

Development of the Amphibian Anatomical Ontology

Anne Maglia

Department of Biological Sciences
Missouri University of Science and Technology

*Jennifer Leopold, Missouri S&T
Susan Gauch, U. Arkansas*

Community-identified need (ATOL)

- Highly variable group
- Several model species
- Diverse lexicons



Challenge

Ontology that accommodates diversity, definitions, literature, phylogenetic character codings, and images

...and include the domain expert community

...and maintain interoperability with other ontologies

...and do it in a reasonable amount of time

AmphibAnat

Combine existing tools/methods with new approaches

1. Ontology maintenance system
2. Web-based community curation
3. Semi-automated approach

1. Ontology maintenance

- Web-based access/collaboration
- One-stop shop
- Query and update functions
 - concurrent, authorized access
 - node based permissions
- Import/export exchange formats
 - OBO, OWL

www.amphibanat.org

Amphibian Anatomical Ontology - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.amphibanat.org/ Google

HOME ABOUT ONTOLOGY F.A.Q. CONTACT

AMPHIBANAT AmphibAnat amphibanat.org

best viewed with Firefox
1280x1024 screen resolution

WELCOME

The Amphibian Anatomical Ontology (AmphibAnat) is a community-based resource for the development of a controlled vocabulary for describing the anatomy of frogs, salamanders, and caecilians.

NEWS & EVENTS

July 25, 2009
AmphibAnat Workshop, at the Joint Meeting of Ichthyologists and Herpetologists

Jun 17, 2009
AmphibAnat Board Meeting June 2009, Jun 17, 2009; Wimba Meeting

Nov 6, 2008
AmphibAnat Workshop/Board Meeting, Nov 6 to Nov 9, 2008; Embassy Suites Hotel and Spa, St. Charles, Missouri, USA

Anatomist/Biocurator Postdoctoral Fellow Position Announcement ::

To Participate in the Community Forum:
[AmphibAnatWiki.org](#)

USER LOGIN

To better serve the AmphibAnat user community, we are now using the RDBOM (Relational DataBase Ontology Maintenance) system to store the ontology.

Please click on the link below to [LOGIN](#) to the RDBOM system.

Internet Explorer Users: Please note that we do NOT support Internet Explorer web browser.

This work was supported by the National Science Foundation award NSF DBI 0640053.

View Ontology

Building the Amphibian Anatomical Ontology

The building of the amphibian anatomical ontology is a threefold process consisting of manual development, semi-automatic construction, and community curation.

Manual construction of the ontology entails experts mining literature sources for semantic concepts and properties. Concepts are given a textual definition, a list of synonyms and alternative terms, and bibliographical references. In the semi-automatic construction phase, subsets of the manually-constructed ontology are used as seeds for a software system we developed that augments the concepts and properties in the ontology by mining electronic media to extract information. The final phase includes enhancement, modification, and acceptance of the ontology by the expert user community via the online collaborative environment.

Throughout all phases of the process, an advisory board comprised of researchers with expertise in amphibian anatomy and systematics, amphibian genomics, ontology building, and Web-based media resources, provide expert opinion on issues inherent to the development of the ontology and the project infrastructure and implementation.

Done

Amphibian Anatomical Ontology - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.amphibanat.org/ Google

RDBOM Relational DataBase
Ontology Maintenance

HOME QUERY ontology UPDATE ontology EXPORT ontology USER GUIDE

Query Ontology

best viewed with Firefox
1280x1024 screen resolution

AMPHIBANAT
AmphibAnat amphibanat.org

Search Phrase: **parasphenoid** Search

<comments>

- 1 anatomical group <comments>
- 1 anatomical cluster <comments>
 - 1 braincase and auditory apparatus <comments>
 - + 1 braincase and otic capsule opening <comments>
 - 1 braincase and otic capsule skeleton <comments>
 - P arcus praecoccipitalis <comments>
 - P basioccipital <comments>
 - P basisphenoid <comments>

• [musculoskeletal system](#)
• [skeletal system](#)
• [cranium](#)
• [braincase and auditory apparatus](#)
• [braincase and otic capsule skeleton](#)
• [parasphenoid](#)

Definitions:

Azygous, dermal bone of intramembranous origin that **underlies the ventral surface of the braincase in anurans and salamanders**. In caecilians, the parasphenoid and other bones are fused to form the **Os basale [AAO:LAP]**

Parent Classes:

Done

Amphibian Anatomical Ontology - Mozilla Firefox

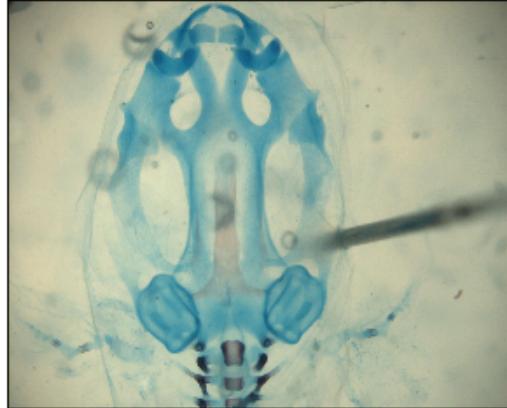
File Edit View History Bookmarks Tools Help

http://www.amphibianat.org/

image_contains:

[Image_1](#) image_contains [Acris blanchardi \(Harper 1947\)](#)
[Image_1](#) image_contains [ascending process](#)
[Image_1](#) image_contains [chondrocranium](#)
[Image_1](#) image_contains [infrastral cartilage](#)
[Image_1](#) image_contains [otic capsule](#)
[Image_1](#) image_contains [parasphenoid](#)

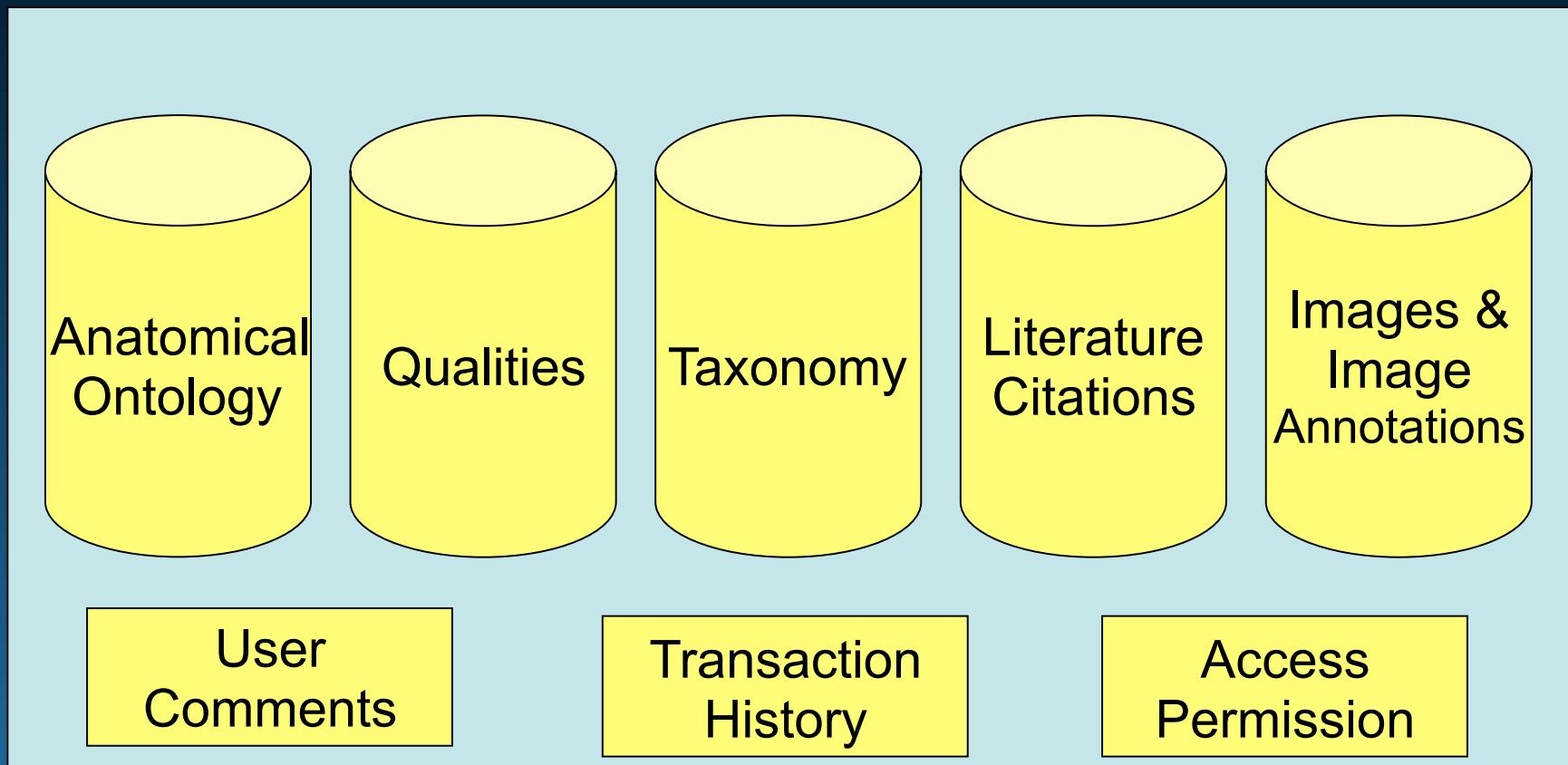
Image:



Home :: Query :: Update :: Export :: Help

Done

Modularity



2. Community curation

- User commenting by node
- “Super-user” node-based curation

The screenshot shows a Mozilla Firefox browser window displaying the 'RDBOM Comments' page. The URL in the address bar is http://174.133.140.86/AmphibAnatRDBOM/comment_add.aspx?Nodeint=232187. The main content is titled 'View / Add Comments: "M. adductor magnus"'. It includes a welcome message and a note about adding comments. Below this is a table showing a single comment entry:

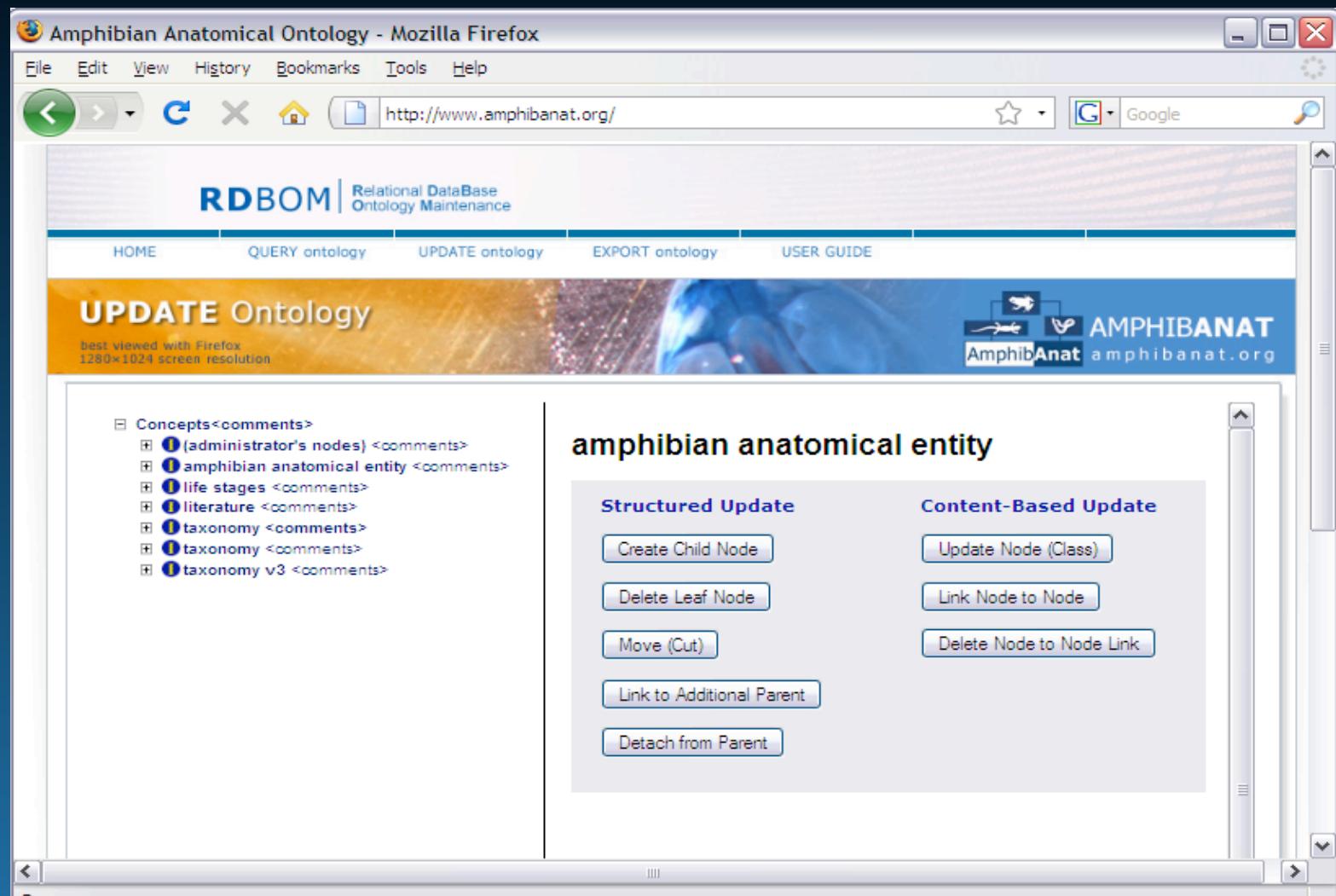
Node Name	Firstname	Lastname	Comments	Date/Time
M. adductor magnus	Julio	Hoyos	This name was done by Ledebour (1829) and adopted by some authors (Ecker, 1864; Beddard, 1908; Dunlap, 1966). They did not distinguish two heads of the Adductor magnus (ventralis and dorsalis), then, we need to define both heads, calling each one as mm.adductor magnus caput dorsalis (Noble, 1922), and caput ventralis (Noble, 1922). These names have been also used by Duellman & Trueb (1986). Synonyms for the m. adductor magnus caput ventralis: Triceps (Kloetze, 1816), Adductor magnus (Ledebour, 1829), Triceps adductor (van Altena, 1829), Sous-ischio-pubi-fémoral (adductor I et II) (Dugès, 1835), Adductor brevis (Collan, 1847), Adductor magnus and extensor femoris profundus (Klein, 1850), Adductor ischiadicus secundus (Stannius, 1857), Pubo-ischio-femoralis medialis (pectineus) (Hoffmann, 1873-1878), Pubo-ischio-femoralis externus posterior (De Man, 1874-1875), Adductor magnus (Ecker, 1864; Beddard, 1908; Dunlap, 1966), Adductor magnus externus (Burton, 1983). Synonyms for the m. adductor magnus caput dorsalis: Idem and Long fléchisseur du fémur (Perrin, 1892) and Adductor magnus internus (Burton, 1983). Although the names of the last two muscles are longer than others proposed, they are more informative, descriptive, and accurate.	6/25/2009 9:26:07 AM

At the bottom left of the table is a 'Done' button.

Privilege assignment

The screenshot shows a web browser window titled "Amphibian Anatomical Ontology". The address bar displays the URL <http://www.amphibanat.org/>. The main content area features a header with the "RDBOM" logo and the text "Relational DataBase Ontology Maintenance". Below the header is a navigation menu with links: HOME, QUERY ontology, UPDATE ontology, EXPORT ontology, and VIEW LOG. A banner at the top right contains the "AMPHIBANAT" logo with icons of a frog and a lizard, and the text "AmphibAnat amphibanat.org". On the left, a sidebar titled "Welcome" contains a brief introduction to RDBOM, stating it is a functional, generic approach to maintaining an ontology as a relational database. The central part of the page is a "User Login" form with fields for "Login (E-mail)" containing "magliaa@mst.edu" and "Password" containing "*****". A "Submit" button is present. Below the form, text for non-registered users encourages them to "Register Now!" and provides information about updating the ontology. At the bottom of the page, there is a footer with links: Home :: Query :: Update :: Export :: View Log.

“Super-user” functions



Simple interface

Amphibian Anatomical Ontology

http://www.amphibanat.org/ Google

RDBOM | Relational DataBase Ontology Maintenance

HOME QUERY ontology UPDATE ontology EXPORT ontology VIEW LOG

UPDATE Ontology
best viewed with Firefox
1280x1024 screen resolution

AMPHIBANAT
AmphibAnat amphibanat.org

• Concepts <comments>

Create Child Node for Concepts

RDBOM ID: AAO:0000001 *

Term Name: *

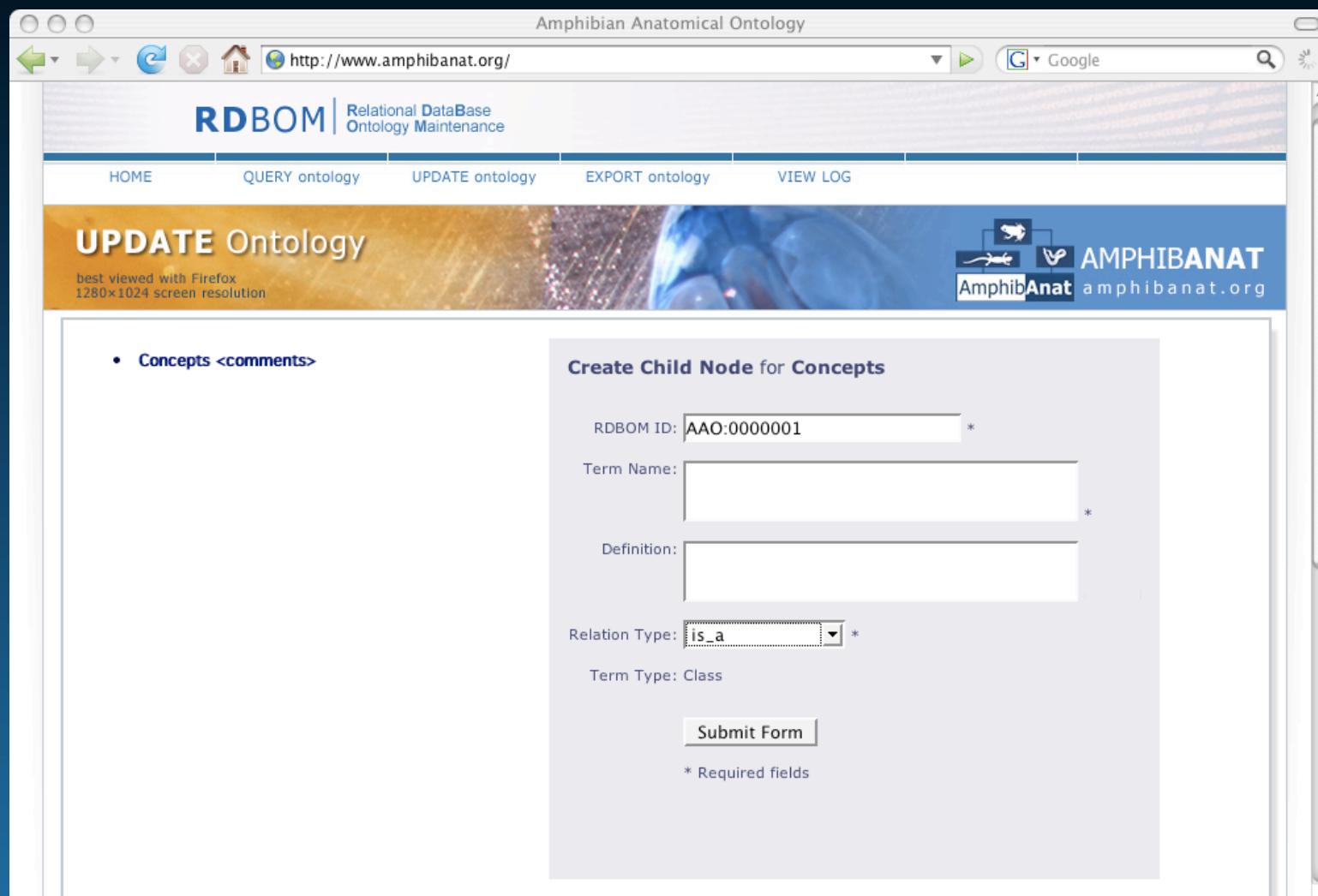
Definition:

Relation Type: is_a *

Term Type: Class

Submit Form

* Required fields



Web-based community curation

- Inclusion of experts
- Forum for argumentation
- Community ownership
- Unites diverse groups toward common goal



3. Semi-automated approach

1. Manually construct subset ontology
2. Community input
3. Develop information extraction (IE) tools
4. Seed with few concepts
5. Benchmark, modify, repeat

IE tools

1. Spider queries web
2. Collects relevant documents
3. Extracts info/builds ontology
 - pattern-based
 - statistical natural language processing algorithms
 - identify/weight most important elements

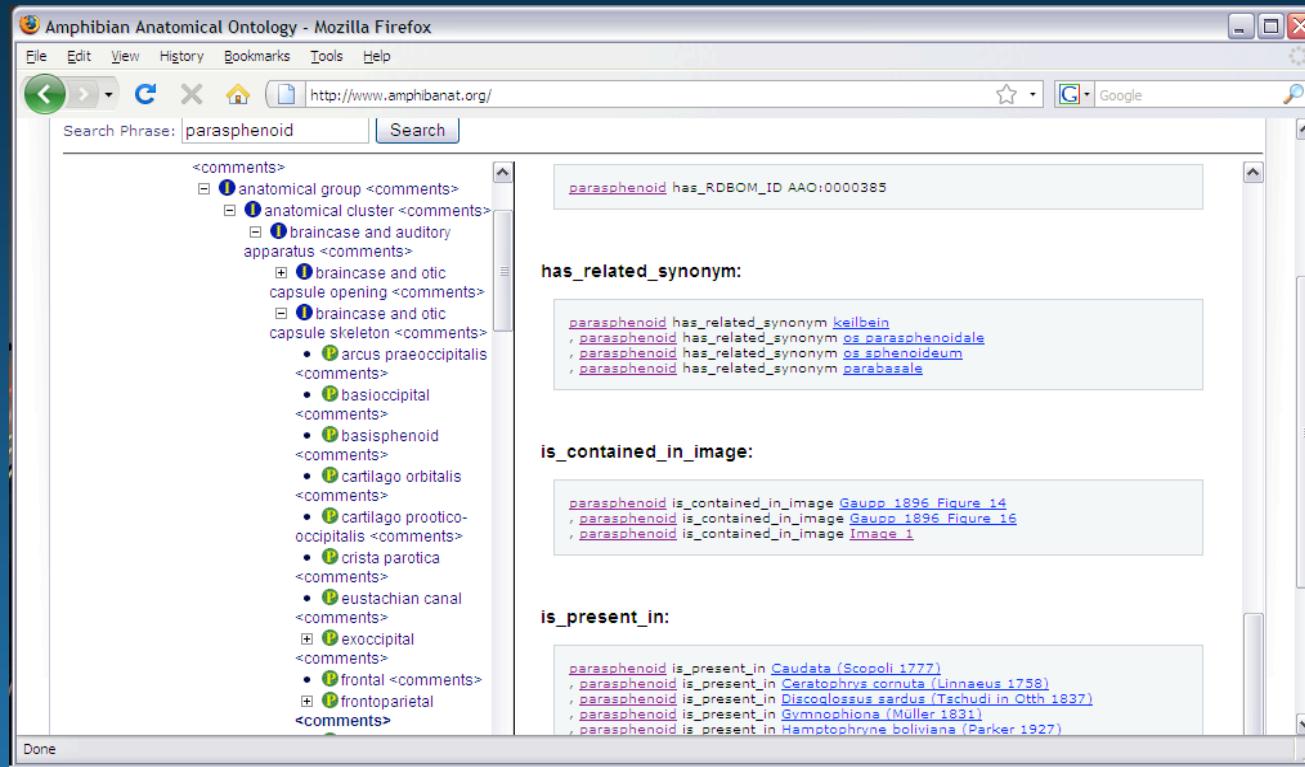
Early IE results

- 5 concepts to spider
- 600 docs returned → 96 relevant → 60 final
- Extract terms
- Compare to manual
 - 960 vs. 623 terms
 - iteration accuracy: avg. 77.5% (up to 88%)

Luong, H et al. *In review*. Int J Adv Life Sci

IE future

- Build backbone of ontology
- Create links between terms



Summary

- Combine existing tools and novel approaches
- RDBOM: diverse data/functionality and interoperability
- Semi-automated approach: reduced effort
- Community-based curation: ownership, expertise

Acknowledgements

- Supported by National Science Foundation award DBI 0640053
- Sarah Havens, Bonnie Beasley, Analia Pugener, Leong Lee, Heip Luong, Alton Coalter
- Users, contributors, evaluators, workshop participants, AmphibAnat board