Mammal Biodiversity Committee

Committee Members: C. Burgin, J. Colella, J. Esselstyn, P.-H. Fabre, A. Feijó, A. Ferguson, D. Huckaby, B. Kohli, S. Maher, M. McDonough, A. Mychajliw, R. Norris, O. Ornelas, B. Patterson, N. Pradhan, D. Reeder, B. Roberts, L. Ruedas, B. Shaw, B. Tanis, N. Upham (Chair).

Cross-committee links: Informatics (Maher, Roberts, Tanis), Nomenclature (Norris, Reeder, McDonough, Pradhan), Mammal Images Library (Huckaby, Tanis), and Public Education (Shaw).

Mission:

The Mammal Biodiversity Committee stewards the Mammal Diversity Database (MDD), an ASM-based, readily updatable, and online database of mammal taxonomic and biodiversity information hosted at http://mammaldiversity.org/ [beta version; official launch in July 2017]. This database aims to serve the global mammalogy community by providing the latest information on species-level and higher taxonomic changes, thereby promoting more rigorous study of mammalian biodiversity worldwide. The initial objective for this online database is to aggregate, curate, and compile new citations on species descriptions and taxonomic revisions into regular releases in comma-delimited format. Downstream goals include expanded hosting of ecological, trait, and taxonomic data, and an online forum for discussing mammalian taxonomy and systematics. By serving as both a platform and forum, this initiative aims to stimulate interest in mammals and promote the ASM's role as a leader in high quality research on mammalian biology.

Information Items:

(1) Activities of the ASM Biodiversity Committee from June 2017 – April 2018 included:

a. We met in person at the ASM Annual Meeting in Moscow, Idaho to discuss the future goals of this Committee, what to prioritize first, and how best to reach those goals.

b. On 6 Feb 2018, the publication of *J. Mamm* article "How many species of mammals are there?" by Burgin, Colella, Kahn, and Upham publically announced the URL for the Mammal Diversity Database (MDD) as http://mammaldiversity.org.

c. Extensive social media activity to promote the MDD aimed to build excitement and attract feedback on the listing of 6,399 extant species (an increase of 1,251 species from MSW3, including 172 lumps).

i. So far the article has >9,000 views and generated 218 tweets from 9 countries: https://oxfordjournals.altmetric.com/details/32717870

d. Formal discussions with the Board of Directors about our Committee's 2018-2020 goals led to considerable email activity regarding how best to move forward.

e. With taxonomic content of the website far from complete, and synonym-based links to ASM content still rudimentary, the structure of the website will be in active development throughout 2018 leading to a greater reliance on volunteer effort in 2019-2020 (see summary of goals in point III, below).

f. In March 2018, we submitted two proposals for Biodiversity Committee-affiliated programing at the 2019 ASM Annual Meeting:

i. *Mammal diversity from GenBank to the RedList: Challenges and rewards of integrating museum specimens in global databases of genetics, taxonomy, and spatial biodiversity.* N. Upham and L. Ruedas, organizers.

ii. *Hackathon for the Mammal Diversity Database*. N. Upham, J. Colella, and C. Burgin, organizers.

(2) Our chief goals for 2018 are to:

a. Obtain full authority citations & web links to associated publications for all taxonomic names in the MDD. This information is highly scattered among resources and when available rarely includes full citations. For mammalogists in developing countries, access to literature is particularly problematic, so to centralize this information in an open database will be a step forward in data accessibility. Doing so will also highlight resources (especially older authorities) in need of digitization. Two paid student research assistants are essential to these efforts and in goal II.

b. Obtain listings of modern synonyms (in use during the last ~30 years) that pertain to currently valid species names. This data is critical for linking up a variety of associated information with each species, including ASM resources from the Mammal Images Library (MIL) and *Mammalian Species* accounts, as well as species trait data and auxiliary information (e.g., geographic ranges, life-history information, karyotypes, etc.). Unlocking this synonym-associated data by assembling a digital dictionary of mammalian synonyms will be a useful resource to a wide community of researchers.

c. Transition from the current MySQL-based web database to a graph-database structure. The graph database will be hierarchical in nature, and thus, lend itself excellently to displaying taxonomic information, including fast navigation to "nodes" representing higher taxa. We plan to have a phylogeny-based navigator on the front page of the MDD that will display current evolutionary relationships among higher taxa. Citations for the evolutionary relationships depicted will also be catalogued, and subject to change with new findings. Adding pages for genera, families, orders, and superordinal nodes will also be part of this website revision; each will summarize the contents located at nodes below it, including links to MIL photos. Our paid web developer is essential to this effort.

d. Coordinating and planning the volunteer based efforts we will launch in 2019-2020. The foundational aim of the MDD was to create a community-based resource with will readily allow for feedback and crowd-sourcing of taxonomic information as it is published. We anticipate that the ASM-funded groundwork for this initiative will be

largely complete by the end of 2018, to obviate the need for student research assistants and enable a considerable scale-down in expenses for 2019-2020.

(3) Committee goals for 2019-2020:

a. Improved organization of volunteers. We will assemble a network of per-clade volunteers (ASM members and non-member specialists) to vet the initial draft taxonomy, looking for additional citations and revised classifications.

i. Given the ~6,400 species of mammals, we will target ~40 volunteers willing to monitor literature for ~160 species/each.

ii. We plan on a 6-month schedule for releasing versions of the mammal taxonomy as updated with new publications, as coordinated by Committee.

iii. Aim to democratize the process of contributing to a taxonomic resource and spread out the workload among more individuals.

b. Use of the data curation backened by student researchers and volunteers.

i. The database platform allows for user-based permissions to be established, so that a dispersed network of volunteers will be able to add content/edit the site

c. **Harmonization of the MDD taxonomy with Mammal Images Library content.**

i. Look for ways to automate the editing of image names with each revision

ii. irect inclusion of image files (jpgs) in new website will streamline the link-up between the MDD species and the MIL images.

d. Editorial oversight by a small group of taxonomic experts. Aim to provide a consistent framework by which taxonomic changes are accepted to the database

i. This may include MSW4 authors (2019 publication?) and in order to promote coordination between that volume and this database.

e. Other content-based priorities:

i. Hyperlinks to new species citations (e.g., in *J. Mammalogy, Mammal. Biol.*, *Zootaxa*)

ii. Online forum for discussing taxonomic changes and engaging the public in issues of mammalian biodiversity and conservation—may be a moderated Wiki-style group.

iii. Expansion of per-species content to include detailed natural history, ecological, and geographic information (e.g., collaboration with Arkive, Animal Diversity Web).

iv. Downstream: per-species info on phylogenetic position (VertLife tree of mammals), geo-distributions by region (continent, country, state in USA), and NCBI/IUCN links.

Action Items:

PROPOSED BUDGET 2019 (year 3 of this initiative)

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(1) ***Maintenance of website***:

Activities baseline to website stability will continue to be needed, including:

- Updates to content and interface, small feature modifications
- Bug fixes, error reports
  a. Web developer time (~40 hrs @ $30/hr;
  non-profit rate of Philip Kahn) ……..… $1,200.00

(2) ***Student research assistants***:
We discontinue the employment of MDD student researchers in 2019-2020 in favor of ramping up volunteer and community-based efforts to curating this taxonomy database for new species descriptions, taxonomic revisions, and possible content expansion (see below).

a. ……..,……. $0.00

(3) ***Graph database web hosting fees***:
In 2019-2020, and continuing thereafter, we expect to have maintenance costs for hosting the graph database structure on GrapheneDB.com.

a. Web hosting fees on GrapheneDB.com ($50/mo, 12 months) ……..... $600.00

Requested Budget Total, 2019 ……..…… $1,800.00

CURRENT BUDGET 2018 (through 3 Apr 2018, year 2 of this initiative)

(1) ***Continued construction and maintenance of website***:
Re-vamp of website based on Committee feedback

- Graph-database format to allow for hierarchical, tree-based navigation of the taxonomy across the phylogeny of Mammalia higher taxa, with per-taxon pages.
- Architecture for an extensive synonym dictionary for cross-referencing names.
- Web developer time (~275 hrs @ $30/hr; non-profit rate of Philip Kahn)

Budgeted ……..…… $8,250.00
To date (2018): Philip Kahn ….....…….. $645.00
Remaining 2018 …….. $7,605.00

(2) ***Student research assistants***:
Continuing the efforts of MDD student researchers in curating this taxonomy database with particular attention to our main 2018 goals: (i) completing the search for full authority citations & web links for all species in the database; and (ii) completing the listing of modern synonyms (and authorities) used to describe those species.

- ~10 hrs/week @ $15/hr, 36 weeks (graduate student)
- ~10 hrs/week @ $10/hr, 36 weeks (undergraduate student)

Budgeted ……..…….. $9,000.00
To date (2018): Jocie Colella ($15/hr) $0.00
To date (2018): Connor Burgin ($10/hr) …… $175.00
Remaining 2018 ……...……. $8,825.00

(3) ***Graph database web hosting fees***:

In 2018 we are transitioning our current MySQL-based database to a graph database structure hosted on GrapheneDB.com. This will allow us to host thousands of taxonomic nodes and corresponding per-species pages in a hierarchical framework perfect for this type of data.

- Web hosting fees on GrapheneDB.com ($50/mo, 12 months)

Budgeted ……..…….. $600.00
To date (2018): ……... $9.00
Remaining 2018 ……...…….. $591.00

Total Budgeted ……..... $17,850.00
Total Spent …… $829.00

Total Unspent to Date (2018) ……. $17,021.00

RECAP OF BUDGET 2017 (entire year, year 1 of this initiative)

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(1) ***Construction of website***:

a. Main construction of database and website (~300 hrs of web developer time @ $30/hr; charitable non-profit rate of Philip Kahn)

Budgeted ……..…… $9,000.00
Actual (2017): Philip Kahn ….....……. $7,602.50
Unspent 2017 …….. $1,397.50

(2) ***Hiring of graduate student research assistant(s)***:

a. Student's hourly employment (~10 hrs/week @ $20/hr, 50 weeks)

Budgeted ……..…… $10,000.00
Actual (Apr-Dec): Jocie Colella ($15/hr) $1,221.25
Actual (Apr-Dec): Connor Burgin ($10/hr) .. $2,477.50
Subtotal …….. $3,698.75
Unspent 2017 ……...……. $6,301.25

(1) ***Soft launch of website***: (May 2017, with full launch in Feb 2018)

a. Website maintenance, hosting, continued design changes

b. Note that $0 were spent here because we are using the existing ASM web server (Linux, with Apache, PhP, and MySQL) to host the Mammal Diversity Database—thus eliminating extra hosting fees / maintenance.

Budgeted ……...…….. $6,000.00
Actual: (none) ...…….. $0
Unspent 2017 ……..…… $6,000.00

Total Budgeted ……..... $25,000.00
Total Spent …… $11,301.25

Total Unspent from 2017 .....…… $13,698.75

Respectfully submitted,
Nathan S. Upham, Chair
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