated systems are the National Pollution Inventory Interactive

Map (<http://www.npi.gov.au/index.html>) and the National Land and Water Resources Atlas (http://audit.ea.gov.au/ANRA/atlas_home.cfm) both from Australia.

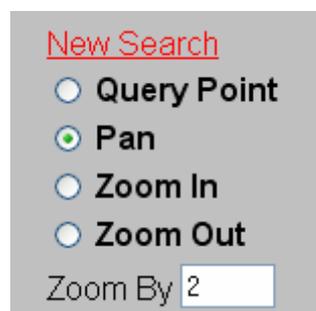
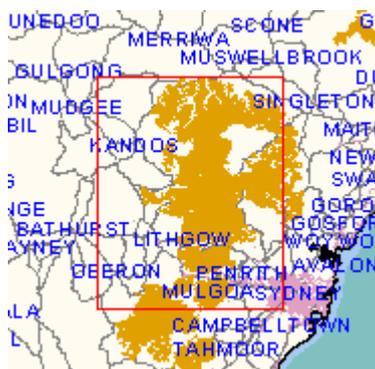
Questions need to be asked as to:

- a. what information is the Atlas Biota intended to provide?;
- b. who are the users?;
- c. what sort of information are the users likely to require?;
- d. what are the future expansion requirements of the Atlas?;
- e. and how much flexibility is required?

before a decision can be made as to how sophisticated the Atlas needs to be.

Specific comments on existing interface follow:

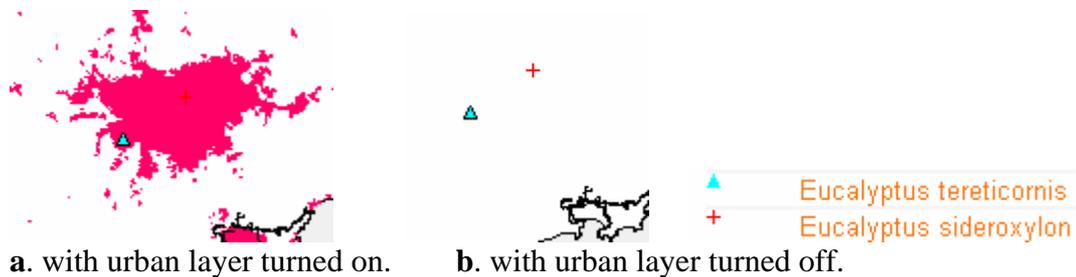
- i. An enhancement could be a “*Zoom to extent of selected items*”. This could possibly be done as a default with the option to turn off. When a species is selected, often the symbol colour clashes with the colour of the background layers (see comment below), and it is hard to find the extent of the total distribution. This would work by determining the extent of the selected species’ distribution and zooming to the extent +10%. A problem here may be doing this with this mapping program.
- ii. If one wished to *zoom in repeatedly* (i.e. zoom in, zoom in, zoom in), one has to click on the “Zoom In” button each time. It is often an advantage for the last selection to remain active until changed. The same may occur if one is Zoomed in and wishes to pan across an area bit by bit. Again this may be a feature of Map Server but could easily be programmed in using Java Script.
- iii. Infinite rather than step-wise zoom. The Atlas only allows step-wise zooming by “2 times” at a time. Infinite zooming as in the National Pollution Inventory and EPBC DSS or the DMSolutions site in Canada, using a rectangle is the ideal method to allow infinite zoom. The Australian Virtual Herbarium (see below) uses similar software to the SinBiota Atlas Biota, and allows a user-defined zoom.



a. National Pollution Inventory b. Australian National Herbarium

- iv. The *colour of the active* (selected) *species* often clashes with the background. This is particularly noticeable with red symbols that overlay urban areas. Where the symbol is an area symbol (i.e. a square, triangle, circle, etc.) it is usually framed with a black square which makes it stand out to some extent,

but this is not the case with a ‘+’ symbol. Possible ways around this would be for all the background layers to be pastel colours, and the selected layers bright, contrasting colours. [Done by Jan 2004].



In this example, with the urban layer turned on – the location of *Eucalyptus sideroxylon* is not obvious

- v. The site needs the addition of a *caveat* along the lines of “the points shown do not necessarily represent the total distribution of the species in the area, but only those points arising from active programs ...” etc. e.g., if one does a search for any of the *Eucalyptus* spp., the only results that appear are records in the middle of São Paulo city. I am sure this is not the only occurrence in the State of these species. It can thus be misleading to users who are unfamiliar with the site (see <http://www.npi.gov.au/about/disclaimer.html> for an example of some things a caveat may include). Other sites (e.g. <http://ims.ci.lincoln.ne.us/isa/flood/>) have a pop-up window that includes the caveat.
- vi. The *species names in the search* (Buscar) need to be entered via a consistent lookup table – whether from an authority table or otherwise. For example if one enters Eucalyptus in the species, the results in the Buscar are as follows

buscar

Mais de uma espécie encontrada. Escolha.

EUCALYPTUS
eucalyptus robusta
eucalyptus rostrata
eucalyptus tereticornis
eucalyptus sideroxylon
eucalyptus ficifolia
eucalyptus citriodora
eucalyptus sideroxylum

Note that ‘eucalyptus sideroxylon’ and ‘eucalyptus sideroxylum’ both appear

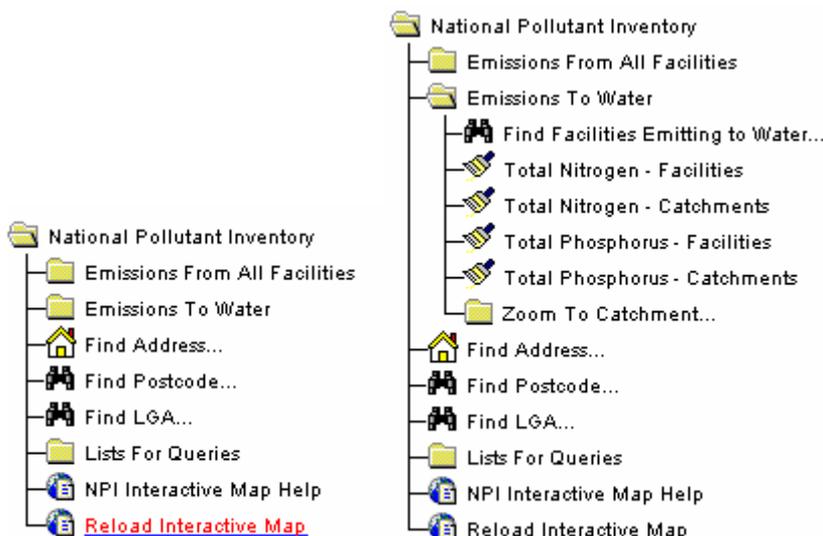
- vii. Also – in the example above, the genus is always given with a lower-case initial letter. I believe that this should follow accepted procedure (and the rules of nomenclature) with the *generic name having an initial upper-case* letter. Where the site is being used by non-taxonomists, it is important to

encourage correct use of this accepted method of citing species' names. See for example Chapman 2002.

- viii. Also – in the above example, there seems to be no obvious *order of the species* listed in the Buscar. This is OK in this case, but with a larger list, it makes it very difficult to find the species of interest.
- ix. It would be nice to be able *to chose more than one species* at a time in the Buscar area by using the Shift key, etc. This would allow a user to carry out a rapid comparison between two or more species.
- x. If one is carrying out lots of sequential species' searches, it would be advantages of having the option to *clear all previous searches* under 'Coletas'. For example, one may have done 20 or 30 searches, and the Coletas area could get quite large.

Coletas			
■	Eucalyptus robusta [2] fonte	■ □	espécie
●	Eucalyptus rostrata [1] fonte	■ □	espécie
▲	Eucalyptus tereticornis [1] fonte	□ ■	espécie
+	Eucalyptus sideroxylon [1] fonte	□ ■	espécie

- xi. **Ecosystems.** The only ecosystem that I can get to come up is Agroecosistema. Should I be able to get Cerrado, Mata Atlantica etc.? Whenever I try, I just get “Ecosistema não encontrado”. Perhaps for the uninitiated (and poor foreigners like myself), there needs to be some context sensitive help of good searchable “Help Menu” (see for example, the help menus in the National Pollution Inventory Interactive Map (<http://www.npi.gov.au/index.html>). [A search in Jan 2004, showed many more ecosystems present.]
- xii. An expandable/collapsible legend may be worth considering as the number of Items could get very large and thus, for example, the ‘Bacias Hidrograficas” might just show with an expandable arrow which would then show the subitems. This should be possible to do using Javascript.



Example of expandable/collapsible menu from National Pollution Inventory.

- xiii. A handy addition for users would be a “Find Place” option that would allow a user to zoom into a named location. See for example



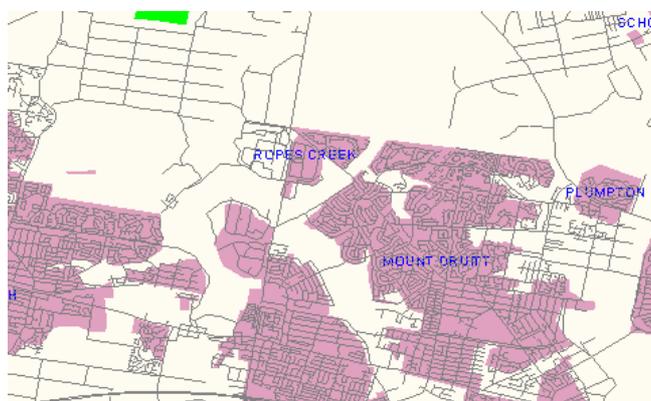
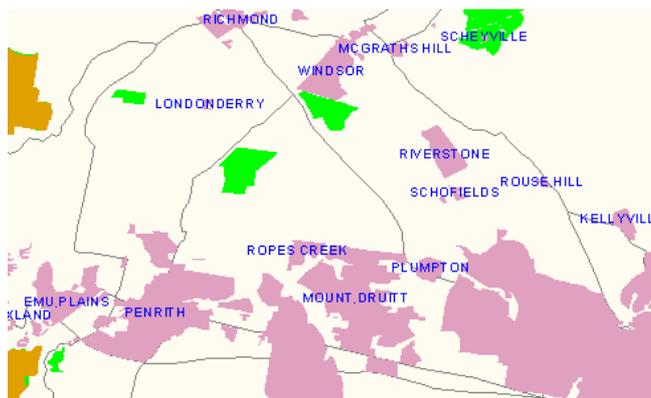
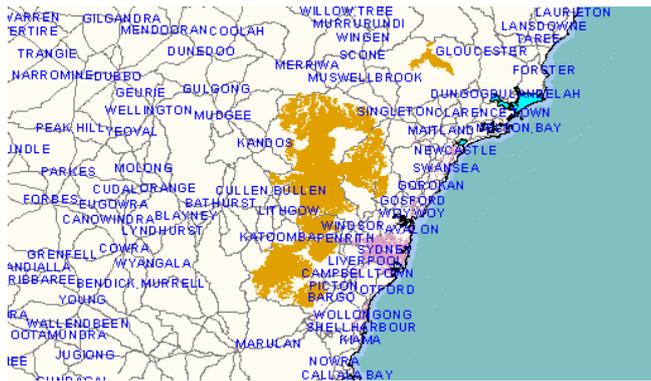
This allows a user to type in a named location, and then select from a list to Zoom to that place. <http://epbcweb.deh.gov.au/images/index.html>. The Minnesota DNR LandView (using Mapserver) (<http://www.dnr.state.mn.us/maps/landview.html>) also shows this feature.

- xiv. Another enhancement would be for new, finer scale layers to turn on as one zoomed in. For example see <http://www.npi.gov.au/index.html>,



Four Zoom levels in the National Pollution Inventory showing layers appearing as scale increases.

and <http://epbcweb.deh.gov.au/images/index.html>



Four zoom levels in the EPBC system showing layers appearing on as scale increases.

- xv. New technologies allow for better size maps than the restrictive – quarter-page maps used in the Atlas. Again see the National Pollution Inventory Interactive

Map (<http://www.npi.gov.au/index.html>) as an example, or the Canadian DMSolutions (<http://www2.dmsolutions.ca/gmap/>) where three possible map sizes are allowed through a drop down menu.

4. Comments on other on-line mapping systems

a. Australian Virtual Herbarium (<http://www.anbg.gov.au/avh/>)

This is based on Mapserver technology as is the Atlas Biota. It also has many of the same drawbacks. I believe it does have some advantages over the Atlas Biota (as well as some worse features).

- The size of the map is larger (see note xv above)
- The Zoom button, etc. remains active (see point ii above)
- Allows for user-defined zoom level (see point iii above)

b. Canadian DMSolutions (<http://www2.dmsolutions.ca/gmap/>)

Also based on Mapserver technology with the addition of Javascript and the Mapserver PHP MapScript Module which appears to allow for considerably improved flexibility. Some of its more interesting features are:

- User selected map size by drop-down menu
- Infinite zoom through use of a rectangle

It does continue to have some of the similar drawbacks of the Atlas Biota, including points i, ii, and vii above.

c. National Pollution Inventory (<http://www.npi.gov.au/index.html>).

The National Pollution Inventory has recently been redesigned using new technologies. The data is served out of ESRI's ArcSDE, which may not be an option for CRIA, however, other options for serving data do exist.

This and other interfaces developed by ERIN (Environmental Resources Information Network) are based on systems implemented on both Sun Solaris and Microsoft Windows NT platforms with a range of applications using technologies such as Oracle, MS Access/ODBC, ESRI ArcIMS, ESRI MapObjects, SDE API (C++), PERL, Java, JavaScript, XML and ColdFusion.

ESRI GIS products are used for the management of spatial data and Oracle v8.1.6 for storage of other data formats.

The Inventory Interactive Map has many good design features and, I believe, one that could be followed. Discussions I had with Environment Australia last year indicated that many of the scripts using Perl, C++, Java and JavaScript were written in house by a consultant, and could be made available if required.

The use of ArcIMS (<http://www.esri.com/software/internetmaps/ims.html>) allows far greater flexibility than does Map Server. It is far closer to an operating on-line GIS with all the flexibility that that entails, although it is a presentation tool and not an analysis tool (however see additional comments below).

d. **National Land and Water Audit**
(http://audit.deh.gov.au/ANRA/atlas_home.cfm)

A similar system to the National Pollution Inventory, above, but has not undergone as much recent development with Java, Javascript and Perl as has the former. It has many of the same features and flexibility, such as new layers appearing as one zooms in, infinite Zoom, etc.

e. **EPBC DSS** (<http://www.ea.gov.au/epbc/interactivemap/index.html>)

Another database developed by ERIN for Environment Australia. It is based on Map Server software, and has many of the same drawbacks as the SinBiota Atlas Biota (small map size, limited legion, etc.) It does have some advantages, such as:

- Integrated place-name search (see point xiii above)
- Zoom and Pan that remain active (see ii above)
- Layers that turn on and off as Zoom level and Scale changes (see xiv above)
- Infinite Zoom through use of a rectangle drawn on the screen (see iii above)

A recent decision has been made to migrate this system to ArcIMS.

5. Conclusions

The SinBiota Atlas Biota is a useful on-line mapping system, and has a lot of good features. Since being created, however, available software for on-line mapping systems has been significantly improved providing much greater flexibility in what can be done, while at the same time, providing simple, easy to use interfaces.

There are two possible directions that CRIA may go, and the direction it takes is largely dependant on the answers to the questions posed above, in conjunction with some of the technical issues mentioned below.

Tony Rosling at ERIN, who is largely responsible for the EPBC On-line Decision Support System made the following comment that may be of value:

ArcIMS will read shape files but I'm not sure how good the querying is against them. The interface would certainly be better than what they currently have. A simple Java applet a la EPBC but as has been revamped by Johan Swinnen would solve many of their problems. The issues are joining it to their map server back end. May well be possible”.

a. Mapserver

The existing Mapserver software being used by CRIA for the Atlas Biota is Open Source and has the advantage of being extremely cheap. The drawback (which is also a strength) is that its flexibility and its power really lies in the wrappers employed to personalise the application. It allows for the use of Perl, C++, Java, Javascript and PHP MapScript as well as many other program languages to extend the basic product.

To quote from the Mapserver web site (<http://mapserver.gis.umn.edu/>)

“The MapServer system now supports MapScript which allows popular scripting languages such as Perl, Python, Tk/Tcl, Guile and even Java to

access the MapServer C API. MapScript provides a rich environment for developing applications that integrate disparate data. If the data has a spatial component and you can get to it via your favorite scripting environment then you can map it. For example, using Perl's DBI module it is possible to integrate data from just about any database vendor (eg. Oracle, Sybase, MySQL) with traditional GIS data in a single map graphics or web page. In addition, there is now a PHP/MapScript module included in the current release.”

Below are a few sample environmental-related sites based on Mapserver:

Minnesota DNR Tons of Maps Online (<http://www.dnr.state.mn.us/maps/tomo.html>)

Minnesota Watersheds Online (<http://terrasip.gis.umn.edu/projects/minnesota/>)

Digital Chart of the World (<http://mapserver.socialchange.net.au/world/init.html>)

Map of Rio Grande du Sol (<http://www.geolivres.gov.br/>)

The examples provided on the Map Server Gallery site (<http://mapserver.gis.umn.edu/gallery.html>) tend to show some of the limitations of the software compared to the ArcIMS below.

The Atlas Biota could increase flexibility, improve the user interface, and solve some of the issues listed here through revisiting some of the scripts wrapping the basic Mapserver product. This would appear to be the cheapest option available to CRIA, and continue to provide a simple, but valuable product to its users. What the limits are, and how much flexibility can be built into the system, I am not sure. It may be possible to obtain and modify some of the scripts from Environment Australia, used there to develop the ArcIMS interfaces.

b. ArcIMS

The most powerful, but at the same time user-friendly on-line mapping systems appear to be based on either ESRI's ArcIMS (Internet Mapping System) or their earlier MapObjects software. Often these have been refined to suit a particular user need, however, tend to have a similar “look and feel” making it easier for users to switch from one interface to another. They allow for large maps, easy use of tools such as Zoom, Pan, etc. and flexible, simple and easy to use legends. An advantage they have is that legends can be made dynamic and updateable as the map is drawn. The software seems capable of answering many of the issues raised earlier in this paper.

To quote from the ESRI web site: (<http://www.esri.com/software/arcims/index.html>)

“ArcIMS provides the foundation for distributing high-end geographic information systems (GIS) and mapping services via the Internet. ArcIMS software enables users to integrate local data sources with Internet data sources for display, query, and analysis in an easy-to-use Web browser.”

ArcIMS attempts to provide a greater GIS-flexibility to the Internet. It has some major advantages over the Mapserver software in that applications can be developed that allow the user to integrate their own data with that being served from the server and to carry out simple analyses on the data. Its greatest drawback is that it is not Open

Source, it has a not-insignificant cost and ESRI training is not cheap to obtain. The software does allow for wrapping using Java, Javascript, Perl, C++, etc.

Below are a few sample environmental-related sites based on either ArcIMS or MapObjects.

City of Lincoln-Lancaster County: (<http://ims.ci.lincoln.ne.us/isa/flood/>)

Geomac Wildfire Fire Support: <http://geomac.gov/>

Planning SA Maps on-line: http://www.planning.sa.gov.au/maps_online/start.html

SE Alaska Fish and Wildlife <http://www.inforain.org/interactivemapping/nfwf.htm>

DMSolutions, Canada <http://www2.dmsolutions.on.ca/gmap/gmap75.phtml>

If CRIA decided that it required a more flexible system for presenting data to the internet than is possible using Mapserver, then ArcIMS would be the ideal solution. Environment Australia has intimated that they may be prepared to supply existing scripts developed for use with the National Pollution Inventory, EPBC on-line DSS and the National Land and Water Resources Audit which could save considerable effort in preparing an interface if the decision were to go down this route.

Updated Comments January 2004

Since the above was written, there have been a number of developments. A meeting, sponsored by the Global Biodiversity Information Facility was held in New Hampshire in September 2003. Partly through my contacts, CRIA was invited to send a representative, and as a result, Alexandre Marino attended that meeting. That meeting discussed a number of issues including visual presentation of information and CRIA made a number of valuable contributions. An invitation has since been received (January 2004) seeking CRIA participation and collaboration, as well as my participation, in a proposal to develop community-based visualisation tools, with particular focus on visualization/validation of natural history collections data using the University of Minnesota's MapServer technology. The developments being carried out at CRIA would contribute greatly to such a project.

CRIA staff have recently been working on a complete redevelopment of the map interface (MapCRIA) and a prototype map interface should be available in the next couple of months. The redevelopment has taken into account the comments made in the earlier draft of this report and in discussions held during my period at CRIA. I have examined at an early prototype, which is developing a map-service approach using SOAP interface and communicating by XML in a similar manner to other CRIA applications. This will make it compatible with other applications such as speciesLink. The map interface as seen by users will be a user-defined interface using a combination of Java and/or Javascript to produce the visual output. I believe that the resultant mapping interface in CRIA and for SinBiota will be world-leading in its simplicity and useability and will be a major advance on the current AtlasBiota interface.

6. References

Chapman, A.D. (2002). *Guidelines on Biological Nomenclature*
<http://www.ea.gov.au/erin/documentation/pubs/nomenclature.doc>.