

Taxon-list of Silurian to Holocene organic-walled microplankton from Hungary (1957–2017)

Szervesvázú microplankton fajok listája Magyarországról,
a szilurtól a holocénig
(1957–2017)

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Abstract. This article It contains the data of Dinoflagellata, Chlorophyta, Prasinophyta, Acritarcha, organic-walled Foraminifera and Thecamoeba, Polychaeta and other unknown taxonomic microfossils (Incertae sedis) occurring in palynological preparations from Silurian to Holocene.

Keywords. Dinoflagellata, Chlorophyta, Prasinophyta, Acritarcha, Foraminifera and Thecamoeba (organic-walled), Polychaeta (organic-walled) and Incertae sedis (organic-walled); Silurian–Holocene.

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Summary. This taxon-list is a compendium on the stratigraphical ranges of *microfossils* (Dinoflagellata, Chlorophyta, Prasinophyta, Acritarcha, Foraminifera and Thecamoeba, Polychaeta and Incertae sedis etc.) in Hungary, from the Silurian to the Holocene.

So, called organic-walled microplankton are fossils that have organic wall and can be found in palynological preparations together with spores and pollen. Size of this phytoplankton and zooplankton is approximately 10–300 µm. Dinoflagellata, Chlorophyta, Prasinophyta and Acritarcha are phytoplankton, while Foraminifera, Thecamoeba (organic-walled) and Polychaeta belong to zooplankton. „Incertae sedis” refers to undefined taxonomical position of fossils.

Investigations of organic-walled microfossils in Hungary started after World War II during the 1950's when the first generation of scientists had graduated and launched their scientific researches. F. Góczán, E. Nagy, L. Rákosi, M. Miháltzné Faragó, and H. Lőrincz in Hungarian Geological Institute; J. Oravecz in Eötvös Loránd University; Járainé M. Komlódi in Hungarian National Museum Department of Botany; M. Juhász, M. Kedves and P. Simoncsics in Szeged University; Krivánné E. Hutter in Hungarian Oil and Gas Company; J. Bóna in Komló Coal Mines; Barabásné Á. Stuhl in Pécs Uranium Mines were who founded organic walled microplankton studies in Hungary. Members of the second generation are still active in scientific life in Hungary or in Western Europe.

Publication of results of Hungarian research started in 1952 (Zólyomi). Originally, I intended to collect the records of taxa from the Hungarian literature only from the period 1957–2000, but later I realized that data from the 21st century are important as well

because the scientists of the first generation passed away or retired in those decades. The extended taxon-list may be in complete but later it can be completed during preparation of the International Database.

This list is neither a microfossil catalogue nor an index. Dinoflagellata Index (G. L. Williams, J. K. Lentin & R. A. Fensome 1998), and catalogues of Dinoflagellata and Prasinophyta etc. fossils (R. A. Fensome & al. 1990–1996) are necessary for all palynologists. Stratigraphical range of dinoflagellates of northern hemisphere were published by G. L. Williams & al. 1993.

This list contains the valid and synonym names of the species and their stratigraphical range in Hungary and worldwide (the latter is based on G. L. Williams & al. 1998). Hungarian palynologists are listed in Table 1, indicating their full name and the stratigraphic units which they actually studied.

The tables of the Hungarian microplankton zonation from the Permian to the Holocene period are placed at the end of the taxon-list fig. 1-3; table 2-11.

As an exception, the summary of Muelleriahaerida (Incertae sedis) fossils of the Silurian and Devonian Periods described by H. Kozur (1984) and the *Sporomorpha* zonation of E. Nagy (1992) are also discussed in this paper.

Geological time scale can be found in table 12-16 to clarify the different geochronological and regional nomenclature, proposed by A. Sóron. Table 17 shows the range in time of organic-walled microplankton taxa.

(Translated: A. Sóron).

Introduction

Palynological studies started in Hungary in the 1950's. Ferenc Góczán and Miklós Kedves published the first organic walled microplankton from Hungary (Góczán 1962; Kedves 1962). The first monograph on Upper Pannonian palynoflora was written by E. Nagy (1958). She evidenced Chlorophyta microplankton of fresh and barely salt water from the barren and clayey layers of the brown coal from the Mátraalja. She firstly described Dinoflagellate species from the Middle and Upper Miocene layers of the Mecsek area, also including the Pannonian layers (Nagy 1965a, 1965b).

During the compilation of the taxa-list, I discovered many interesting things. Some of them are mentioned separately, but who will use the taxon-list in practice, will find much more curiosity.

Acritarcha species (and Graptolites) were first published by J. Oravecz from the oldest Silurian sediments of Hungary (Oravecz 1964). H. Kozur (1984) described species and genera for Incertae sedis from the Silurian and Devonian layers in Hungary.

The first representatives of Dinoflagellates are known in the northern hemisphere from the Upper Triassic (G. L. Williams & al. 1993). From the Upper Triassic layers of Hungary, J. Bóna described one Dinoflagellata species (Bóna 1983, 1995a).

Beyond the Dinoflagellates, the Prasinophyta and Acritarcha microplankton species are also common in the marine layers of the Triassic Period. The description of these species was prepared by F. Góczán (Góczán 1983–2000) (Table 2).

Based on international collaboration, the Triassic formations of the Transdanubian Mountains and the Italian Dolomites were interpreted and identified by Hungarian and

Italian researchers, while geological and paleontological points of view were also taken account (Góczán in Loriga & al. 1990).

Microplankton communities of the Toarcian stage of the Jurassic Period were firstly described by Bucefalo Palliani & al. (1997) from the excavation from the Réka Valley in the Mecsek Mountains. These researches were continued by V. Baranyi (2016) (Table 3). The presence of marine Microplankton from the Upper part of the Jurassic coal-bearing series is known from the Sporomorpha examinations of J. Bóna (1984-1995).

Dinoflagellate species from the Cretaceous Period were firstly described by F. Góczán in 1962. He also described the unique Normapolles plant assemblage from the Senonian Stage of the Cretaceous and so created the palynozonation of the Upper Cretaceous (1961–1990). The examination of the Dinoflagellate and Sporomorpha communities from the Upper Cretaceous were continued by Sieglné Farkas Á. (1983–2003). She worked out the Dinoflagellate zonation of the Upper Cretaceous and also correlated to the European Nannoplakton zonation (Siegl-Farkas Á. & Wagneich M. 1983–1999). The identification of Pelso and Tisza megaunits from the Upper Cretaceous layers was prepared by international collaboration. The palynological and Dinoflagellate examinations are also very important parts of this work (Figs. 1-2, tables 4-5).

The dominant Prasinophyta algae from the marine layers of the Mesozoic Era are also present in the Paleogene sediments. Their first description from the Paleogene was published by E. Kriván-Hutter (1963).

The elaboration of the Paleogene microplankton zonation in the Hungarian palynological research associated to L. Rákosi who correlated the Microplankton zonation to the Nannoplankton zonation (Rákosi 1993; Rákosi & Snopkova 1993) (Fig. 3, table 6). His work from the Eocene to Pannonian layers is known from several publications. Beyond the Microplankton, the Hungarian Sporomorpha, Polychaetes and Thallophytes were also worked out by him (Rákosi 1963–1993). Spore-pollen examination of the Eocene coals based on the works of M. Kedves and L. Rákosi, but these groups are excluded from this taxon-list.

The Dinoflagellate zonation of the Karpatian, Badenian and Sarmatian stages of Miocene was worked out by G. Jiménez-Moreno, based on several Central European and Hungarian (e.g. Tengelic 2) borehole samples (Jiménez-Moreno 2005 and Jiménez-Moreno & al. 2006) (Table 7).

Microplankton species was described from Karpatian and Badenian of Hungary (Miocene Period) by E. Nagy (1965a, 1965b, 1966, 1969).

Based on the Foraminifera examination of Koreczné I. Laky (1968), the age of the Middle Miocene layers in Pécsvárad was established Sarmatian. Therefore, the Microplankton described by M. Hajós from this layer are negotiated in the Sarmatian (Hajós, 1966).

In the research of the Pannonian layers, besides the Mollusca, Ostracoda, Foraminifera, Diatoma, and Nannoplankton studies new methods of Dinoflagellate examination have been developed. This work has been published in since 1982, providing instant assistance to the developing Molluscs, Ostracods, Nannoplanktons and seismic research.

The first description of the Pannonian Dinoflagellate zonation was published in 1988 and has been continuously evolving since then Sütő–Szentai (alias Sütőné Szentai Mária, Sütő Zoltánné) 1991, 1994a, 1994c, 2002, 2010, 2012, 2016) (Table 8-10).

The integration and incorporation of paleontological, lithostratigraphic and seismic examinations into the international scientific research is the merit of I. Magyar (Magyar & al. 1999a, 1999b, 2004, Magyar 2010). Currently, this work is being carried out by young researchers, V. Baranyi and A. Sóron.

The examination of the spore and pollen from the Holocene Period after the ice ages began with the basic research of B. Zólyomi (1952) in Hungary. (Table 11). The occurrences of ancient freshwater Algae were reported by B. Zólyomi, O. Sebestyén, Miháltzné Faragó M., Nagyné E. Bodor and Sieglné Á. Farkas.

The Hungarian geological research was characterized by the large number of subtle drilling and their detailed paleontological and lithostratigraphic processing in the decades before the change of political regime in 1989. The stratigraphic application and integration of seismic with paleontological and lithostratigraphic data began to unfold in the early 1980s. At this time a new method of paleomagnetic aging also came to us, which, the radiometric age data, provided timeliness for the relative cognition of fossils (VIII th Congress of the Regional Committee on Mediterranean Neogene Stratigraphy, Budapest, 15-22 September 1985).

A large amount of scientific research results was born closed by political and geographical boundaries up to the 80's, which were only published in Hungarian scientific papers. The outlook and collaboration with foreign researchers started in the 1980's, but its rapid expansion occurred around the turn of the millennium and after Hungary's accession to the EU.

Today, researchers are publishing in well-known and read international scientific journals in Europe. Their latest work can be well traced on the internet (e. g. ResearchGate). The catalogues of Dinoflagellates and other microfossils can also be accessed on the internet.

I think that the scientific research of the latest 60 years has broken into a fraction of the international researchers' horizons. This was my inspiration when I started to collect the taxon-list 15 years ago, during my museum work, encouraged by Imre Fazekas. I feel that it helps, also in this contently incomplete form, that we do not lose the results of the Hungarian geological research.

(Translated: T. Henn)

Materials and methods

The genera and species are listed in alphabetical order in the taxon-list. Firstly, the data of Dinoflagellates, Chlorophytes, Prasinophytes, then the data of Acritarcha and finally, the data of Zooplankton and the unknown remains (*Incertae sedis*) are listed. In the case of Dinoflagellates, the index of G. L. Williams, J. K. Lentin and R. A. Fensome (1998) was used to specify the names of species, genera and also the holotypes. If it was possible, the stratification data of species were also described following the work of G. L. Williams & al. (1993)

This taxa-list makes the spread of species more transparent and makes it easier to aggregate them.