Typology: Tools for Integration and Analysis

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This presentation reflects the contributions of many individuals, organizations and agencies over the course of more than 6 years

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Thesis: Use of “typological” approaches to defining and solving problems offers multiple benefits to the process of achieving LOICZ goals and objectives.

- Potential bridge between disciplines – including the natural and social social sciences (classification and visualization are universal, and nearly neutral, processes).

- Potential bridge between subgroups and methodological communities within disciplines (e.g., the measurers and the modelers).

- Potential bridge between specialists/researchers and ‘laypersons,’ including other scientists (a communication and information – and perhaps education – tool!).

- **A pathway for enhancing participation and collaboration**

A search for "**typology**" in the ISI Web of Science Database

		Nat. Sci.	Soc. Sci.
1983-90	528 for 8 years = 66/yr	13%	37%
Rapid growth in mid-late 1990s			
2004-05	545 for 17 mo = 385/yr	18%	33%
Absolute % increase:		810%	520%

2 take-home messages:

--There is a growing number and range of applications

--The methodology spans, and might serve to link, the disciplines of interest to LOICZ

Typology, in the LOICZ context:

A quantifiable system of classifications for comparisons and analyses of similarity (regardless of what you call it) --

- Commonly using multiple variables;
- Often, but not necessarily, geospatial;
- May use clustering or a number of other techniques.

Useful for:

- Estimating class characteristics from the well-studied members of the class;
- Visualizing distributions;
- Upscaling; and
- Enabling participation and contributions by diverse groups of people

Typology (like science in general) should not be expected to:

1. Provide unique or immutable answers
2. Provide a single classification useful for addressing all questions or problems
3. Provide useful answers to ill-posed questions
4. Operate effectively with inadequate or invalid input data

However, when treated as a process, it can help the user(s) diagnose and improve the quality of the questions being asked and the data being used – ultimately enabling a satisfactory end result.

Achievements and experiences (1)

In LOICZ-I, an on-line database and linked analysis tools were created, user-tested, and refined.

GEF-sponsored and other budget and typology workshops brought together diverse groups of scientists to share their data and knowledge in a common format, for common goals, producing immediate products.

There was some preliminary success with regard to products (see LOICZ synthesis volume).

The power of visualization was repeatedly demonstrated –

A frequently requested example of clustered typologies from a presentation at the IGBP meeting in 2001:

The inverse question – where might we find relatively pristine coastal environments?

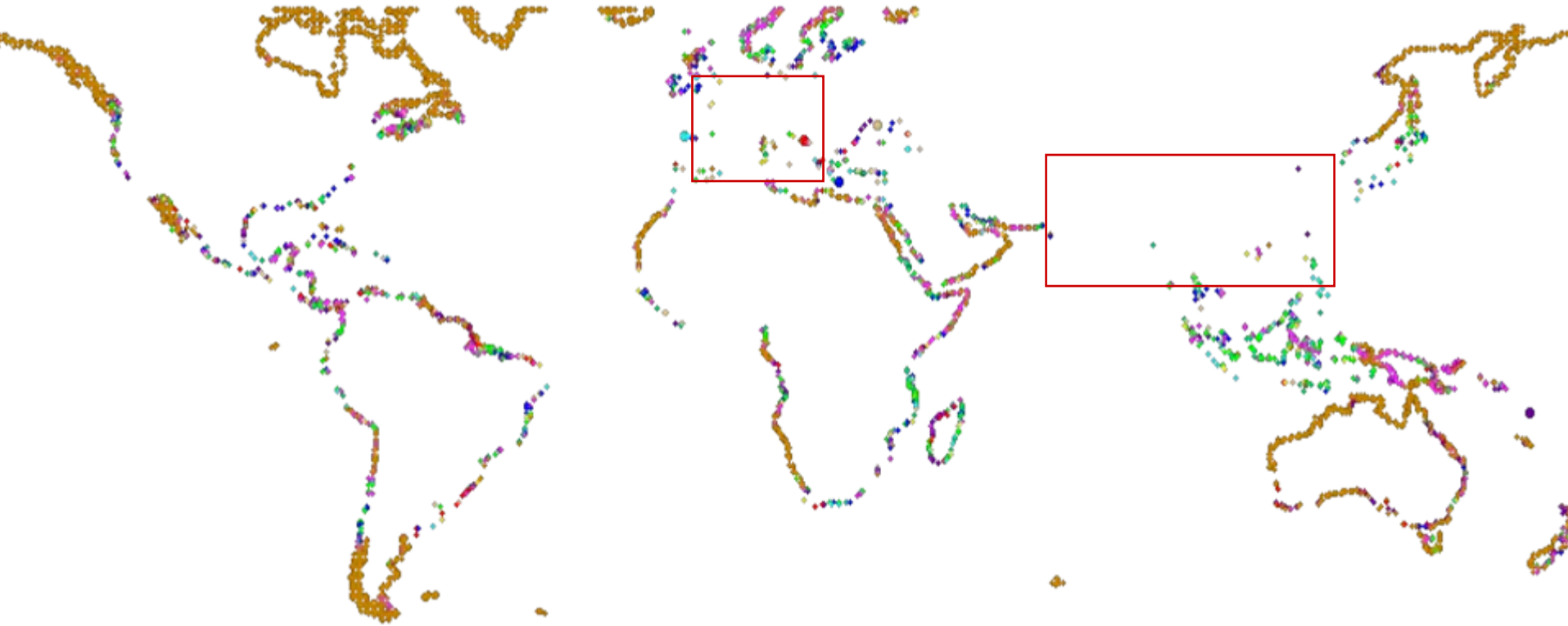
With polar regions cropped, filter data for population density <10/km^2, land cover < 5% cropland – then cluster

Areas of probable human impact disappear

Relax the standards – to population density <100/km^2 and <10% cropland

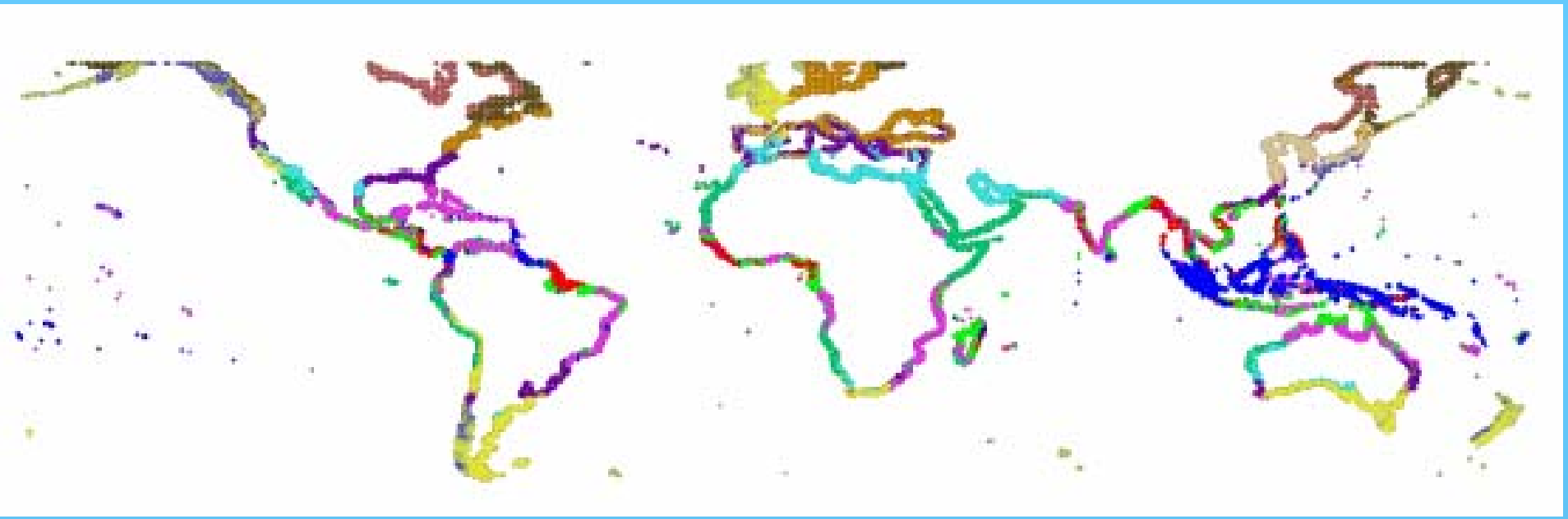
Most of Asia and much of Europe is still “gone” –

What does this imply about our ability to characterize coastal environments and their changes?



Population and classification – a simple example:

Climate index based on temperature, precipitation and their seasonal variations



Can we use space-for-time trades to understand human-climate interaction in environmental changes?

The Climate-Classified World Coastal Zone (same clusters, different colors) – MINUS those cells with: detectable urban land-cover, OR > 5% cropland, OR >10 people /km2

There may be NO unimpacted <u>regional</u> examples of some types of coastal environments

Achievements and experiences (2)

Beyond LOICZ –

Use in the classroom, as an educational tool

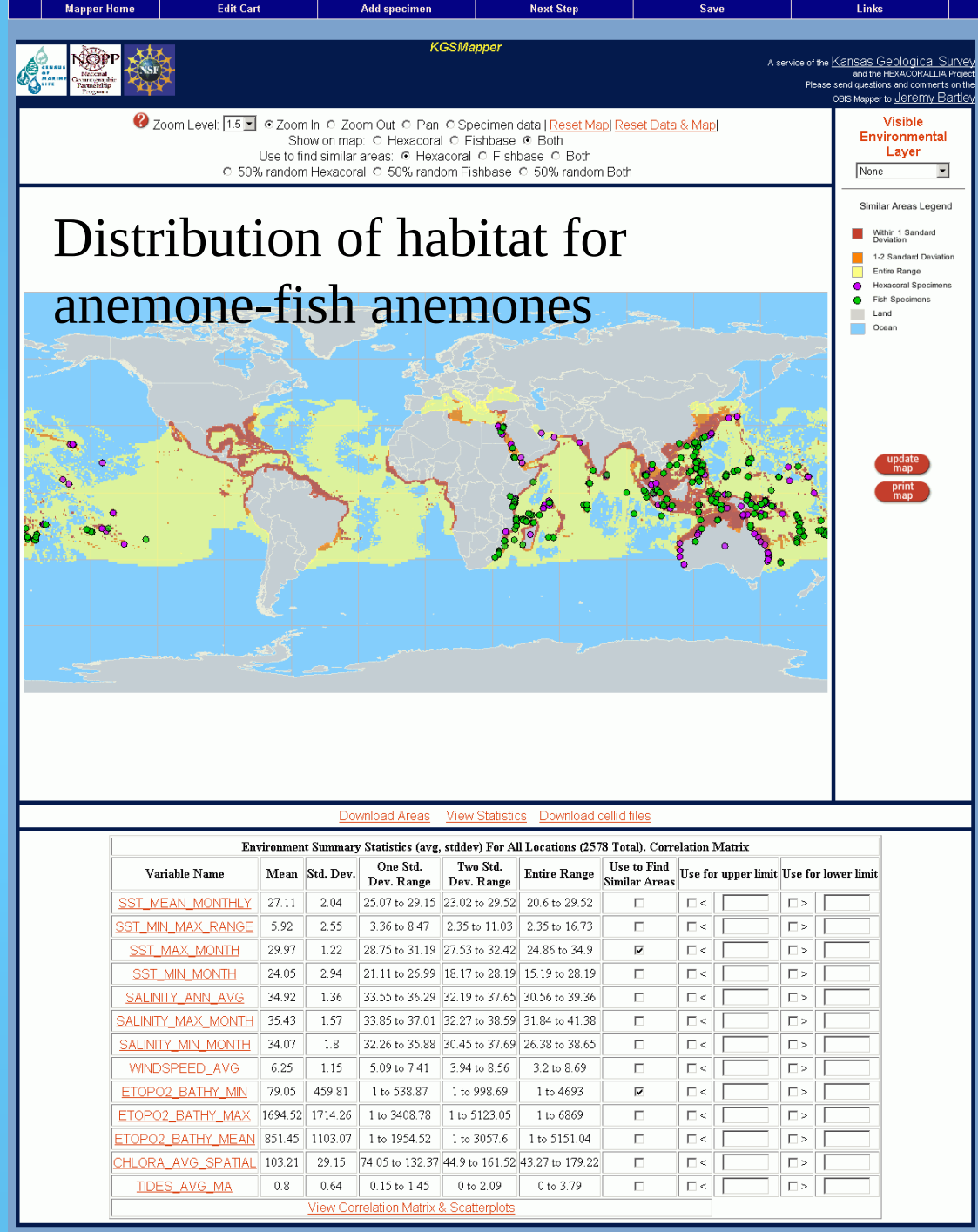
Use by (and with) resource managers for prioritizing areas

Use by independent researchers in many disciplines (e.g., biogeography and ecology, economics and anthropology)

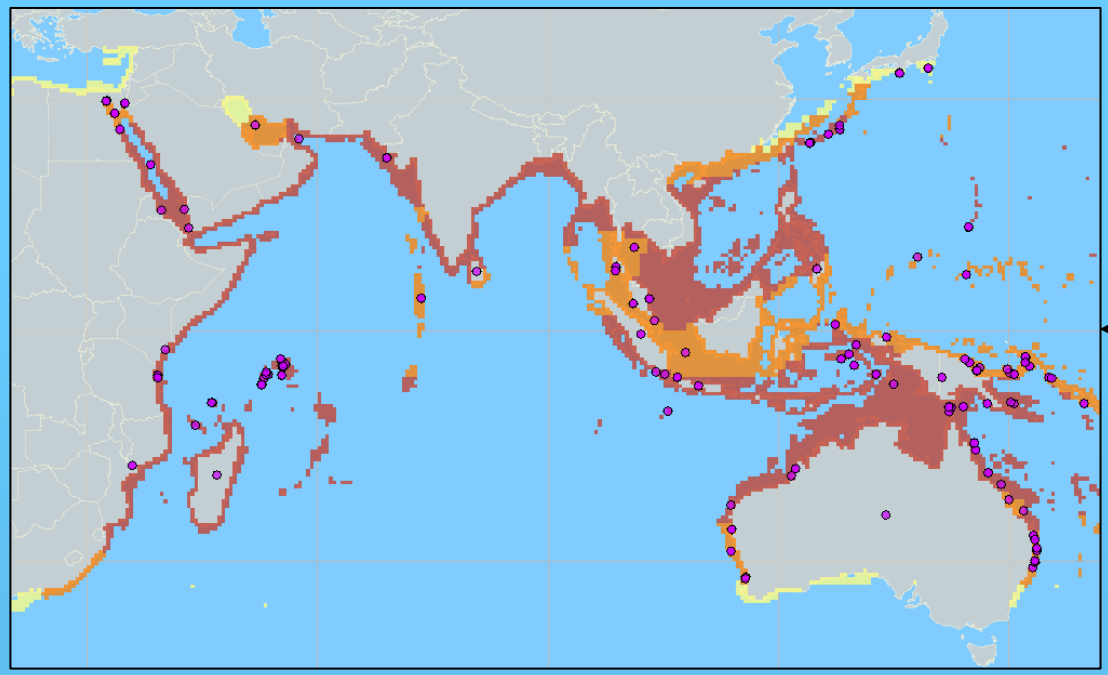
Linkage to, and incorporation into, other programs and tools – e.g., the KGSMapper tool serving the *Ocean Biogeographic Information System* (OBIS: www.iobis.org), based on the "LOICZ" environmental database running within the website *Biogeography of the Hexacorallia* (www.kgs.ku.edu/Hexacoral).

KGSMapper accepts georeferenced organism occurrence data from a network of distributed databases and uses ArcIMS and the environmental database to dynamically display statistical evaluations of potential habitat based on similarity to known habitat.

The user controls selection of variables to use and area to analyze, but the distributed biogeographic data comes as it is, including errors and conventions in assignment --- which explains why the predicted range for photosynthetic organisms includes some deep ocean.



In order to permit hypothesis testing, data evaluation and ‘cleaning,’ and integration of data subsets, a prototype upgrade of KGSMapper now permits the user to upload data points, edit point by point, and to filter or transform selected environmental variables



The anemone distribution map with the depth data filtered to remove cells with minimum depth >100m – and therefore predictably erroneous organism locations

What is needed to solve the rest of the world's problems?
(or at least to provide effective typology support for LOICZ-II)

More data – especially near-shore marine/estuarine data

Higher resolution data (presently at 30' -- ~55 km)
(a pilot project to nest higher resolution data for the Hawaiian archipelago is beginning)

Continued development of the tools, database front ends, etc.

Further integrative links to distributed data and relevant tools.

Continued growth of, and better communication within, the user community.

Support for infrastructure maintenance and development.

What's next?

Typology as a method/concept is well and growing, and still relevant to LOICZ needs and objectives.

During the transition period between LOICZ-I and LOICZ-II, the specific tools and resources have persisted, with the original providers (individuals and institutions) maintaining them with other, often severely limited, resources.

Other uses, users, and relevant tools continue to appear – but not necessarily in ways specifically adapted for LOICZ objectives.

??? What is needed to renovate, expand, and re-engage typology tools and resources to support LOICZ-II???