Archosaur Phylogeny

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Saurischian diversity
All evidence agrees that crocodiles are the closest living relatives of birds.
The Problem....

- Although it has been firmly established that birds are ingroup dinosaurs there have been no detailed phylogenetic treatments of the complete group at fine taxonomic levels.
- No large combined analysis of molecular and morphological characters has been undertaken
- Our experience working on coelurosaursaurian phylogeny has taught us that character placement is greatly affected by taxon sampling regimes
- Fine-grained taxonomic sampling is key for a clear understanding of macroevolutionary events, such as avian origins and the evolution of associated key morphological and behavioral character systems.
4 winged-dromaeosaur
Fossilized behavior
Goals

• Combine all relevant morphological characters into a single large matrix
• Examine an extensive series of archosaur taxa
• Code taxa at the specimen level
• Sequence an extensive series of Neoaves and Crocodylia
• Develop a Supermatrix database to store all relevant character and specimen data
The Supermatrix

- A virtual archive of information
- Includes both text and images
- Web accessible
- Platform independent
- Strict version control
- Entries can be combined into composites
- Data can be output into formats for phylogenetic analysis
Supermatrix model developed and site under construction
Hundreds of saurischian specimens have been scored & photographed
A master list of morphological characters is compiled and being updated
Ongoing development and expansion of analyses for sub-clades
NEOAVIAN PHYLOGENY

Mayr & Clarke, 2003
Follow a liberal interpretation of generic limits: ~2450 extant genera to be sampled (expect 82%, or 2112, to be represented by tissues)

S & A had 760 genera in their "Tapestry." We expect 2.6X coverage in this study.

Sequencing partitioned equally between Cracraft, Barrowclough, and Baker labs.
Phylogeny of the Furnarii (suboscines)

- 135 of 148 genera represented
- Many new insights into generic relationships

New biogeographic insights into origins of South American avifauna
Phylogeny and diversification of the largest avian radiation

- All "families" except 1 (Hypocoliidae, endemic to Iran and Iraq!)
- RAG-1 and RAG-2 nuclear genes (4129 bp)
- The passerines (passeriforms) arose in Australasian part of Gondwana prior to KT
- Significant incongruence with DNA hybridization "Tapestry" (e.g., Australasian "Corvida" massively paraphyletic)
Barn owls are sister to strigines as expected

Australasian *Ninox* is sister to all other strigines

*Otus* is polyphyletic and now the separate clades make more sense biogeographically.

25 of 31 genera represented
What remains to be done....

- Visit more collections and sequence/score more taxa
- Annealing of subclade matrices to create Supermatrix
- Upload information onto Supermatrix website
- Development of user-friendly interface to facilitate broad use.
- Large-scale simultaneous analysis of all the data