

Archaeocyatha: from synthetic works to knowledge base

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Archaeocyatha are a key-group in different fields of Life and Earth History. They represent an extinct class of the phylum Porifera, close to the Demospongiae. Reef dwellers, they are marine sessile organisms almost exclusively early Cambrian, with some relicts into the middle and upper Cambrian. They provide reliable basis for biozonation in key regions and suitable constraints to settle tropical paleolatitudes.

Discovered in the middle of the XIXth century by the captain Bayfield (1845)¹, in the oldest fossiliferous rocks of Labrador (Canada), they have quickly become a traditional Russian field of research. In the USSR, material is abundant, well preserved and covers a large geographical and stratigraphical extension. In the 1930s, modern studies really begun. Two schools were in competition: the Eastern school led by Vologdin and his team and the Western one led by Okulitch (Vancouver, Canada) and the Bedfords (Australia). In the 1950s, over 230 out of about 400 species of archaeocyathan come from the USSR, (Siberian Platform, Altay-Sayan, Tuva, Urals, Kazakhstan) and Mongolia. From the mid-1950s, despite the language barrier, I.T. Zhuravleva (Novosibirsk, USSR) began to exchange regular correspondence with F. Debrenne (Paris, France). Since then, Russian and Western specialists have engaged in active cooperation that still continues today. Zhuravleva is at the origin of all modern researches. She established the basis of modern systematics, still in use to-day, by applying the ontogenetic principle². The systematics ranks are defined as follows: 1. orders by cup architecture, 2. suborders by the growth pattern, 3. superfamilies by the outer wall types, 4. families by the inner wall types, 5. genera by variations in walls and intervallar primary types and distribution of pores in each element, and 6. species by different numerical coefficients. Gradually, discoveries increase archaeocyathan geographical distribution to a world-wide one, including Russia, Kazakhstan, Uzbekistan, Poland, Mongolia, China, Greenland, Canada, USA, Mexico, Argentina, France, Germany, Sardinia, Serbia, Spain, Morocco, South Africa, Antarctica, and Australia. Different recent synthetic works updates the diagnoses of genera³ to ⁶. These works were used to establish the present knowledge base on Archaeocyatha^{7,8}.

At present, knowledge base and ontologies are the most powerful ways to manage and analysis complex information. Initially produced to provide a flexible tool to identify archaeocyaths genera, archaeocyathan knowledge base becomes a precious tool for different domains of archaeocyathan researches for instance, faunal geographical and stratigraphical repartitions. It has been developed with Xper2⁹ (<http://www.infosyslab.fr/lis/?q=en/resources/software/xper2>), a free software to store, edit and manage descriptive data and to provide free access keys (well adapted for paleontological specimens that are often incomplete). Building a good knowledge base requires the definition of a descriptive model and the description of each genus using only terms included in the descriptive model. To create the descriptive model, terms are standardized, defined, illustrated and one term corresponds to a single concept (shape, distribution, direction...). When the standardization is complete, an adapted terminology is adopted and genus can be computerized. The couple descriptive model/descriptions of genera forms the knowledge base. It comprises the 307 valid genera described with 120 descriptors (85 morphological and ontogenetical, 8 stratigraphical and geographical and 27 refer to traditional classification data). Each genus is illustrated with type specimen of the type species; some additional specimens may be present. The entire product is freely accessible on the internet inside a website about Archaeocyatha: <http://www.infosyslab.fr/archaeocyatha>¹⁰. It is composed of three parts: 1. introduction to Archaeocyatha, role in the Cambrian system, morphology and a list of references; 2. general remarks about the knowledge base and some exports: list of genera and their detail sheets, list of descriptors, list of groups of descriptors and knowledge base properties; 3. the interactive key and its tools: user guide, matching terminology and glossary. For specialists, accustomed to the traditional terminology, a table explains the correspondence between ancient terms and computerized ones (matching terminology page).

As a conclusion, this is the first knowledge base comprising a free access key, which includes the up to-date descriptions of all valid genera with the figures of their types. It will be completed and updated to follow the evolution of scientific researches. It is a first step to refine descriptions for paleontological studies and to develop tools for analysis descriptors.

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