Graellsia, 67(1): 109-111
enero-junio 2011
ISSN: 0367-5041

Recensiones bibliográficas / *Book reviews*

LISANFOS KMS: Everything you wanted to know about amphibian fossils but were afraid to ask

No doubt about it, we live in the information society. Information is overwhelmingly abundant and, which is even more impressive, readily available on our computers with just one click of the mouse. It is now possible to distribute, gather, use, and manipulate, an enormous quantity of data on nearly any topic. This is probably more true for professional activities like scientific research, where the primary goal is to generate knowledge. Indeed, in science, we are overwhelmed by the available information, information that is important not only for daily scientific activities investigating specific subjects in depth, but also for maintaining a broad and integrative perspective on the studied topics. Consequently, we are now witnessing the development of increasingly sophisticated tools that permit not only the gathering of raw data and information, but also its filtering, digestion, and treatment. This is, precisely, what LISANFOS KMS is.

LISANFOS KMS (http://www.lisanfos.mncn.csic.es/) (Martín & Sanchiz, 2011) focuses on the fossil record of living species of amphibians and their extinct ancestors. The information contained in it has been curated from all the references published from 1758 to 2010 specifically referring to the amphibian orders Allocaudata, Anura, Caudata, Proanura, and Gymnophiona. This is an impressively daunting, yet fabulous task, and it is, to my knowledge, the most comprehensive and exhaustive compilation of amphibian paleontological literature to date.

LISANFOS KMS is not a conventional database or searching engine. 'KMS' stands for 'Knowledge Management System', implying that this tool has been designed with a specific goal in mind, that is, to organize the information in a logical way so that users can not only retrieve a datum *per se*, but also trace back the source of this information, and observe how the datum flows or is related across the organizational layers of the system. As a result, the user obtains an annotated 'history' of the datum, and this final retrieve constitutes an added value that standard databases do not have.

Information is not just summarized in LISANFOS KMS. First of all, the text of most of the references has been indexed, thus facilitating the accuracy and reliability of the searches performed. Second, all the information has been standardized. This is probably one of the most important and challenging aspects of LISANFOS KMS. Standardization is a necessary step for the reliable interpretation of data. For instance, a common problem when organizing zoological databases is the taxonomic treatment of the groups involved. Taxon names and systematic classifications change through time, and it is not obvious what are the best methods for incorporating such changes in a database. One could simply leave the names as they were published in every reference, a common procedure in most databases. However, this can be misleading if users are not provided with a complete list of changes or if users do not know beforehand all the changes. To solve this problem, the information (in this case taxon names and taxonomic changes) can be analyzed and homogenized, i.e., standardized. In LISANFOS KMS, taxonomy has been standardized following the taxonomic and systematic proposal in *Amphibian Species of the World version 5.5* (Frost, 2011) such that all the information published from 1758 to 2010 relative to a specific taxon is recovered with the taxonomic denomination suggested in this proposal. However, and more importantly, the list of taxonomic changes or the list of synonymies of valid names is explicitly presented. The valid consideration of any taxon name can be easily checked together with the list of taxonomic changes. This is the added value that conventional databases do not have. After performing a search, one not only retrieves a punctual datum (e.g., the presence of a species at a fossil site), but also the 'history' of the datum (e.g., how the taxonomic or systematic consideration of the species has changed through time and the different authors' opinions on the subject). All the information contained in the different data sets has been treated using this method and, therefore, has also been standardized including, for example, the names of fossil sites, epochs and stages, localities, or authors' names.

Information in LISANFOS KMS is organized in six cross-referenced databases, which also serve as searching routines: 'Taxa', 'Fossil sites', 'References', 'Museums', 'Time', and 'Osteology'. Users, thus, can easily search any datum starting from different evidences. I suspect many users will approach LISANFOS KMS using the ´Taxa' routine first, which is an intuitive way to start a search. The searching options offered in 'Taxa' are broad (13 fields), including the taxon name, author(s) of the description, period, epoch, biozone, or museum, among others. Thus, the 'Taxa' option offers the most comprehensive search fields. These fields are expanded in the other databases, and advanced searches can be performed in those databases. Of special utility for users who are not interested in getting a detailed account of fossil sites and museum collections but who want to have an overview of fossil distributions and time span for specific taxa is the 'Time' database, in which it is possible to retrieve information on the fossil record for any given taxon within a specified time interval. Systematists and molecular biologists looking for calibration dates for their molecular phylogenies will likely explore this option often. Another pathway that will certainly be explored is the 'Osteology' database. Although still under construction (as of May 2011), this section will eventually contain images of bones for most of the extant and fossil species. Users will be able to check for intraspecific and intrageneric variability for different structures as well as to identify and assign elements through the 'Identification Assistant', developed to act as an interactive identification key for amphibian skeletal structures. Therefore, LISANFOS KMS would not only work as a repository of information, but could also be used as an identification and research tool in the laboratory.

From a practical point of view, I highlight three main advantages of LISANFOS KMS. First, the simplicity and accuracy of the searching design makes it possible to start searching from very different initial evidences. The results obtained will be consistent among the different searching routines thanks primarily to the effort to homogenize and standardize the information. Second, I would highlight the clarity of information. The results obtained are displayed in a clear, concise and easy to print or store manner. Independently of the search pathway followed, all the items retrieved are summarized in a table that can be easily printed. It is also possible to choose a specific entry within the table and get its final record containing details such as the list of synonyms, a chronological list of references, the list of fossil localities, the reliability of the fossil identification and museum collections containing specimens, among others. Finally, it is worth mentioning that LISANFOS KMS has been designed with a strong sense of 'user friendliness' and utility in mind. The navigation icons are simple, informative, and very visual, thus users will feel very comfortable moving through the different sections. Overall, the web design is quite aesthetic, which is always a plus.

It may sound a little paradoxical but information is not the most important aspect of the 'information society' we are living in. The emphasis is now on the development of tools permitting the organization and tractability

of the data. LISANFOS KMS is a clear example of such a tool. It is interesting to notice that it has been developed in a Natural History Museum (Museo Nacional de Ciencias Naturales – CSIC, Madrid, Spain) and, dare I say it, with a strong taste of a museum collection. Instead of actual specimens, LISANFOS KMS is a collection/repository of historical knowledge on amphibian fossils. The information has been synthesized and organized to foster future research on the topic, which is one of the functions of museum collections. Furthermore, this web-based collection-like tool has some extra potentialities. For instance, it could easily be linked to other existing web-based resources, or it could be a platform for the development of future analytical tools. It would be really interesting, for instance, to integrate LISANFOS KMS with the recently developed Amphibian Anatomical Ontology (Maglia *et al.*, 2007). This recent initiative is developing an ontology for amphibian anatomical elements with a broad perspective in mind. The goal of this new ontology is to recover a consensus vocabulary for amphibian anatomy and to use this consensus ontology to connect different knowledge areas (e.g., genetics, development, taxonomy, systematics) and research tools (e.g., *Xenopus* web-based resources, among many others): the standardization of the anatomical terms would serve as an anchor point from which to relate data from different sources and levels of biological organization, generating an integrative tool with which to analyze a variety of biological processes from distinct perspectives. LISANFOS KMS clearly fits within this framework and it would be extremely interesting to coordinate these two web-based tools. Both platforms would definitely benefit from this interaction.

References:

Frost, D. R., 2011. *Amphibian Species of the World: an Online Reference. Version 5.5 (31 January, 2011)*. Electronic Database accessible at http://research.amnh.org/herpetology/amphibia/. American Museum of Natural History, New York, USA.

Maglia, A. M., Leopold, J. L., Pugener, A. L. & Gauch, S., 2007. *The Amphibian Anatomical Ontology web project*. Online reference accessible at http://www.amphibanat.org.

Martín, C. & Sanchiz, B., 2011. *Lisanfos KMS. Version 1.2*. Online reference accessible at http://www.lisanfos.mncn.csic.es/. Museo Nacional de Ciencias Naturales, CSIC. Madrid, Spain.

David Buckley
Departamento de Biodiversidad y Biología Evolutiva
Museo Nacional de Ciencias Naturales – CSIC
c/ José Gutiérrez Abascal 2
28006-Madrid
Spain
dbuckley@mncn.csic.es