Systematics and Biodiversity of the Order Cypriniformes (Actinopterygii, Ostariophysi) -

A Tree of Life Initiative

NSF AToL Workshop 19 November 2004

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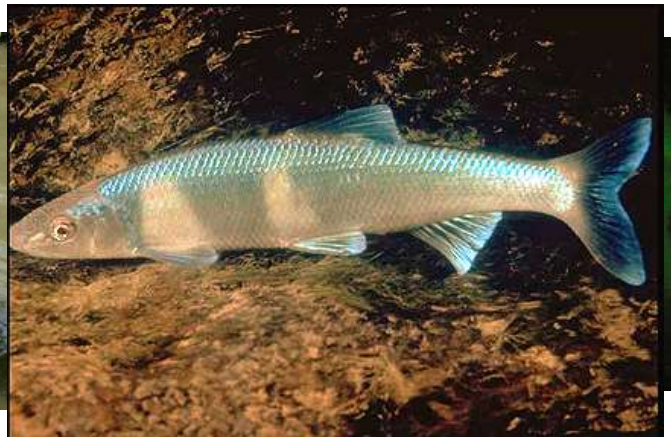
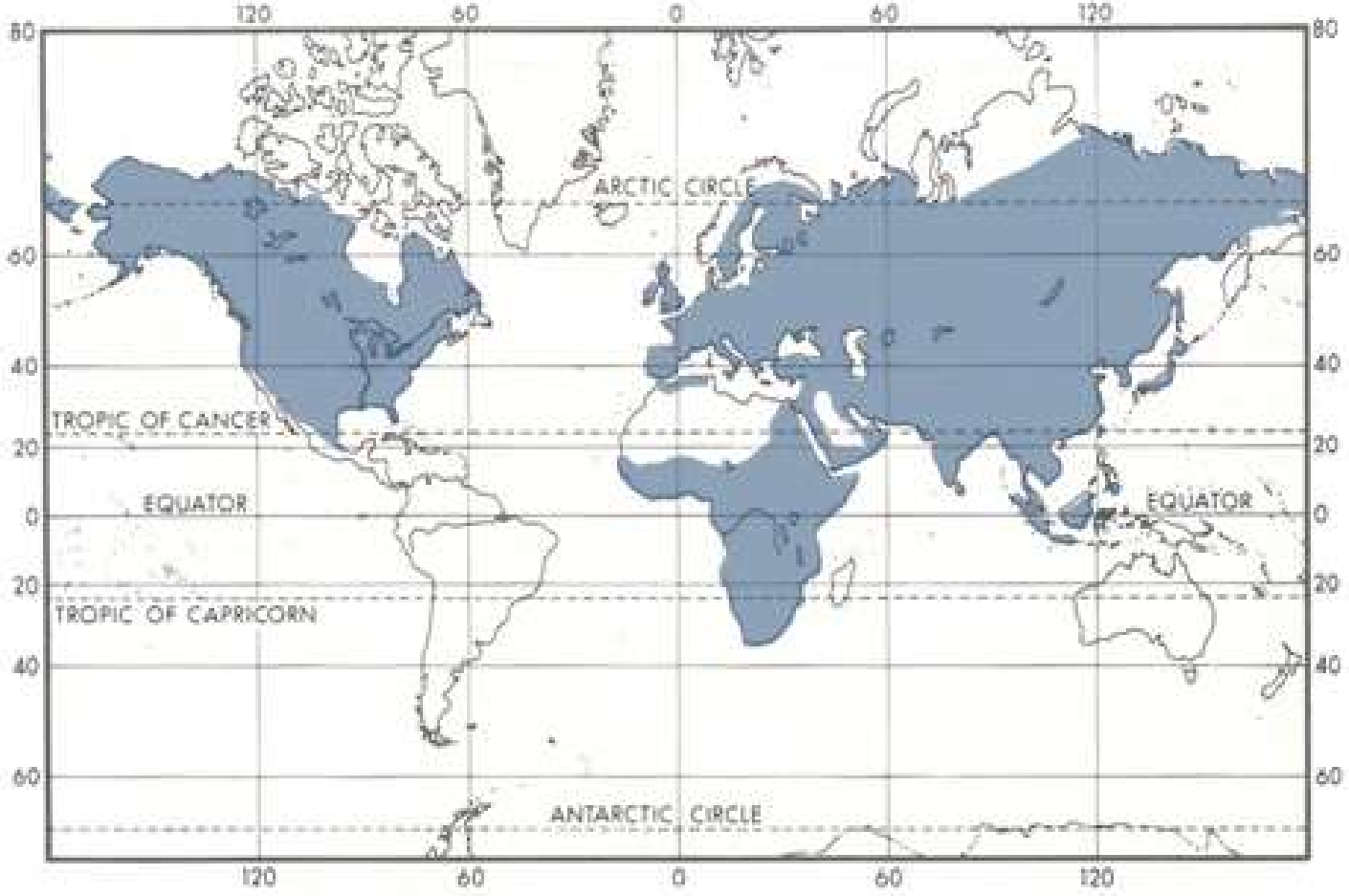
www.cypriniformes.org

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ANTARCTIC CIRCLE

Phylogenetic Objectives

Estimated 3,500 described species

CToL Project to examine 1,000 species plus outgroups

Share specimens and tissues/DNA for phylogeny of these 1,000 species

Conduct collaborative inventories for descriptions of many new species and share catfishes with international All Catfish Project

Objectives

1. Develop an interactive, online public portal for synergistic research and educational activities with the diversity of Cypriniformes.
2. Eventually generate and synthesize morphological and molecular characters for all species of Cypriniformes.
3. In 5 years reconstruct phylogenetic relationships of all genera using entire mitochondrial sequences (Japan), five nDNA (S7 intron, Rag-1, Rag-2, Rh, GH), and a suite of osteological and myological characters.
4. Reconstruct phylogenetic relationships of remaining species using four mtDNA genes (Cyt. b, 12S rDNA, 16s rDNA, ND2), five nuclear genes, and a suite of osteological and mycological morphological characters.
5. Examine detailed developmental biology of 30 species, representing all major clades, for comparative and evolutionary studies involving zebrafish, *Danio rerio*.

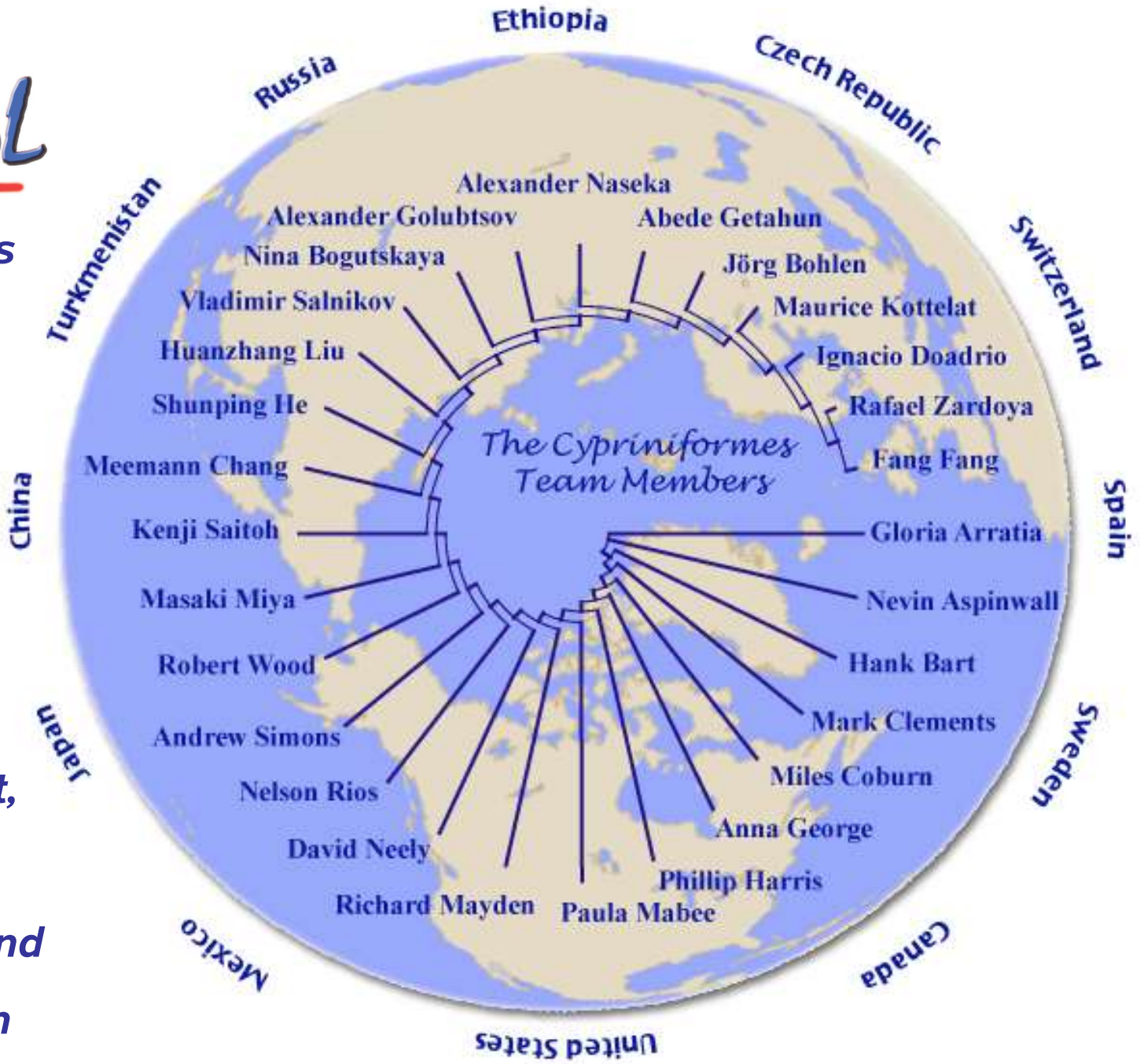
Objectives

6. Conduct inventories and rapid bio-assessments, also in conjunction with other active initiatives (e.g., All Catfish), of remote aquatic ecosystems containing cypriniform species.
7. Describe species in revisionary studies and produce phylogenetic classifications.
8. Using recent and fossil taxa and their hypothesized phylogenetic relationships, examine historical biogeography of cypriniform fishes from global to local scales.
9. Laboratories testing hypotheses of molecular evolution and rates of morphological change using combined data sets, the fossil record, and known tectonic history of Earth.
10. Provide an online database for all museum holdings of species of cypriniformes available for public access and mapping studies, in collaboration with FishNet.

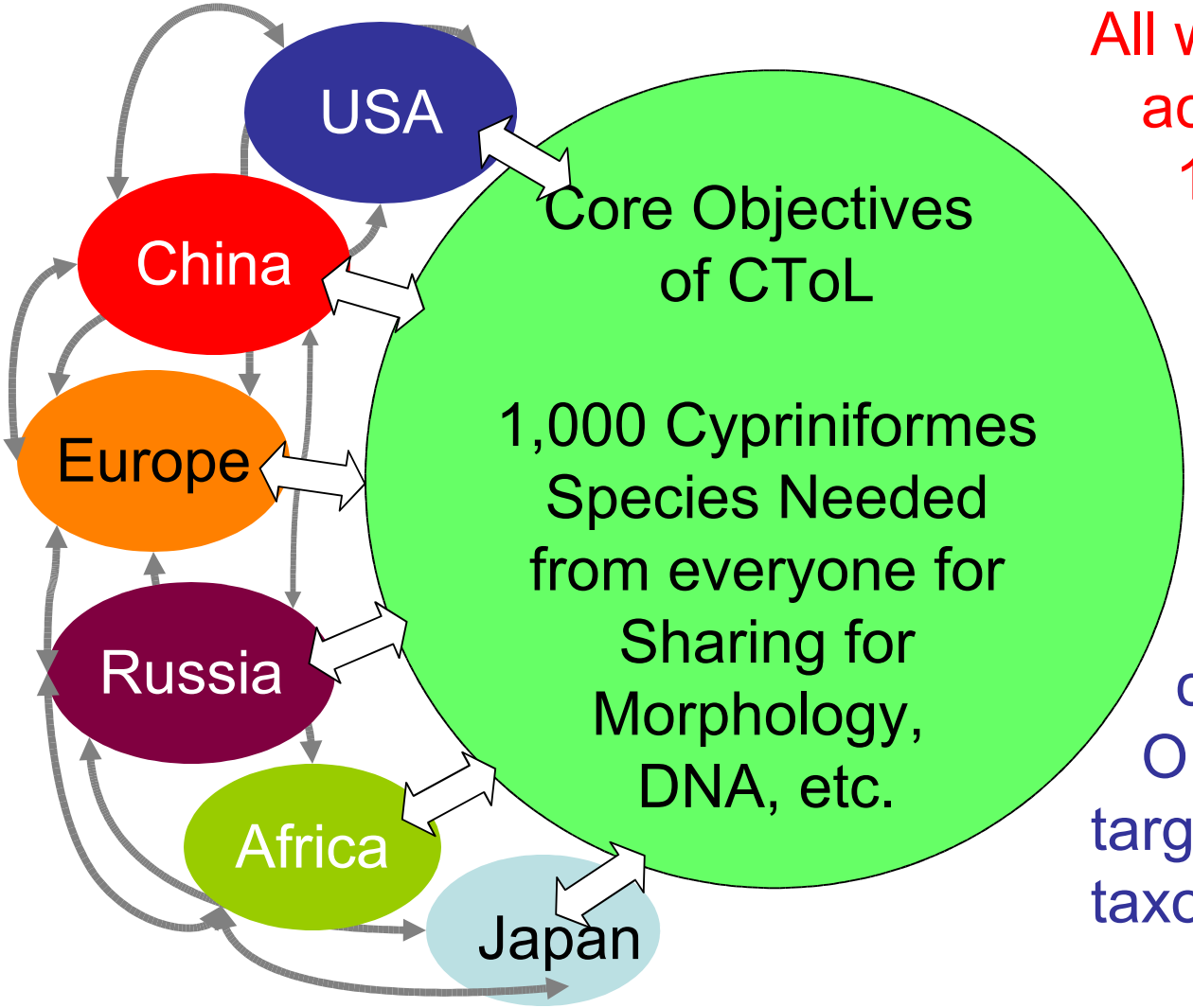
Objectives

11. Provide public information on diversity of cypriniform fishes, in collaboration with FishBase. and their cultural and economic importance.
12. An online key to the major groups and some species, especially commercially important and invasive species.
13. Provide vital information on the changing distributions of and impacts of invasive cypriniform species in North America.

Collaborators From Around Planet Focusing On DNA, Morphology Development, Diversity, Education, and Conservation



Shared Collaboration -- In concert with Individual Laboratories Working Independently!

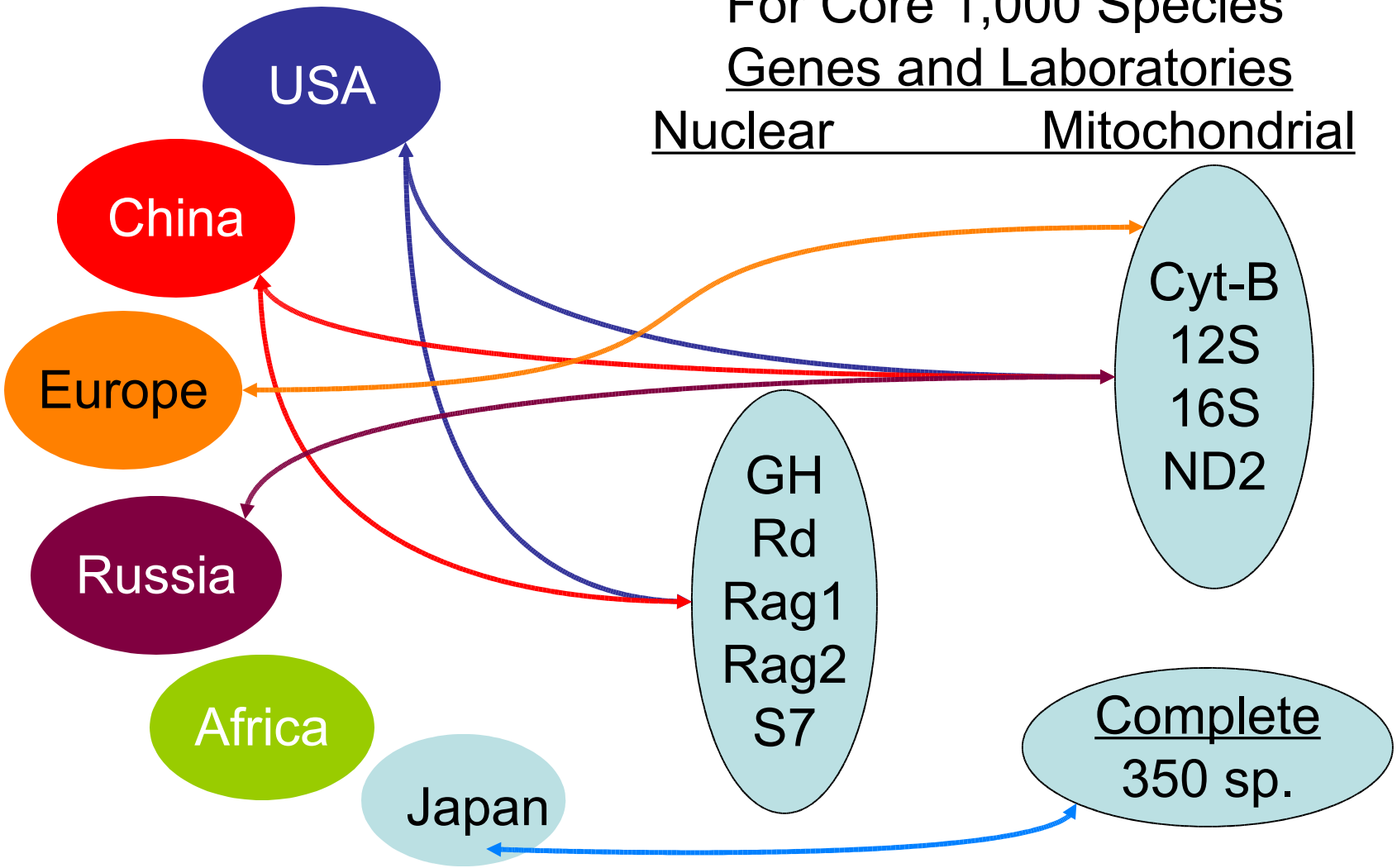


All work together for accomplishing the 1,000 species PHYLOGENY by collaboratories!

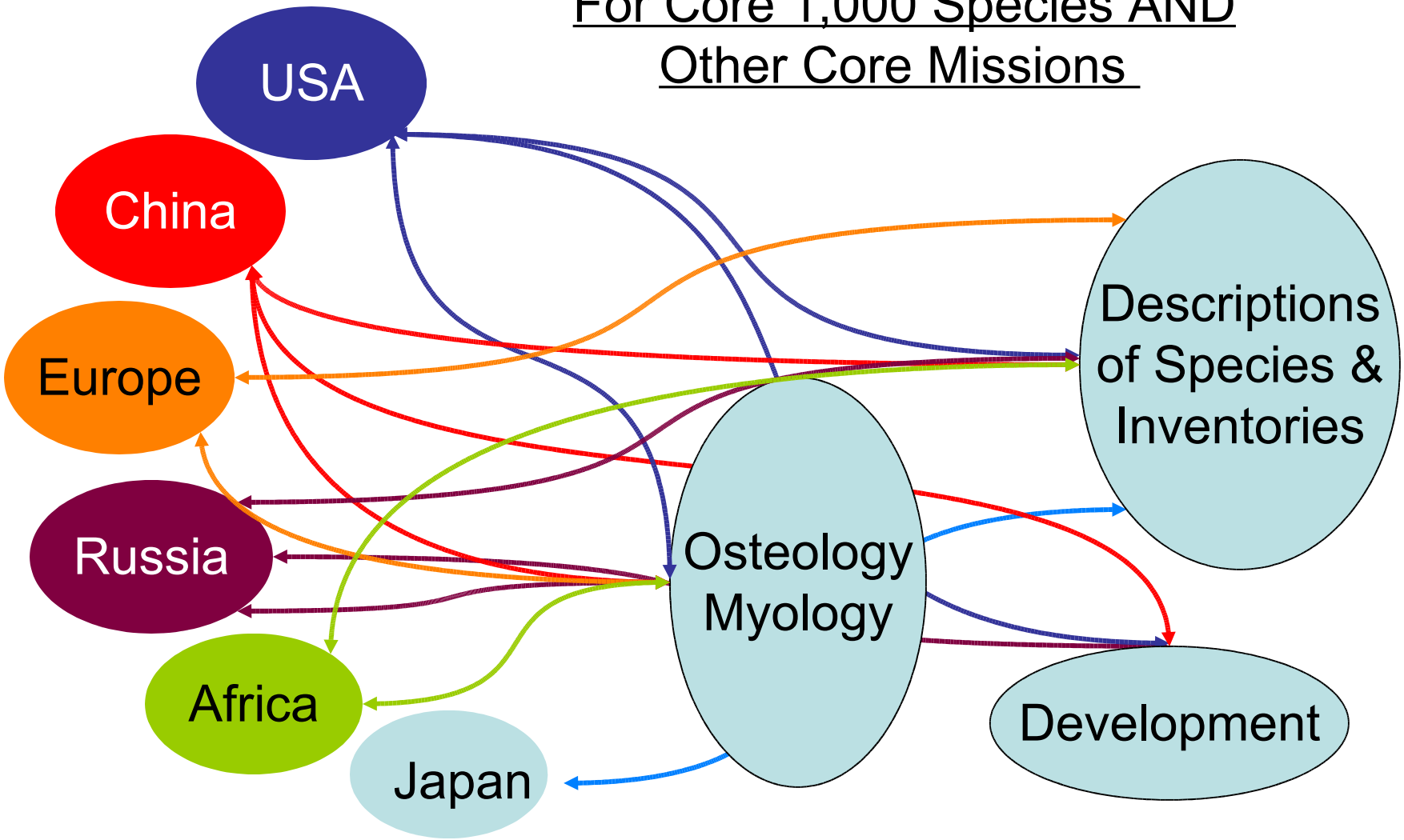
AND

EACH laboratory can work separate OR together on other targeted groups or taxonomic issues

Shared Collaboration -- In concert with Individual Laboratories Working Independently!



Shared Collaboration -- In concert with Individual Laboratories Working Independently!

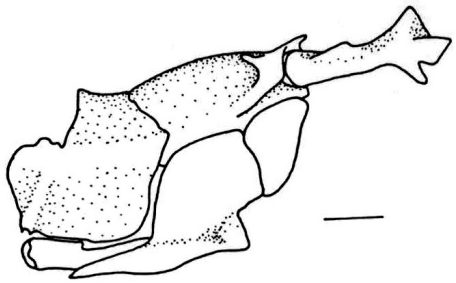


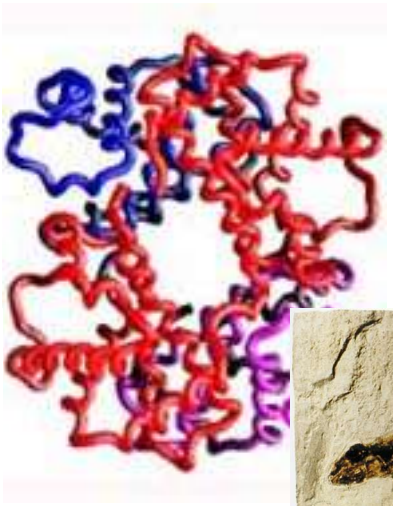
Web Portal

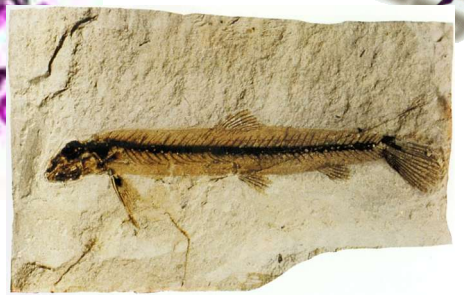
- Provides an interface for users to query and add data to the back-end databases
- Provides information on resources (tissues, specimens etc.) available to researchers
- Promotes community interaction through shared workspaces
- File repository of various information
- Email/discussion and archives
- Selected content made available to education/outreach activities

Data Objects

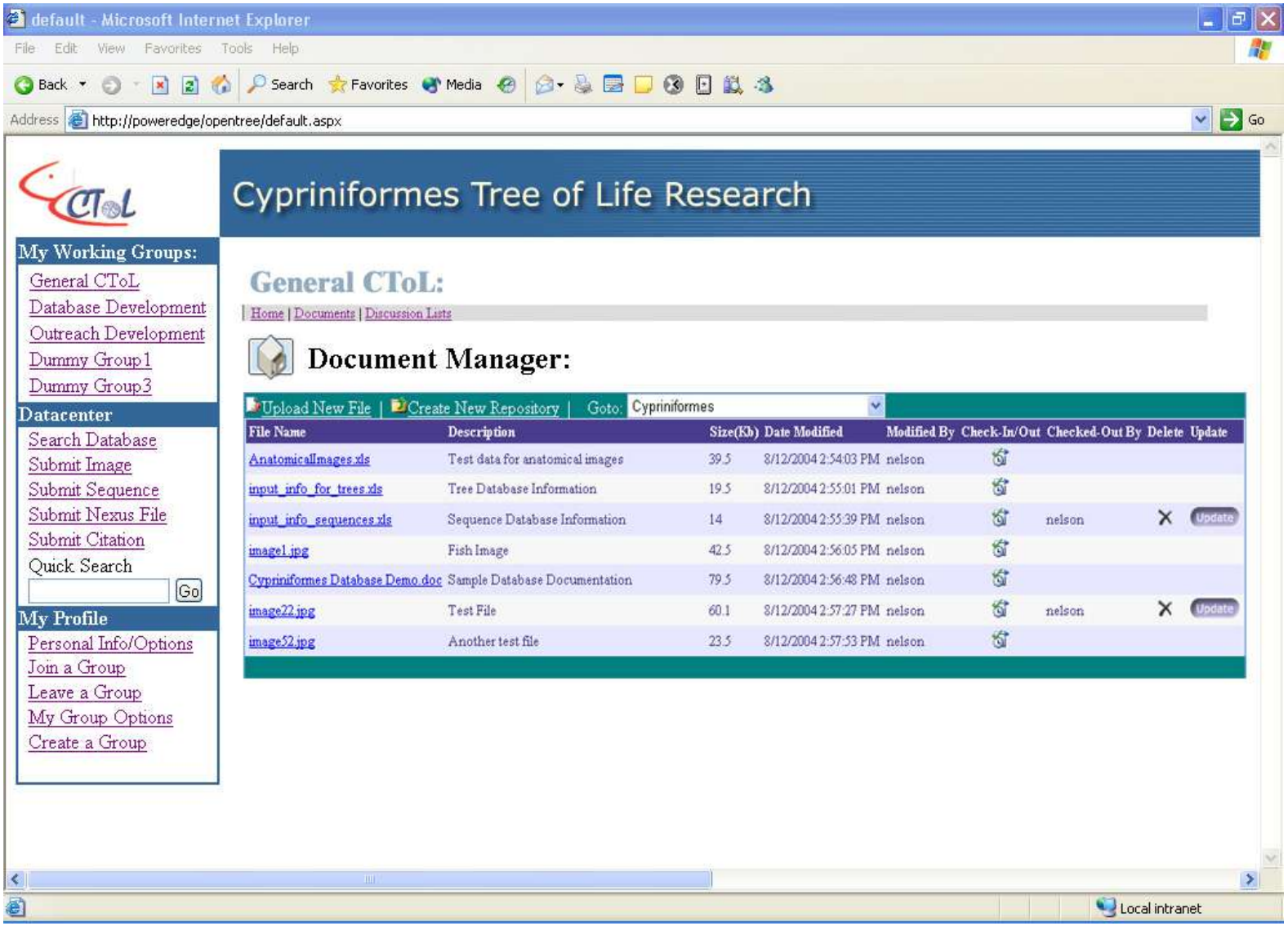
- Sequences (ATGCCCTACAGGATC)
- Images (Specimens/Anatomical Part
- Trees
- Nexus Files
- Movies
- Etc.



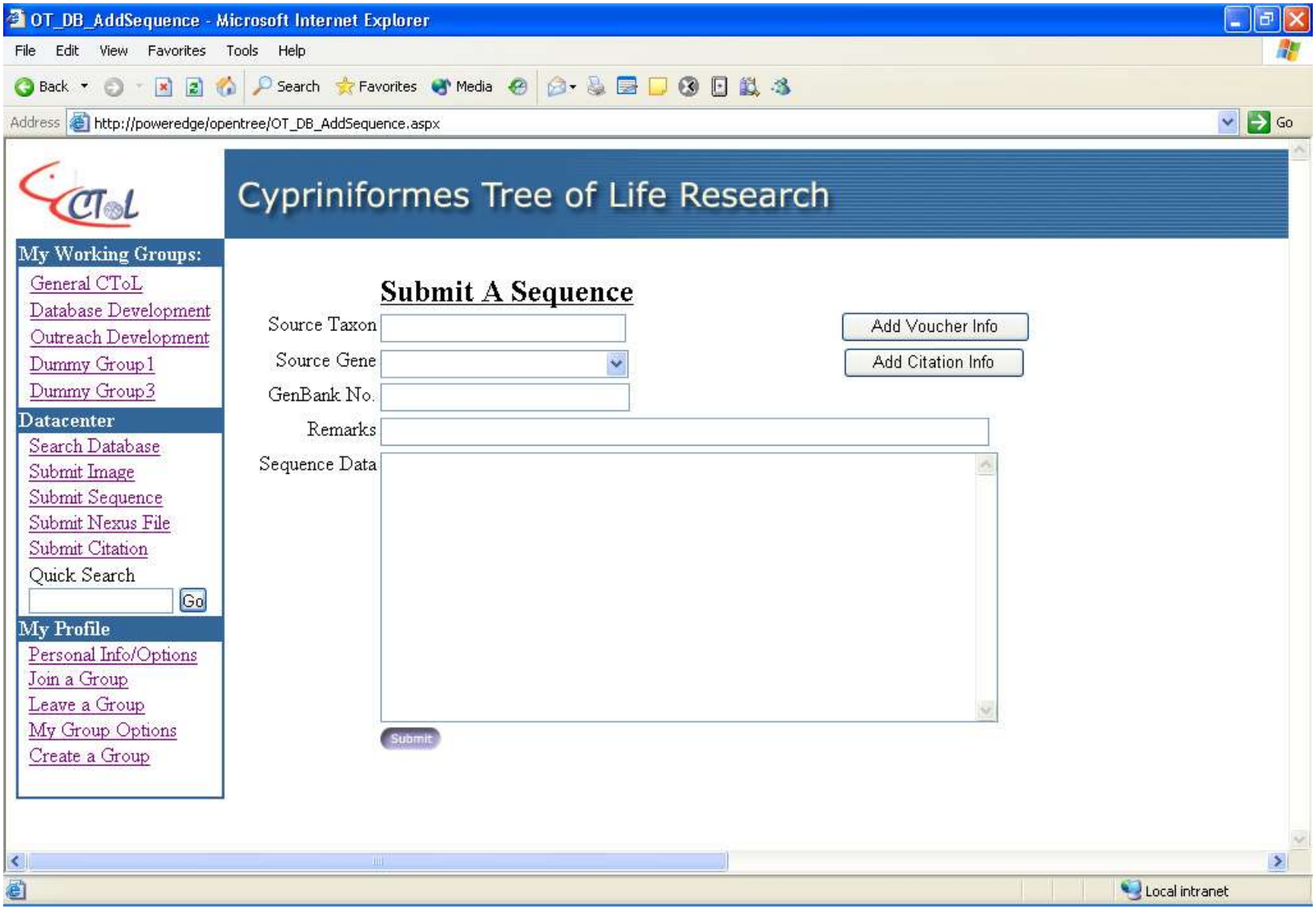




Interactive File Management



Data Entry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My Working Groups:
General CToL
Database Development
Outreach Development
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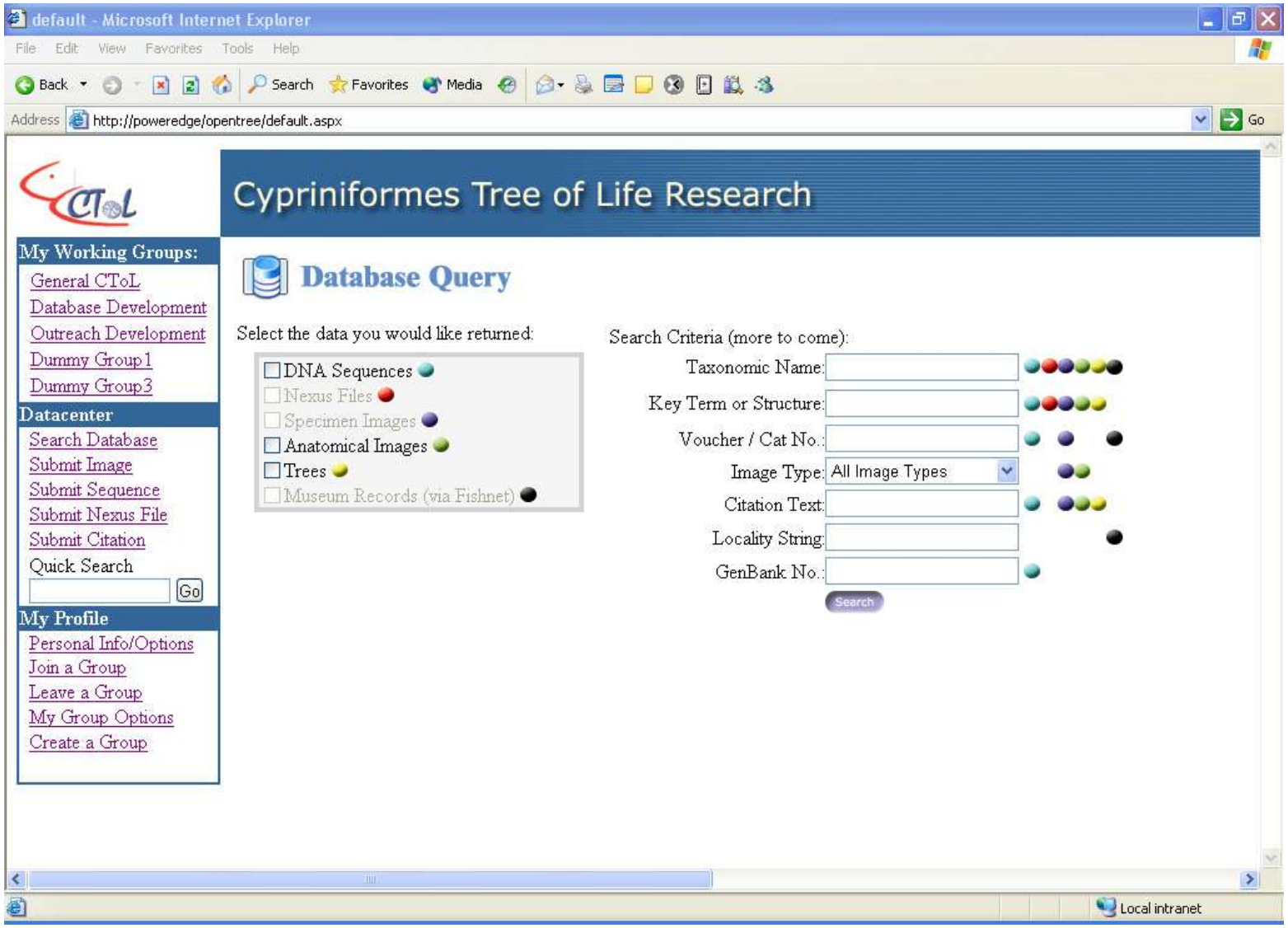
Data Query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My Working Groups:
General CToL
Database Development
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Dummy Group1
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Search Database
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My Profile
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Create a Group
Database Query
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DNA Sequences
Nexus Files
Specimen Images
Anatomical Images
Trees
Museum Records (via Fishnet)
Search Criteria (more to come):
Taxonomic Name:
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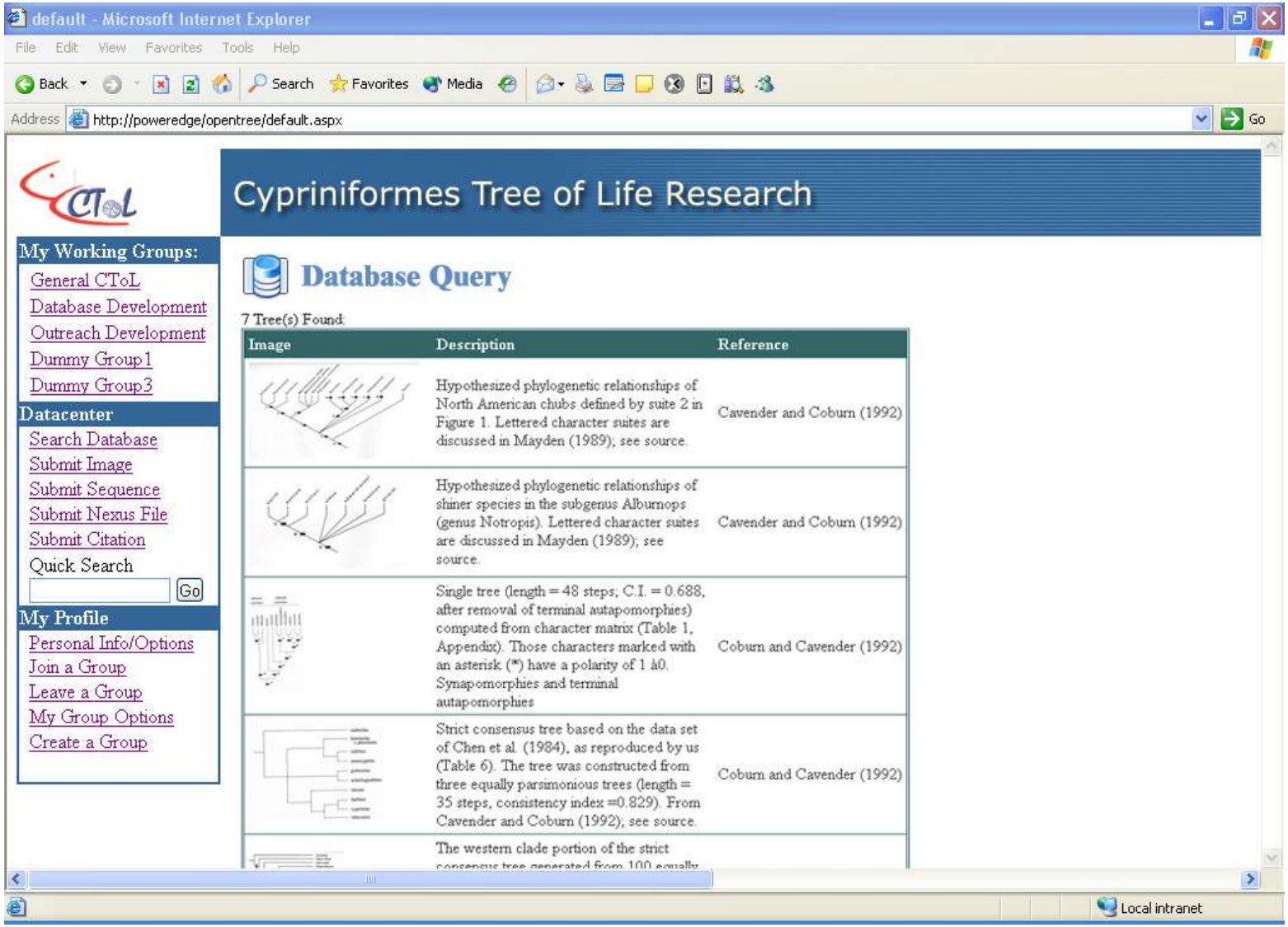
Query Results



Query Results Detail

Tree Details - Microsoft Internet Explorer

File Edit View Favorites Tools Help

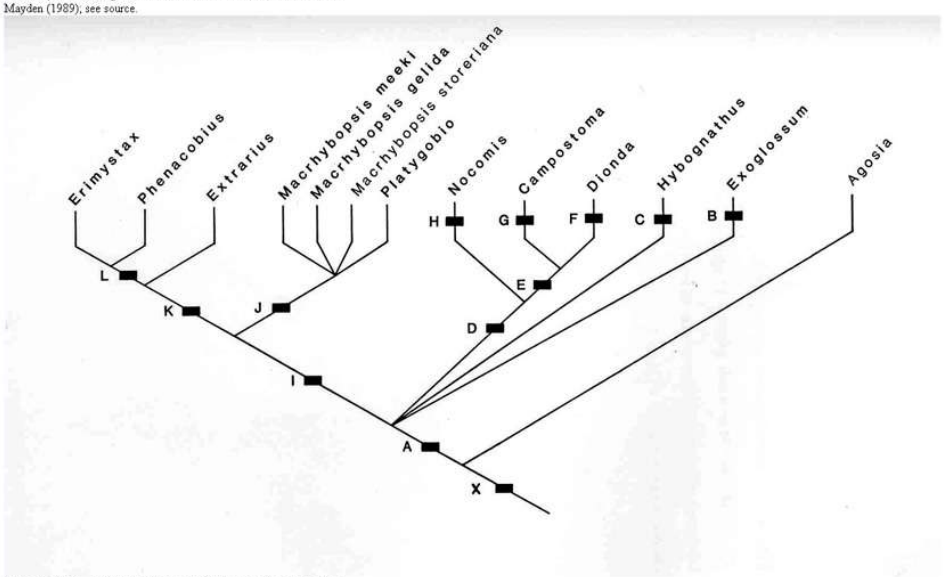
Address http://www.museum.tulane.edu/cypportal/displayTree.aspx?id=19

Tree Details

Species referenced in this tree:

Agosia		"
Exoglossum		"
Hybognathus		"
Dionda		"
Campostoma		"
Nocomis		"
Macrhybopsis storeriana	(Kirtland, 1844)	'Silver chub '
Macrhybopsis meeki	(Jordan & Evermann, 1896)	'Sicklefin chub '
Phenacobius		"
Erimystax		"
Platygobio		"
Macrhybopsis gelida		"
Extrarius		"

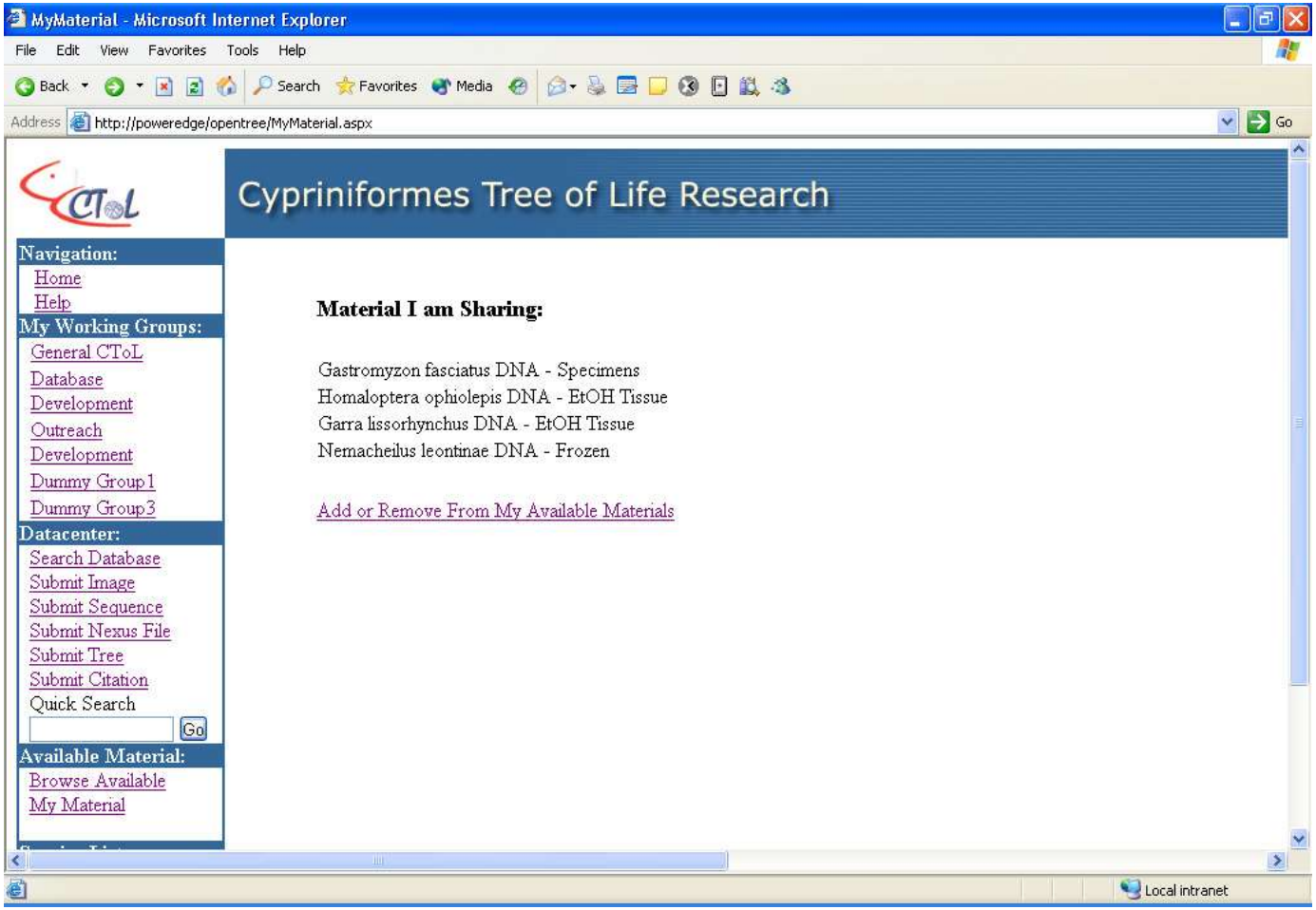
Hypothesized phylogenetic relationships of North American chubs defined by suite 2 in Figure 1. Lettered character suites are discussed in Mayden (1989), see source.



Cavender, T. M., and M. M. Coburn. 1992. Phylogenetic relationships of North American Cyprinidae, p. 293-327. In: Systematics, Historical Ecology, and North American Freshwater Fishes. R. L. Mayden (ed.). Stanford University Press.

Trusted sites

Data, Results, Ideas, Materials



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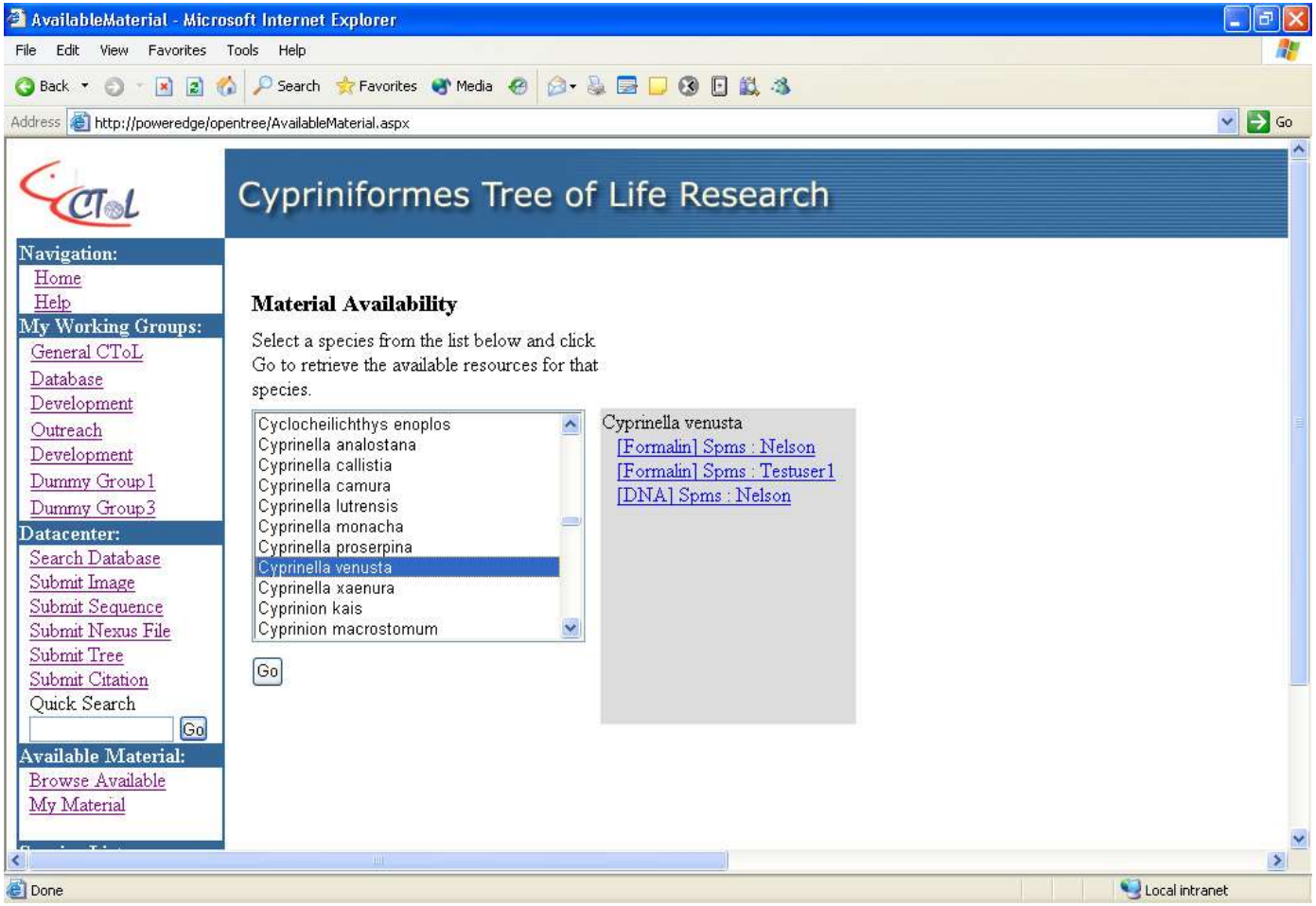


Various Project Functions for CToL

- Steering committee oversight
- Working groups for taxonomy, specimen acquisition, genes, morphology, analysis, web portal, and public, policy, government education
- Curators for genes and morphological data
- Outreach and training program (documentary, museums, K-G education and homeschools)
- Annual meeting agendas and regular international symposia

Basic needs

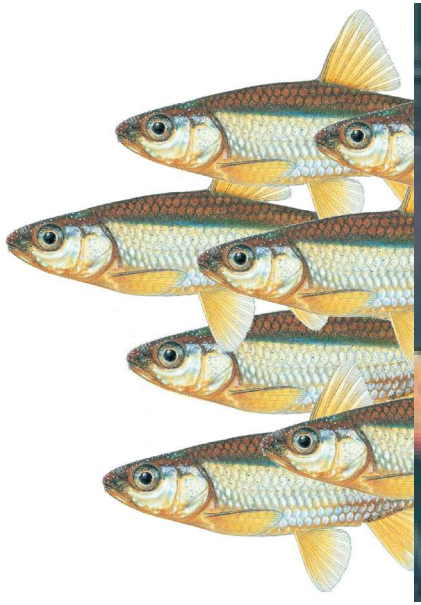
- Sophisticated phylogenetic algorithms for distributed analyses - even if at beta stage!!!!!
- How to incorporate other researchers interested?
- Data standards(especially in morphology, etc.)
- Coordination of efforts with other AToL projects
- Better system for communicating with data, trees, protocols, etc. in the systematics community
- Better “advertising” by NSF, etc. of success
- Better international participation and NSF programs for the success of AToL projects
- Clarity on any NSF policy for project endorsement of other proposals being submitted to NSF?

Where are we?

- 2 months in!! Thanks again!
- Two workshops and symposium with 27 presentations
- Increasing coordination with international members; Japan and China likely submitting complimentary proposals
- Policies and procedures document
- Bulletin for communication
- Functional web portal
- SICB symposium approved for 2006 with zebrafish groups, etc.
- Annual meetings planned over the next 5 years
- Exchange program of students/postdocs around the world (UA & Ethiopia; SLU & Scotland)

The Cypriniformes Tree of Life

www.cypriniformes.org



USA