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Az e-Acta Naturalia Pannonica 1 (1) [2010.03.31.] tartalmából

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e–Acta Nat. Pannon. 1 (2): 205–210. (2010)

Coleophora alnifoliae Barasch, 1934 and *Alucita palodactyla* Zeller, 1847 in Hungary, with a checklist of the Hungarian Alucitidae (Lepidoptera: Coleophoridae & Alucitidae)

Imre Fazekas

Abstract – Fazekas I. 2010: *Coleophora alnifoliae Barasch, 1934 and Alucita palodactyla Zeller, 1847 in Hungary (Lepidoptera: Coleophoridae & Alucitidae). – e-Acta Naturalia Pannonica 1 (2): 205–210.* – The author announces the presence of *Coleophora alnifoliae* Barasch, 1934 and *Alucita palodactyla* Zeller, 1847 in Hungary, the first records of the taxa in Pannonian regions. The male genitalia and distribution maps are illustrated with line drawings. A new checklist of Hungarian Alucitidae is included, but without references of the first confirmed records of each species. The family Alucitidae in Hungary contains 8 species and 2 genera. With 8 figures.

Összefoglalás – A *Coleophora alnifoliae* Barasch, 1934 és az *Alucita palodactyla* Zeller, 1847 új fajok Magyarországon és Pannon életföldrajzi régióban. A szerző leírja a taxonok diagnózisát, a hasonló fajokat, a genitáliák szerkezetét. Bemutatja a fajok biológiáját, s azok földrajzi elterjedését és közli a magyar *Alucita* Linnaeus, 1758 nemzetség revideált névjegyzékét.

Key words – Lepidoptera, Coleophoridae, Alucitidae, *Coleophora alnifoliae, Alucita palodactyla*, new records, faunistic survey, biology, checklist, Hungary.

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Introduction

Only one study has been published on the Coleophoridae of Hungary (Gozmány 1956). Gozmány described 143 species from Hungarian territory 54 years ago. Until the last decade no further work was published. The specialists did not deal with Hungarian species. Consequently, the biology of the Hungarian Coleophoridae fauna and their distribution area are barely known. At the present, there are 198 species which have been reported to occur in Hungary (Pastorális 2010), but in the past, species have been inaccurately identified and many mistakes have been made. For this reason, older references are unreliable, making it difficult to be conclusive on the distribution. Knowledge of the biology of Hungarian Coleophoridae is also very limited.

There 8 species of Alucitidae known to occur in Hungary and 22 species in Europe. As with the Coleophoridae, knowledge of the Hungarian Alucitidae is sparse. Gozmány (1955) reviewed the Hungarian species' diagnostic characters on several pages and he described the biological and geographical details known at the time. In the last 45 years, the revision of the *Alucitidae* species has been neglected. The family did not attract the interest of the Hungarian researchers. References in the Hungarian literature are mostly doubtful and the identification of the species is uncertain.

In this study, the author reports the occurrence of two new species in Hungary. In subsequent studies, details of the biology and the distribution area of the species of *Coleophoridae* and *Alucitidae* will be provided.

Coleophora alnifoliae Barasch, 1934 (Coleophoridae)
Coleophora milvipennis subsp. alnifoliae Barasch, 1934, Dtsch. ent. Ztschr. 1934, p. 36. Locus typicus: Potsdam (D).
Synonyms*: Coleophora alniella McDunnough, 1933, nec Heinrich, 1914 (misidentification); Coleophora alnivorella McDunnough, 1946.*
References: Baldizzone et al. 2006, Ellis 2010, Kimber 2010, Patzak 1974, Toll 1962.

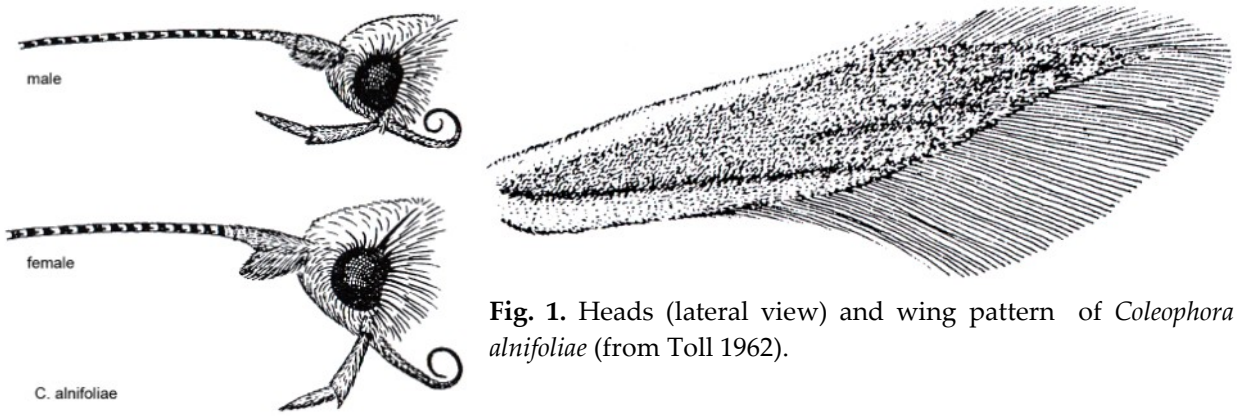


Fig. 1. Heads (lateral view) and wing pattern of *Coleophora alnifoliae* (from Toll 1962).

Fig. 2. Male (**a**) and female genitalia (**b**) of *Coleophora alnifoliae* (lateral view) .

Diagnosis: *Wing expanse 11–13 mm*. The adults are golden-brown in general colouration, with a cream or whitish leading edge to the forewing.

Similar species: It is difficult to distinguish adults of *Coleophora alnifoliae* from *C. milvipennis Zeller, 1839*, *C. limosipennella* (Duponchel, 1843) and *C. badiipennella* (Duponchel, 1843).

Genitalia: The male genitalia are difficult to identify, the female genitalia are easier (see Fig. 00).

Biology: Larvae begin in September, feed until end October, making two small cases during this period, then go into hibernation. They resume feeding in May and make their final case, in which they pupate around June. Case: A slender, brown, spathulate leaf case, ultimately about 13 mm long; mouth angle about 15°. Young case slender, not hooked (Ellis 2010). According to Biesenbaum and Wolf (1999) "Die Raupen fertigen zuerst in einem Jugandsack, später in einem Blattsack un minieren an Erle (Alnus)". According to references, the adult is univoltine between June and August.

Distribution: *C. alnifoliae* is evidently widespread all over Europe wherever *Alnus* grows. Outside Europe: Caucasus, Central Siberia, Canada and U.S.A. (Baldizzone et al. 2006).

New data of distribution: Material examined; Dombóvár–Gunaras; 1 ♂, 13–23.06.2006; 1 ♂, 14–28.07.2007, det. H. v. d. Wolf. Only two specimens captured at light. A species new for the Hungarian fauna, never previously reported from the country.

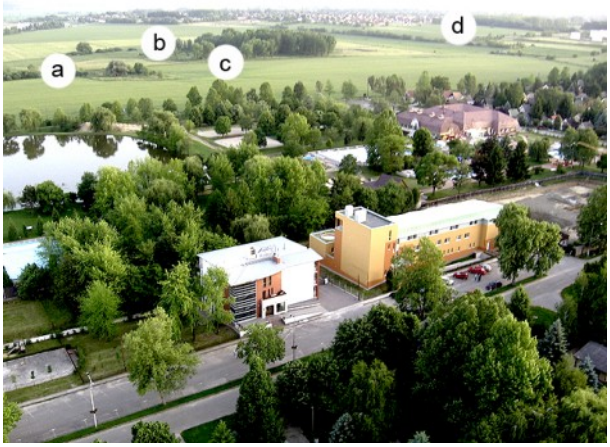


Fig. 3. Habitat of *Coleophora alnifoliae* in Dombóvár–Gunaras: riverine willow scrub (**a**), riverine willow-poplar woodlands with Kapos-river (**b**), arable land with fine scale, often low-intensity agriculture (**c**), town of Dombóvár (**d**).

a b c d

Fig. 4. Mature larval case (**a-b**) and larva (**c-d**) of *Coleophora alnifoliae* .

Remarks: *C. alnifoliae* is apparently very rare and local in Hungary but could be overlooked and therefore careful search is required. No additional specimen has been collected in Hungary since 2007. Its proposed Hungarian name is aranyfényű zsákosmoly.

Alucita palodactyla Zeller, 1847 (Alucitidae)
Alucita palodactyla Zeller, 1847, Isis von Oken 40: 908. Locus typicus: Sicily.
Synonyms*: Alucita perittodactyla Staudinger, 1859; Alucita parthenodactyla Chrétien, 1915*
References: Gozmány 1955; Gielis 2003; Scholz & Jäckh 1994; Zagulajev 1986.

Diagnosis: According to Zeller (1847); *„Palporum articulo ultimo adscendenti brevi; alis albidis, fasciis duabus murinis per omnes continuatus, exteriore in costae maculam unicam coarctata."*

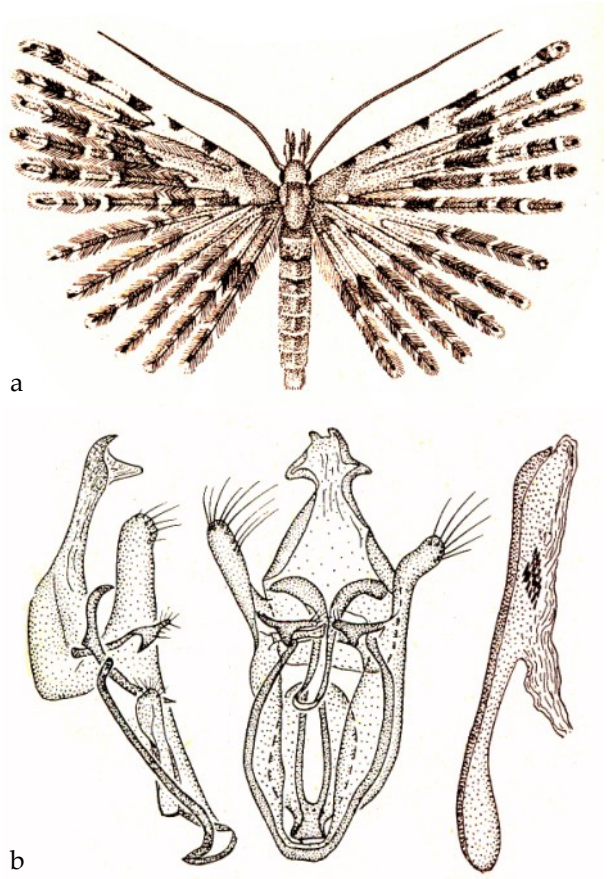
Similar species: *Alucita kosterini* Ustjuzhanin, 1999; According to Ustjuzhanin (1999), the new species is very like *A. palodactyla* in the widened distal part of uncus, but differs in the narrow ribbon-like valvae and pointed apex of the gnathos; in *A. palodactyla* the valvae are more wide and the gnathos apex is widened. In the absence of signa and the cup-like shape of the antrum, the new species resembles *A. desmodactyla* Zeller, 1847 and *A. hexadactyla* Linnaeus, 1758 but it differs in the oval shape of bursa, less elongated than in *A. hexadactyla*, and the absence of the saccate process before the ductus, as in *A. desmodactyla*.

Genitalia: See in preceding text and at figures (Fig. 5.).

Biology: Recorded foodplants *Scabiosa rutaefolia* Vahl. (Gielis 2003). This plant is unknown in Hungary, and we have no information about the foodplant in this country. Probably bivoltine; adults fly in May and from July to September. According to records, *A. palodactyla* is strongly associated with its food plants, and so its habitat requirements are the same as those of the foodplants.

Distribution: At present, recorded from the following countries and regions; Asia Minor, Crete, Balkans (uncertain Albania, Bulgaria, Romania), Ukraine, Hungary, Germany, Switzerland, Italy, Sardinia, Sicily, France, Corsica, Spain, north Africa (Gielis 2003; www.faunaeur.org [visited 03.05.2010]) and Iran (Zagulajev 1986).

New data of distribution: 1♂, Hungary, Nyirád (46°56'16.03"N;17°25'27.15"E), 14.09.2009, leg. et coll. Peter Davey (GB). A single specimen captured at light. It is a new species for Hungary.



a

b

Fig. 5. Adult (**a**) and male genitalia (**b**) of *Alucita palodactyla* (from Zagulajev 1986, with modification).

a b

Fig. 6. *Alucita palodactyla*: **a**) adult, ♂; **b**) male genitalia;
Hungary, Nyirád , 14.09.2009, leg. et coll. Peter Davey (GB).

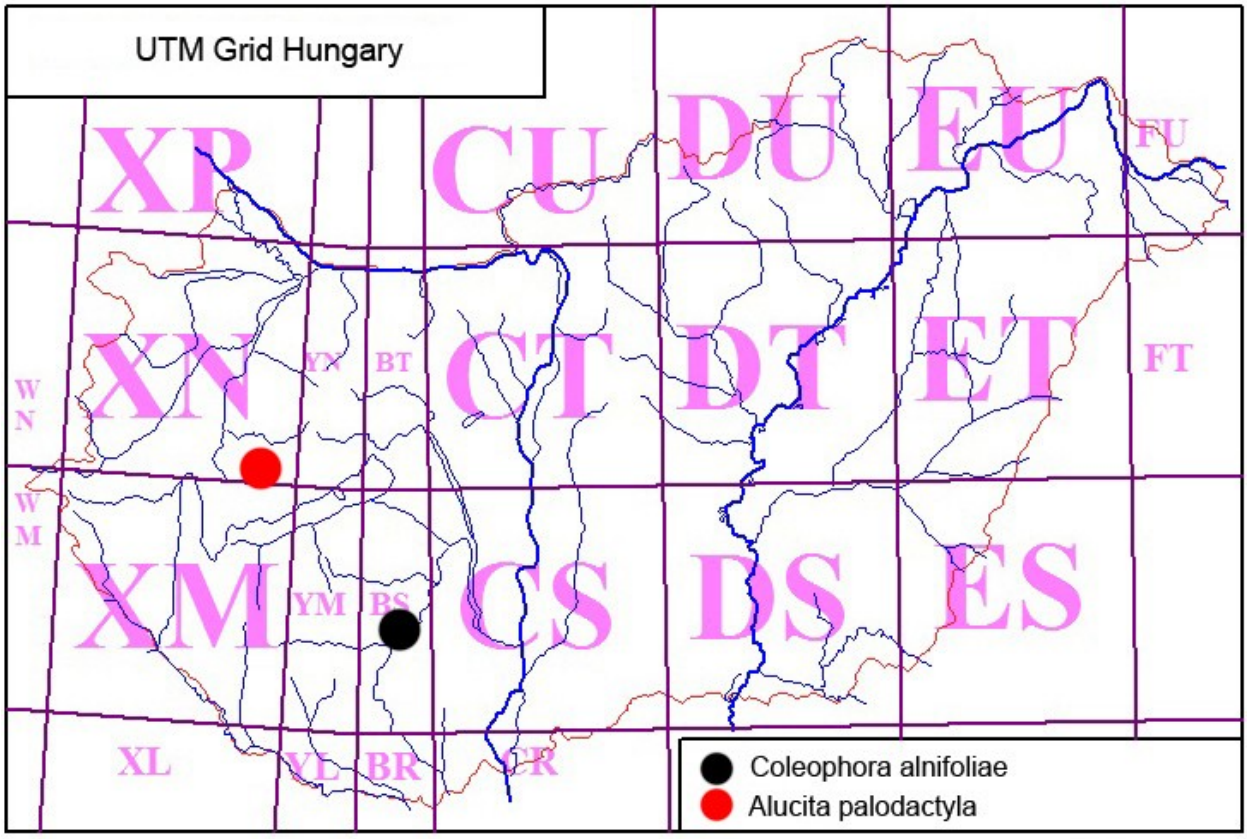


Fig. 7. Distribution of *Coleophora alnifoliae* and *Alucita palodactyla* in Hungary.

Remarks: The ecology of the *A. palodactyla* has not been examined in nature yet in Hungary. There is only one reliable reference from Hungary, in September 2009 when P. Davey caught a specimen of *A. palodactyla* near Nyirád; the voucher specimen is in the collection of the P. Davey in England.

This part of West Hungary belongs to the Pannonian biogeographical region, so the occurrence of this species there was not a very great surprise and further findings in the area are to be expected. At present, this is the most westward known point of its distribution in Carpathian Basin. Its proposed Hungarian name is szicíliai soktollúmoly.

Fig. 8. Landscape and habitat pattern from Nyirád

Provisional checklist of Hungarian Alucitidae spp.

Alucita Linnaeus 1758
cancellata (Meyrick, 1908) – According to record from Hungary (Gielis 2003).
cymatodactyla Zeller, 1852
hexadactyla Linnaeus, 1758
huebneri Wallengren, 1859
grammodactyla Zeller, 1841
palodactyla Zeller, 1847 – new species for the Hungarian fauna.
desmodactyla Zeller, 1847
Pteropteryx Hannemann, 1959
dodecadactyla (Hübner, [1813])

Expected, potential species from Hungary

[*Alucita bidentata* Scholz & Jaeck, 1994] – Known in the neighbouring countries: Slovenia, Croatia and Serbia.

[*Alucita major* (Rebel, 1905)] – Known in the neighbouring countries: Slovenia, Croatia and Serbia.

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The author offers a word of thanks to H. W. Van der Wolf (NL), C. Gielis (NL), for help with identifying difficult species. The author would like to thank Sz. Sáfián (H) for his data and kind help in the work, Peter Davey (GB) for providing unpublished data for the article. I am grateful to G. Pastoralis (SK) for his advice. B. Goater (GB-Chandlers Ford) corrected the English language of the manuscript. We are grateful to all for their help.

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Ustjuzhanin, P. Ya. 1999: New and little-known Palaearctic species of Alucitidae . – Far Eastern Entomologist 68: 1–7.

Zagulajev, A. K. 1986: A guide to the insects of the European part of the USSR Tom. IV, Lepidoptera. Family Alucitidae. – Opredeliteli po Faune SSSR 144: 215–228.

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e–Acta Nat. Pannon. 1 (2): 211–218. (2010)

A *Nemophora pfeifferella* (Hübner, 1813) magyarországi elterjedése, s az Adelidae fajok névjegyzéke (Lepidoptera)

Distribution of *Nemophora pfeifferella* (Hübner, 1813) in Hungary, with the list of the Hungarian Adelidae (Lepidoptera)

FAZEKAS Imre

Abstract – Fazekas, I. 2010: *Distribution of Nemophora pfeifferella (Hübner, 1813) in Hungary, with the list of the Hungarian Adelidae (Lepidoptera). – e-Acta Naturalia Pannonica 1 (2): 211–218.* – The first study is completed with reference the Hungarian distribution of *Nemophora pfeifferella* (Hübner, 1813). Biological data and the habitats of the species are presented. Restricted to few localities in Hungary. Rare and local. Vulnerable on account of limited distribution and habitats. Limited information available about habitat preference. The revised list of the Hungarian Aedelidae. Text in Hungarian with English summary and with 6 figures.

Key words – Lepidoptera, Adelidae, revised list, *Nemophora pfeifferella*, biology, distribution, Hungary.

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Summary – *Nemophora pfeifferella* (Hübner, 1813) is an endangered species in the whole of Pannon biogeographical region. There are no similar species in Hungary, and *N. pfeifferella* it self is rare and local in the country: Bánk, Érsekcsanád, Feldebrő, Zemplén Mts, Simontornya, Százhalombatta. Identified by I. Fazekas and M. V. Kozlov. The author describes the entire geographical distribution of the species in Carpathian Basin. He shows that the species is critically endangered and that active conservation measures are justified for its protection. The preferred habitats are in wet meadows with dominance of *Molinia*, which are vulnerable to excessive use of agricultural fertilisers. Regularly the water table does not reach the surface. These *Molinia* meadows are most frequent on Dunai-Alföld, especially on the fenlands of Duna-Tisza köze. On Tiszai-Alföld they are found almost only on Nyírség (= Great Hungarian Plain), although the stands are small and partly have marsh meadow character. *Molinia* meadows are common on Kisalföld (= Little Plain) in the eastern basin of Hanság, and also in Őrség and in the Zalai-dombság on Nyugat-Dunántúl (= West Hungarian Borderland). There are species-rich stands on the foothills of Dunántúli-középhegység (= Transdanubian Mountains), especially on Bakonyalja. They are uncommon in the Dunántúli-dombság (= Transdanubian Hills) and in the Északi-középhegység (= North Hungarian Mountains).

The larval foodplant (*Succisa pratensis* Moench.) is also protected in Hungary. According to Huemer (1996) the caterpillars are oligophagous on gentian (*Gentiana* spp.); in the NSG Rheindelta exclusively on Marsh Gentian (*G. pneumonanthes*). From the end of August, at first the flowers and fruits eaten, and occasionally the leaves.

In Slovakia, *N. pfeifferella* has recently been recorded on *Dipsacus laciniatus*: the eggs are laid in the thorny inflorescence, and the larvae feed in the stem eventually pupating either within the stem or in the soil. The imago is attracted to flowers of *Galium verum* (Pastorális pers. comm.).

It is possible that without protection *N. pfeifferella* will become extinct in Hungary. According to Ronkay and Szabóky (1981) only one specimen was collected on a flower of *Chrysanthemum corymbosum* L. in late afternoon in Zemplén Mountains (North Hungary), the valley of Kemence stream. This area can be considered as the border of the Carpathian Cassovicum flora. The hillsides are woody, except where clear-felled when they become overgrown with scrub, and on the rocky slopes. In the wider valley bog forests, turf mead-

ows and alder groves have developed, often within the lower areas of beech forest (Ronkay, Szabóky 1981).

Bevezetés – Introduction

A hosszúcsápú-tőrösmolyok (Adelidae) fémesen csillogó szárnyú, igen nagy szemű (hímek) és hosszúcsápú fajok. A szárnyak megnyúltak, keskenyek, az apex lekerekített, a fesztávolság 9–21 mm. A hernyók virágokban, vagy növényi levelekből készített zsákokban élnek, a földön bábozódnak. Lágyszárúakat, lomb- és tűleveleket fogyasztanak. A *Nematopogon* nemzetség tagjai a kezdeti lárva korban aknáznak, majd száraz levéllemez darabkákból zsákot készítenek. Az imágók napfényes erdőszéleken, erdei tisztásokon tavasztól tömegesen rajzanak (Fazekas 2007). Hazánkban 28 faj ismert (Pastorális 2010).

A magyarországi Adelidae fajok taxonómiájával, elterjedésével, biológiájával csupán néhány jelentősebb tanulmány foglalkozott (Szent-Iványi 1945, Gozmány 1965, Szőcs 1977; Kozlov 2006, Fazekas 2007). A Bükk hegységből leírt *Adela reskovitsiela* Szent-Iványi, 1945 az *Adela mazzolella* (Hübner, 1796) szinonimájának bizonyult (vö. Kozlov 2006), s már korábban a *Cauchas rufimitrella* (Scopoli, 1763) szinonimája lett a szintén Bükk hegységből leírt „*Adela Uhrik-Mészárosiella*" Szent-Iványi, 1945 is (Küppers 1980).

Ebben a közleményben áttekintem a *Nemophora pfeifferella* fontosabb határozó jegyeit, a faj biológiáját, hazai, Kárpát-medencei és palearktikus elterjedését. Végül közlöm a magyar *Nemophora* nemzetség revideált névjegyzékét. Magyarországról ez idáig 12 *Nemophora* faj bizonyítható (Pastorális 2010). Jelen tanulmányom célja, a magyar Adelidae atlasz előkészítése, a taxonok részletes vizsgálata.

Rövidítések a szövegben – Abbreviations in text: – ex= példány (exemplar); – MTM= Magyar Természettudományi Múzeum (Hungarian Natural History Museum, Budapest).

Nemophora pfeifferella (Hübner, 1813)
Adela chrysochraon Razowski, 1978
Adela huebneri Koçak, 1980
Irodalom – References: Abafi-Aigner et al. 1896; Gozmány 1965; Kovács & Kovács 1999; Kozlov 2004; Küppers 1980; Nielsen 1985; Razowski 1978; Ronkay & Szabóky 1981; Szent-Iványi 1945; Wojtusiak 1996.

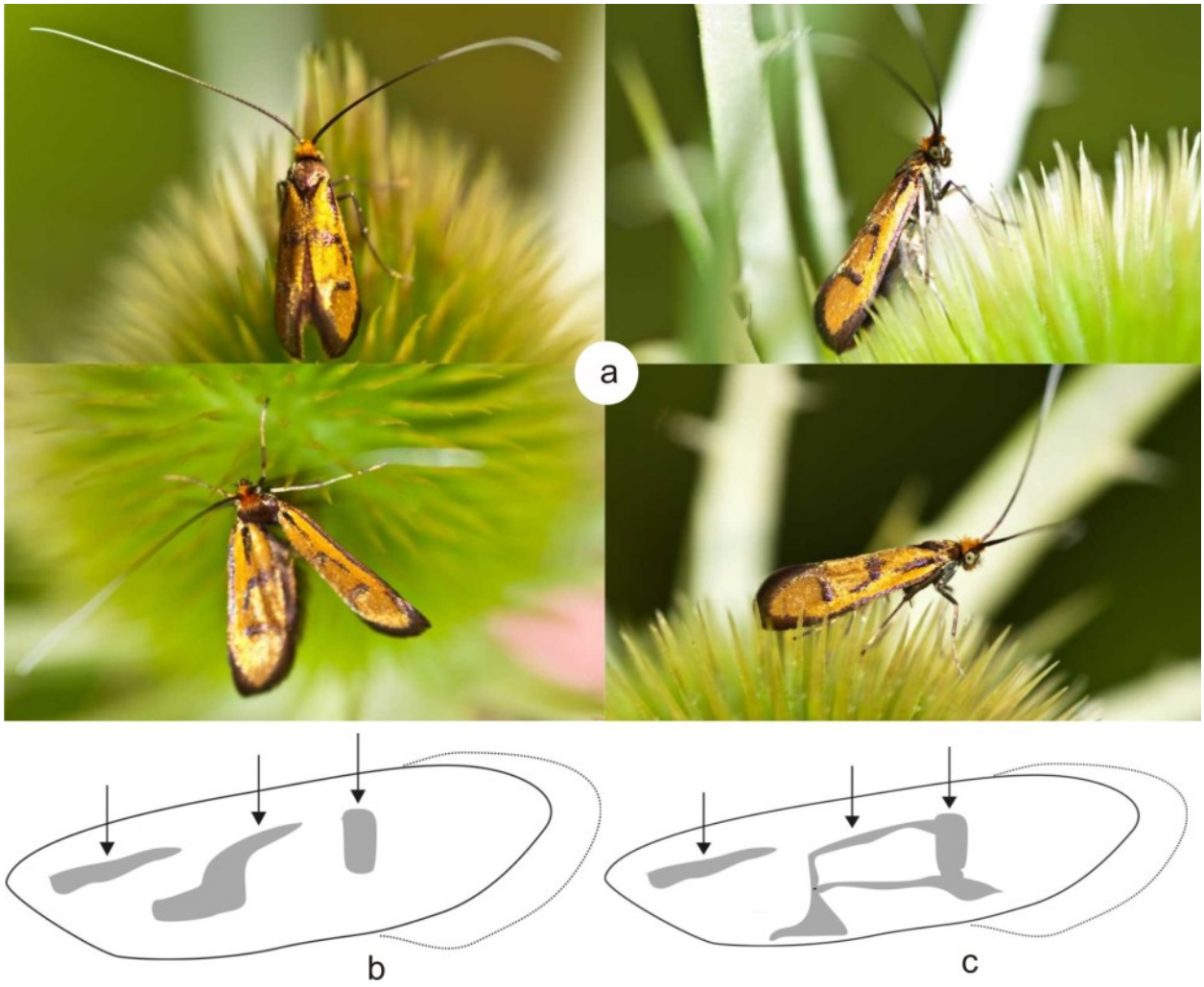
Diagnózis – Diagnosis (1. ábra – Fig 1.)
A szárnyak fesztávolsága 10,5–13,5 mm. Az elülső szárnyak alapszíne matt bronz, a costa és foltmintázat enyhén ibolyás csillogású és kiemelkedik a szárny síkjából. A rajzolat egy nyújtott tőtéri, egy s -formájú középtéri és egy téglalapszerű, enyhén lekerekített sarkú, sejtvégi foltból áll (1. ábra: a). Európa keleti tájairól ismertek olyan példányok is, amelyeknél a középtéri ibolyás rajzolat vonalasan összezáródik (1. ábra: b). A rojtok barnásak. A hím fejtető szőrzete feketés, a nőstényé pedig sárgás, vöröses. A csáptövek feketék, s apikálisan szürkések, fehéresek és csaknem kétszer hosszabbak, mint az elülsőszárny.

Hím genitália – Male genitalia (2. ábra – Fig. 2.)
A saccus mediálisan enyhén domború, apexe dorzális irányba madárcsőrszerű, s majdnem 4x olyan hosszú, mint a valva; az uncus szegélye és a valva apikálisan fogazott. Az aedeagus hosszabb, mint saccus és középen ívben meghajlik.

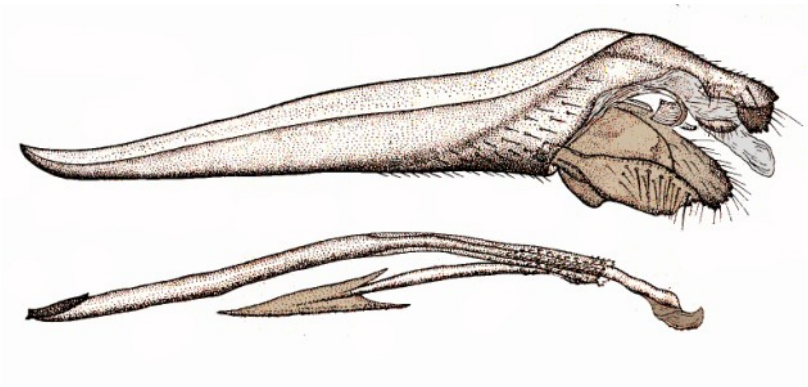
Nőstény genitália – Female genitalia
Magyar vizsgálat nem ismert.

Biológia – Biology (3. ábra – Fig. 3.)
A hernyók tápnövénye a „*Scabiosa succisa*" (Gozmány 1965). A botanikai irodalomban az idézett növény a *Succisa pratensis* Moench. szinonimájaként ismert. Az imágók június végétől augusztusig a nappali órákban repülnek, főleg fészkes virágzatúak nektárjával táplálkoznak. Zemplénihegységben, a késő délutáni órákban *Chrysanthemum corymbosum* L. virágzatán (Ronkay & Szabóky 1981) gyűjtötték.

Megjegyzések – Remarks
Szőcs (1977: 66. ábra) június-júliusban megtalálta a „faj" aknáját veresgyűrűsom (*Cornus sanguinea*) levelében, s közölte annak tusrajzát. Az akna a levél szélén kezdődik, amelyet teljesen kitölt az ürülék.



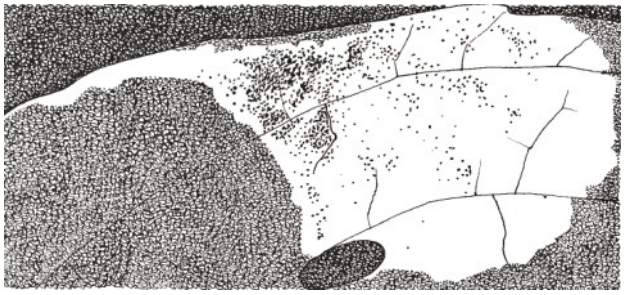
1. ábra. *Nemophora pfeifferella* imágók *Dipsacus laciniatus*-on (**a**), a szárnymintázat változatai (**b**, **c**)
Fig. 1. Adults and diagnostic characters (indicated) of *Nemophora pfeifferella:* adults on *Dipsacus laciniatus* (**a**), wing patterns (**b**, **c**) . Photo: L. Kurucz, drawings by author.



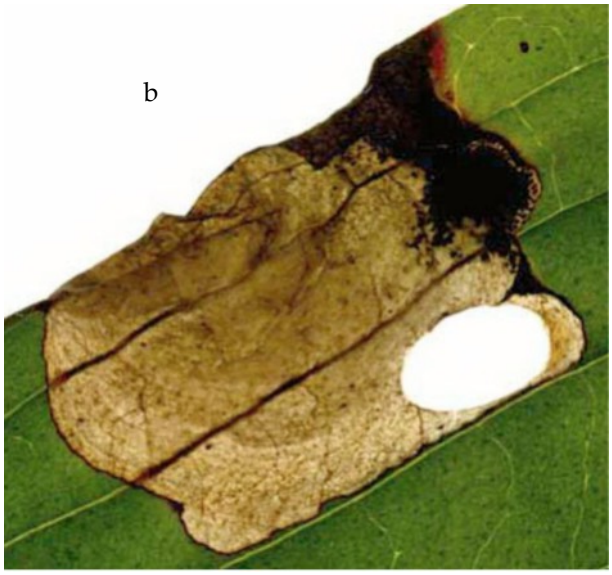
2. ábra. A *Nemophora pfeifferella* hím genitália (Zagulajev 1978 nyomán kiegészítve)
Fig. 2. Male genitalia of *Nemophora pfeifferella* (from Zagulajev 1978, with modification).

A szerző megállapította, hogy a hernyó hátán nincsenek fekete foltok. Szőcs (1977) az imágók repülését tavaszra teszi (IV–V), mely időpont lényegesen eltér a gyűjteményi- és megfigyelési adatoktól. Revízió során egyértelműen megállapítható, hogy Szőcs (1977) leírása az *Antispila metallella* (Denis & Schiffermüller, 1775) [Heliozelidae] fajra vonatkoznak, s az „Antispila Pfeifferella Hb." nevet tévesen használta. Ennek alapján Szőcs (1977) könyvének 121. oldalán a „Antispila Pfeifferella Hb." név áthúzandó, s helyére az *Antispila metallella* fajnevet kell írni (3. ábra – Fig. 3.).

Pastorális Gábor (pers. comm.) Komárnotól (SK) keletre lévő Izsa település, védett szikes terü-



a



b

3. ábra. Az *Antispila metallella* levélaknája:
a) Szőcs 1977, **b**) www.bladmineerds.nl alapján
Fig. 3. Mines of *Antispila metallella* on leaves of *Cornus* sp.

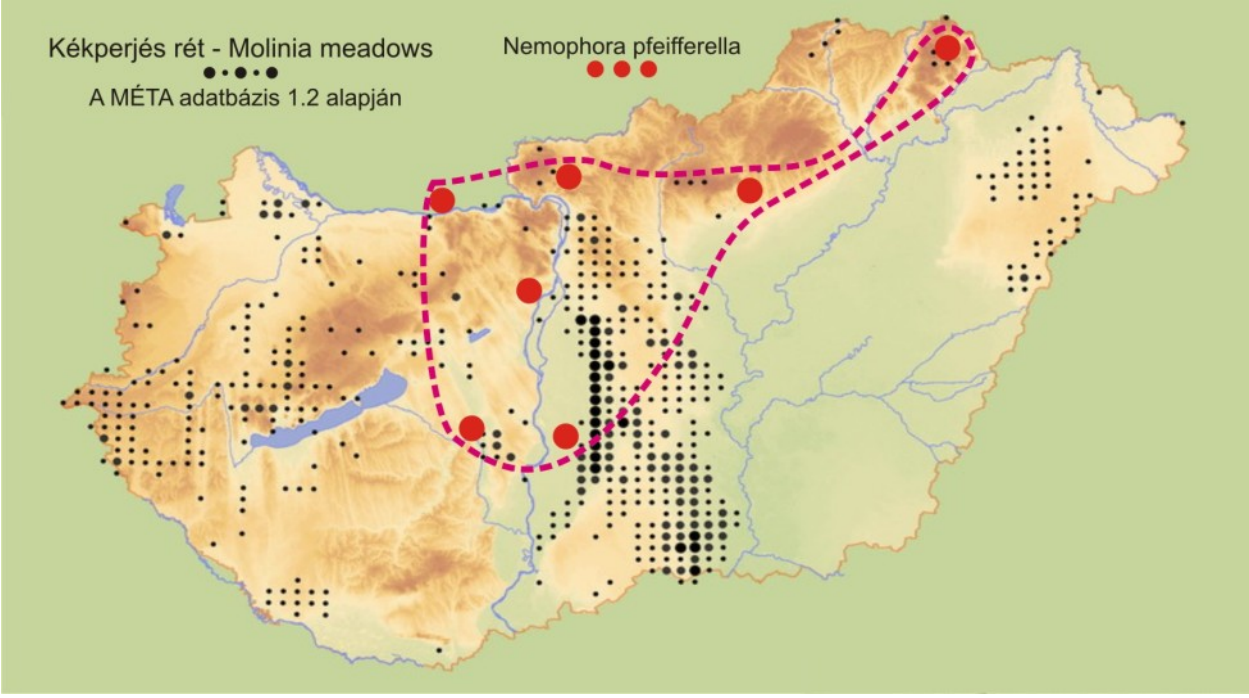
letén, egy csatorna mellett többször megfigyelte, hogy a *N. pfeifferella* héjakút mácsonya (*Dipsacus laciniatus* L.) virágzatába, a tüskék közé rakja tojásait. A hernyó a növény szárában él, majd a gyökérben vagy a földben bábozódik valószínűleg még abban az évben. Az imágók pedig tejoltó galajon (*Galium verum* L.) táplálkoztak. A lepkék preferálják a virágokban gazdag, sűrűbb aljnövényzetet.

Élőhely – Habitat (5. ábra – Fig. 5.): Kaszálók, száraz gyepek, sztyeprétek, sziklagyepek, mérsékelten száraz, mérsékelten üde tölgyes erdők szegélyek. A *N. pfeifferella* preferálja a virág gazdag, meszes talajú kékperjés réteket (*Succiso-Molinetum hungaricae*), amely Magyarország legelterjedtebb kiszáradó láprét társulása, főként a Dunántúlon és a Duna–Tisza közén, s areája leginkább Közép-Európára esik (Borhidi & Sánta 1999). Védett társulás, Corine azonosító szám: 37.311. Az élőhely fennmaradásának veszélyforrásai: a gyepek feltörése, az intenzív gyepgazdálkodás, a felülvetés, spontán erdősödés és cserjésedés, a tájidegen gyomok terjedése, motocross okozta taposás. Főként a kaszálóként való hasznosítás javasolt, nyár végi, vagy ősz eleji kaszálással.

Magyarországi elterjedés – Distribution in Hungary: – 1 ex, Bánk, Nógrád m., 1949.VII.8., leg. Éhik, Loksa (coll. MTM); – 1 ex, Érsekcsanád, 1933.VII.20., leg. Erdős (coll. MTM); – 1 ex, Feldebrő, 1938.VII.8., leg. Erdős (coll. MTM); – 1 ex, Simontornya, 1909.VII.28. (coll. Pillich, in MTM); – Zempléni-hegység; Kemence-völgy (Ronkay & Szabóky 1981);

4. ábra. Százhalombatta és környéke
Fig. 4. Landscape near Százhalombatta

5. ábra. Kékperjés rét, a *Nemophora pfeifferella* tipikus habitatja *Gymnadenia conopsea* virágzáskor
Fig. 5. *Molinia* meadow with *Gymnadenia conopsea* in Hungary. Typically habitat of *Nemophora pfeifferella* (http://www.tankonyvtar.hu/site/upload/2008/09/images_2510.jpg)



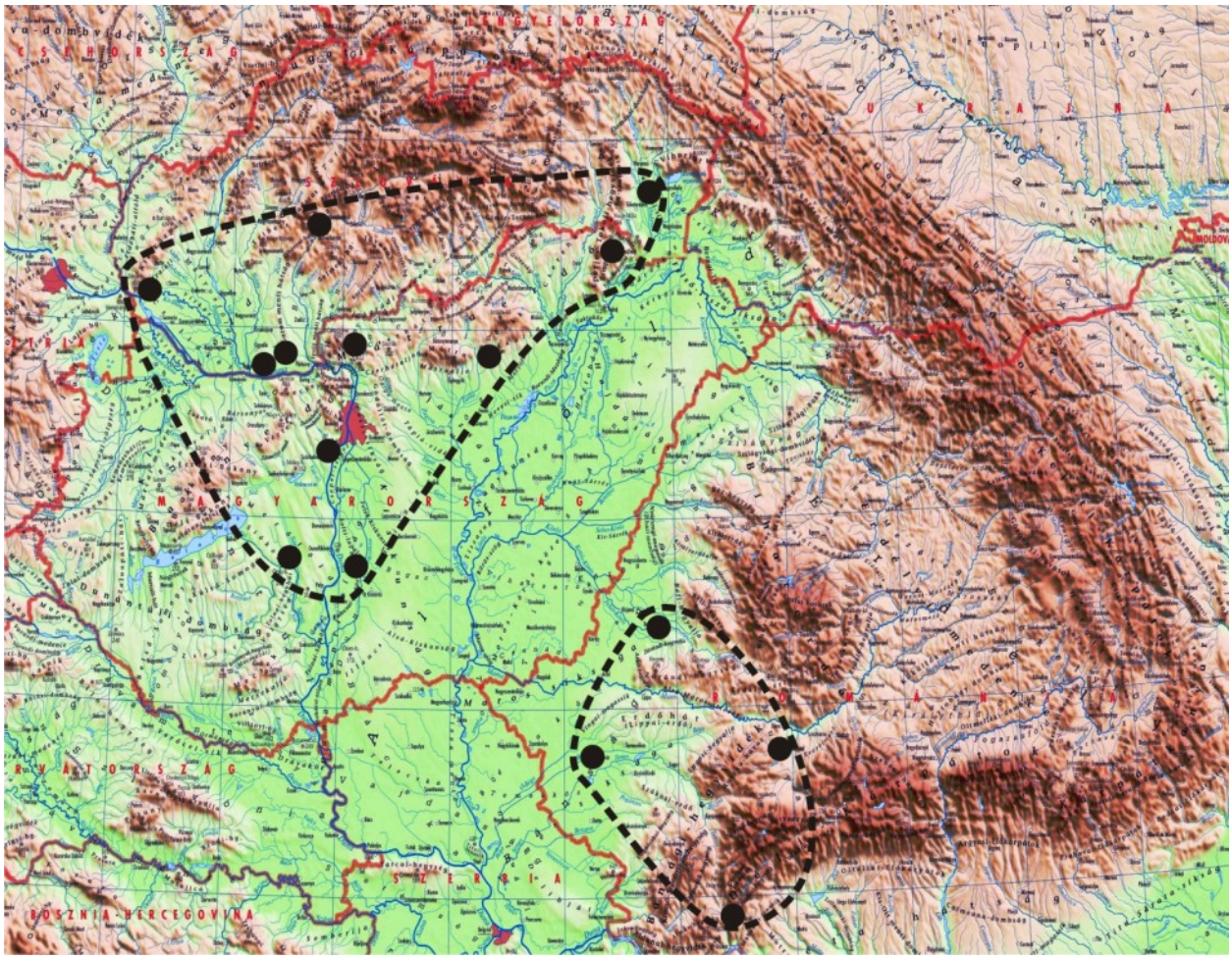
6. ábra. A Kékperjés rétek és a *Nemophora pfeifferella* elterjedése Magyarországon
Fig. 6. Distribution of Molinia meadows and *Nemophora pfeifferella* in Hungary

– Új adat: Százhalombatta, déli lakótelep melletti erdősáv, 2009.07.17., fotó: Kurucz Lajos.

Lelőhelyek a Kárpát-medencében – Localities in Carpathian Basin (7. ábra – Fig. 7.)**:** – 3 ex, [Románia] Borosjenő, 1911.VIII.4., 1913.VI.9., leg. Diószeghy ; – 3 ex, [Románia] Herkulesfürdő, 1904.VII.24., leg. Uhryk ; – 2 ex, [Románia] Tamánd, Arad m., 1912.VII.24., leg. Schmidt (minden példány az MTM gyűjteményében). Reiprich és Okáli (1988) szerint Szlovákiában a következő helyeken gyűjtötték: Bratislava – Petržalka Sv; Trnava Msk; Iža Ps; Mužla, Štúrovo No; Krivoštianka Tr. Romániai adatok (Popescu-Gorj 1964): Hùnedoara, Timişoara (Casa Verde).

Palearktikus elterjedés – Distribution in Palaearctic: Gozmány (1965) még közép-európai fajnak tekintette. Ismert jelenlegi elterjedési adatok: Ausztria, Bosznia-Hercegovina, Bulgária, Csehország, Horvátország, Franciaország, Közép-Oroszország, Lengyelország, Magyarország, Németország, Románia, Svájc, Szlovákia, Ukrajna (http://www.faunaeur.org [2010.06.11.]).

Természetvédelem – Natural conservation: A XIX. század végén, a faj magyarországi elterjedéséről Abafi-Aigner et al. (1896) még csak a következőket közölték: „Teste H.-Schäffer etiam Hungariae incola". A XX. század közepe táján Gozmány (1965) is mindössze két lelőhelyről tudott. Bajorországban vörös listás faj, s nagy valószínűséggel kipusztult (Pröse et al. 2003). A hazai populációk részletes elterjedése, nagysága nem ismert. Kutatásokat megnehezíti, hogy 1909 óta szinte alig kerültek elő bizonyító példányok. A *N. pfeifferella* preferálja a kékperjés réteket, ezért a magyar állományok védelme szempontjából ezeket a habitatokat kell előnyben részesíteni. Az élőhelyek eltűnésében, megszűnésében közrejátszik az, hogy sok kékperjés rétet szántónak használnak/használtak. Az elhagyott kékperjések többsége elcserjésedik. A megfigyelések szerint a művelés felhagyása után viszonylag rövid idő alatt – propagulum forrás megléte mellett – helyreáll réttársulás, de a helyi *N. pfeifferella* állomány megfelelő metapopulációs kapcsolat nélkül regionálisan eltűnik vagy kipusztul. A kékperjés rétek kis vízhiány alatt kevésbé degradálódnak, de kiszáradás esetén a sztyep- és szikes réti fajok foglalják el. A megfelelő vízkészletű dunántúli és alföldi rétek kezelésére a természetvédelmi szempontokat előnyben részesítő kaszálást és szarvasmarha-legeltetés ajánlják a botanikusok. Mivel a fajt hazánkban a középtávoli jövőben élőhelyein a kihalás veszélye fenyegeti természetvédelmi szempontból védelme indokolt.



7. ábra. A *Nemophora pfeifferella* lelőhelyei a Kárpát-medencében
Fig. 8. Localities of *Nemophora pfeifferella* in Carpathian Basin

Magyarországi *Nemophora* fajok jegyzéke
Checklist of Hungarian *Nemophora* species
Nevezéktan és szinonimák Kozlov (2004) alapján.

Genus ***Nemophora*** Hoffmannsegg, 1798

1. ***N. degeerella*** (Linnaeus, 1758)
2. ***N. ochsenheimerella*** (Hübner, [1813])
   Nemotis chibiana Matsumura, 1931
   Nemophora japanalpina Yasuda, 1957
3. ***N. raddaella*** (Hübner, 1793)
   Tinea raddella Hübner, [1796], lapsus calami
   Alucita latreillella Fabricius, 1798
   Nemotis raddaëllus Wocke, 1871
   Nemaotis algeriensis Walsingham, 1907
4. ***N. metallica*** (Poda, 1761)
   Phalaena scabiosella Scopoli, 1763
   Nemotois aerosellus Zeller, 1850
   Nemotois rebelellus Turati, 1924
5. ***N. pfeifferella*** (Hübner, 1813)
   Adela chrysochraon Razowski, 1978
   Adela huebneri Koçak, 1980
6. ***N. cupriacella*** (Hübner, 1819)
7. ***N. violellus*** (Stainton, 1851)
   Adela violaria Razowski, 1978
8. ***N. prodigellus*** (Zeller, 1853)
   Nemotois auricellus Ragonot, 1874
   Nemotois splendidus Staudinger, 1880
9. ***N. fasciella*** (Fabricius, 1775)
   Tinea schiffermillerella [Denis et Schiffermüller], 1775.
   Nemotois annae Zeller, 1853.
   Nemotois purpureus Stainton, 1867
10. **? *N. mollella* (Hübner, [1813]) ***
    Nemotois molellus Hartmann, 1880
    Nemotois glabrata Meyrick, 1922
11. ***N. minimella*** ([Denis & Schiffermüller], 1775)
    Nemotois schiffermillerellus var. *lenellus* (Zeller, 1853).
12. ***N. dumerilella*** (Duponchel, [1839])
    Adela inauratella Duponchel, 1844.
    Tinea basochesella Hübner, [1824], nomen oblitum.
13. ***N. associatella*** (Zeller, 1839)
    Tinea megerlella Hübner, [1810], nomen oblitum.

Jegyzetek – Notes: A *Nemophora mollella* (Hübner, 1813) fajt először Szent-Iványi (1945) közölte Budafokról és Budapestről. Gozmány (1965) „molella HBN." (sic!) néven csak egyetlen budapesti lelőhelyéről tett említést. Pastorális (2010) szerint a *N. mollella*-t hazánkban több évtizede nem gyűjtötték, s bükki adata (Ács & Szabóky 1993) téves határozáson alapul. Kozlov (2006) megállapította: „The spelling of this name was nearly consistent during almost two centuries." [= *Nemotis molellus* Hartmann, 1880, incorrect subsequent spelling.]

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Köszönöm Bálint Zsoltnak (MTM, Budapest), hogy a gyűjteményi adatok közlésében segítségemre volt. Megköszönöm Kurucz Lajosnak (Százhalombatta) értékes fényképfelvételeit, valamint Pastorális Gábornak (SK-Komárno) a kézirat átolvasását és faj szlovákiai megfigyeléseinek személyes közlését. Taxonómiai, állatföldrajzi kérdésekben M. V. Kozlov (Turku, Finnország) volt segítségemre. Az angol nyelvű összefoglaló korrektúrájában Barry Goater (GB, Chandlers Ford) működött közre.

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Weboldalak – Internet websites

– http://www.tankonyvtar.hu/site/upload/2008/09/images_2510.jpg – [5. ábra – Fig. 5.]

– https://msw.botanika.hu/meta/2_terkepek_2.0/KV_EH_d2_elterjedes_2.0.htm – [6. ábra – Fig. 6.]

e • Acta Naturalia Pannonica
e–Acta Nat. Pannon. 1 (2): 219–222. (2010)

Az Archips oporanus (Linnaeus, 1758) Baranyában

Archips oporanus (Linnaeus, 1758) in Baranya County, Hungary (Microlepidoptera: Tortricidae)

Fazekas Imre

Abstract – Fazekas I. 2010: *Archips oporanus (Linnaeus, 1758) in Baranya County, Hungary (Microlepidoptera: Tortricidae). – e-Acta Naturalia Pannonica 1 (2): 219–222.* – The author announces the presence of *Archips oporanus* (Linnaeus, 1758) in South Hungary, the first records of the species in Baranya County. The male genitalia and distribution maps are illustrated with line drawings. The family Tortricidae in Baranya County is now known to contain 250 species. With 6 figures.

Summary – Baranya County is the most southern territory of Hungary. The author has been researching the fauna of the moths since 1970's. Up to now approximately 250 Tortricidae species have been recorded from the County, but this is the first report of *Archips oporanus* (Linnaeus, 1758). The larva feeds mainly on pine (*Pinus*), but the other important foodplant is *Juniperus*. Local strongholds of *Juniperus* are only in the nearby Somogy County. The pine-woods are not native in southern Hungary, and only small plantations woods which are known. *A. oporanus* must therefore be an adventive element of the fauna. The new locality is in a small building estate built in a beech forest. The pines were planted in the gardens 60-70 years ago. *A. oporanus* has been collected elsewhere in Hungary in the West Hungarian Borderland, Transdanubian Hills and North Hungarian Mountains.

Key words – Lepidoptera, Tortricidae, *Archips oporanus*, new records, faunistic survey, biology, Hungary.

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Bevezetés – Introduction

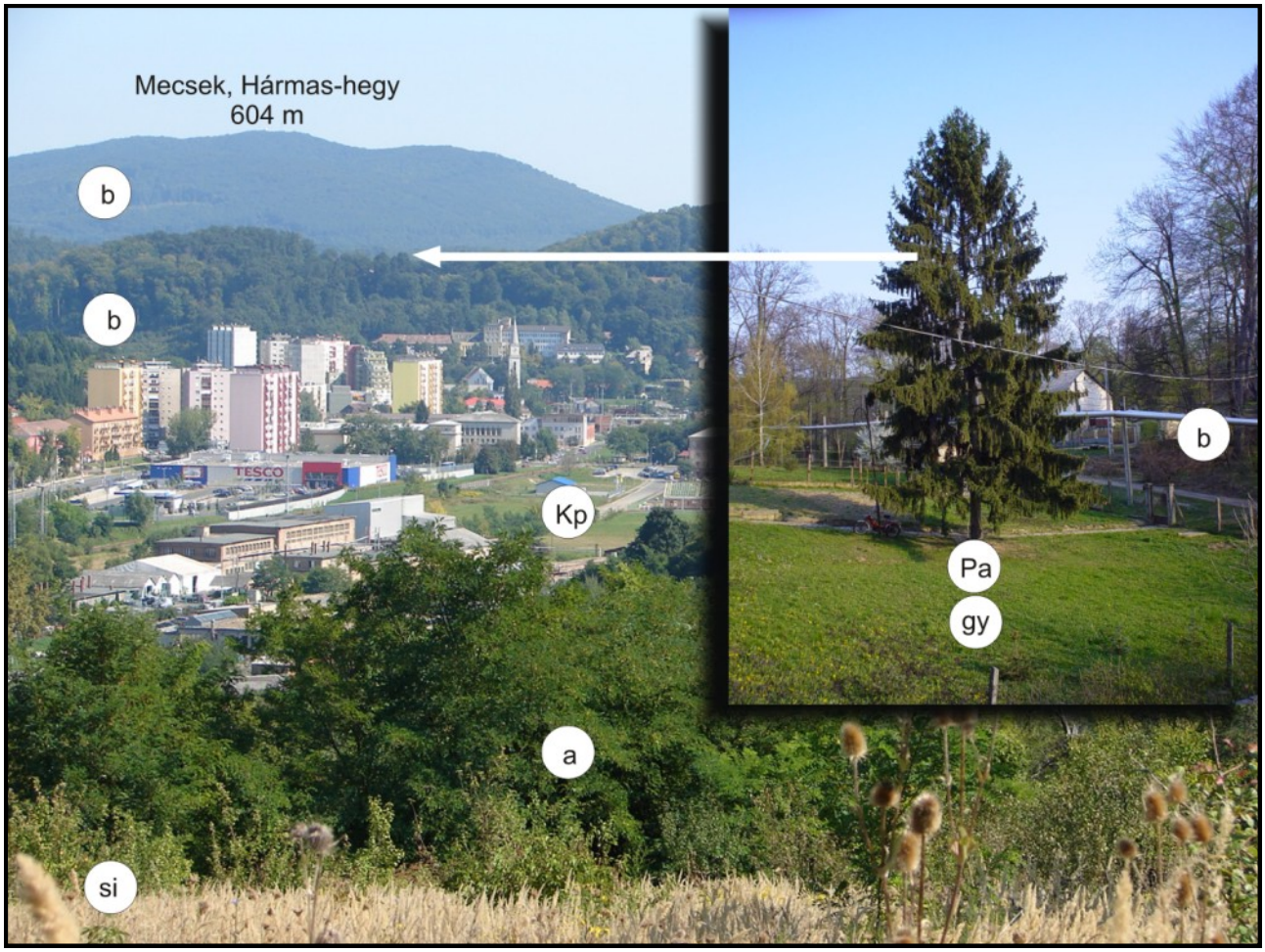
Magyarországról eddig öt *Archips* Hübner 1822 faj került elő (Pastorális 2010): *A. oporana* (Linnaeus, 1758), A. *podana* (Scopoli, 1763), A. *crataegana* (Hübner, 1799), A. *xylosteana* (Linnaeus, 1758), A. *rosana* (Linnaeus, 1758). Közülük az *Archips oporanus* lokális elterjedésű, egyes földrajzi területeken még nem találták meg, míg másutt rendkívül ritka.

Életciklusával, a hernyók nevelésével főleg Szőcs (1977) foglalkozott. A piceo-pinetális jellegű taxon feltehetőleg, csak az Alpokalja térségében őshonos, míg más térségekben a fenyők ültetésével telepedett meg. A Dél-Dunántúlon korábban csak Kaposvárott gyűjtötték (Fazekas 2001; Szabóky 1983, Szőcs 1977 [= *Archips piceana* L.]).

A tanulmány célja, hogy áttekintse a fajjal kapcsolatos magyarországi kutatásokat, s megrajzolja az előzetes földrajzi elterjedési térképet.

Archips oporanus (Linnaeus, 1758)
Phalaena Tortrix oparana Linnaeus, 1758, Systema Naturae, ed. 10: 530.
Synonyma: *Phalaena piceana* Linnaeus, 1758; *Tortrix hermanniana* [Denis & Schiffermüller], 1775; *Lozotaenia dissimilata* Bentley, 1845; *Cacoecia similis* Buttler, 1879; *Cacoecia bathyglypta* Meyrick, 1912; *Cacoecia impervia* Meyrick, 1928.
Irodalom – References: Bradley et al. 1973; Fazekas 2002, 2007; Kennel 1921; Kuznetzov 1978; Razowski 2001, 2002.

Diagnózis – Diagnosis: A hímek szárnyainak fesztávolsága 14–19,5 mm, a nőstényeké 14–29 mm. Az ivari dimorfizmus jelentős. A hímek vörösesbarna, határozott szubbazális-, mediális- és szubterminális rajzolati elemei kiemelkednek a vöröses szürkés alapszínből. A nőstények sárgásvöröses alapszínében a rajzolati egységei jobban tagoltak, s a mediális harántszalag az elülső szegélytől a háti szegélyig fut. A hím és nőstény genitália szerkezetét a 4. ábra mutatja be.

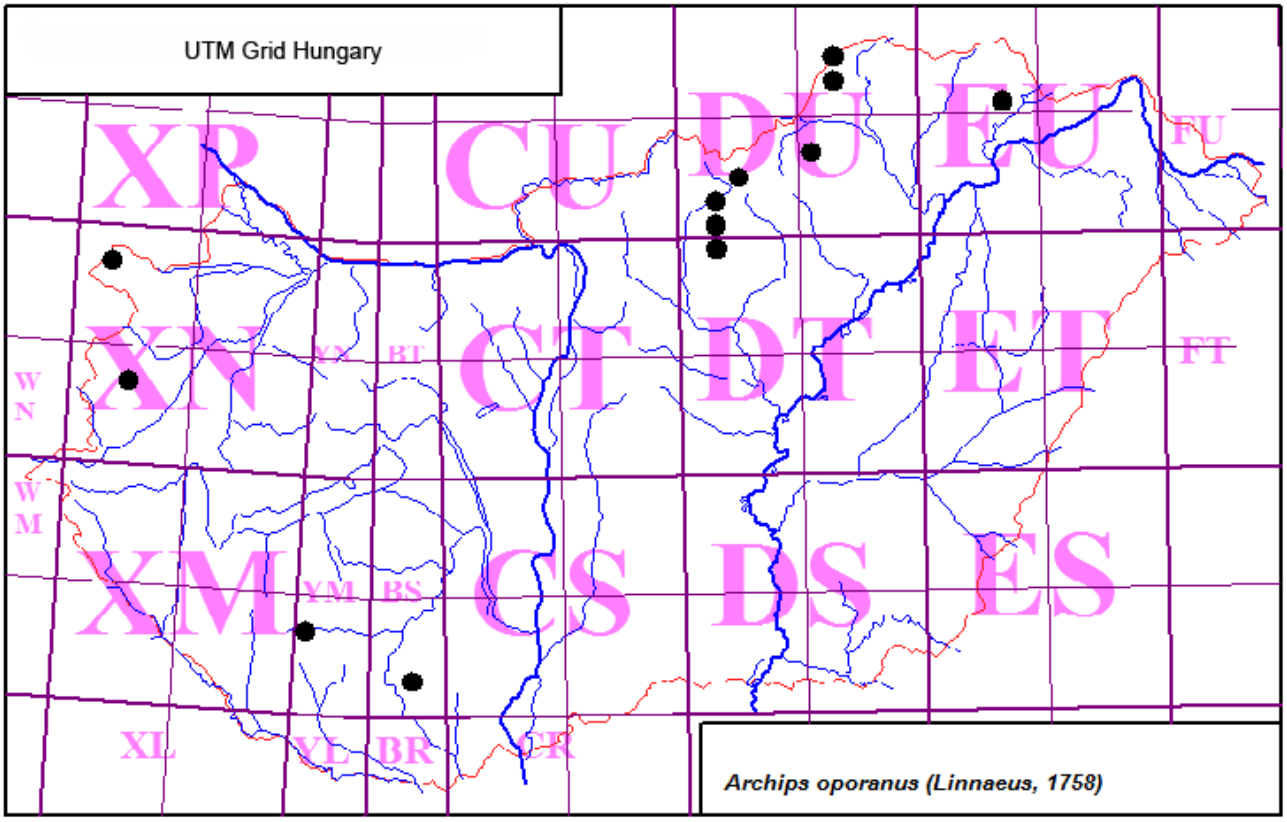


1. ábra. Az *Archips oporanus* habitatja Komlón: **a**) akácos, **b**) bükkös, **gy**) gyepes udvar, **Kp**) Kaszánya-patak völgye, földalatti csatornában, iparterületekkel, **Pa**) *Pinus abies* a Hasmány-tetőn, **si**) felhagyott szőlők és gyümölcsösök siska nádtippannal (fotó: Fazekas 2009).

Fig. 1. Habitat of *Archips oporanus* in Komló: **a**) black locust plantation, **b**) beech wood, **gy**) kitchen garden, **Kp**) valley of Kaszánya-stream with industrial, commercial, and agricultural ruderal sites, **Pa**) *Pinus abies* in orchard, **si**) semi-natural vegetation of abandoned vineyards and orchards (photo: Fazekas 2009).

2. ábra. *Archips oporanus* imágók: ♂ (balra), ♀ (jobbra)

Fig. 2. Adults of *Archips oporanus* : ♂ (left), ♀ (right).



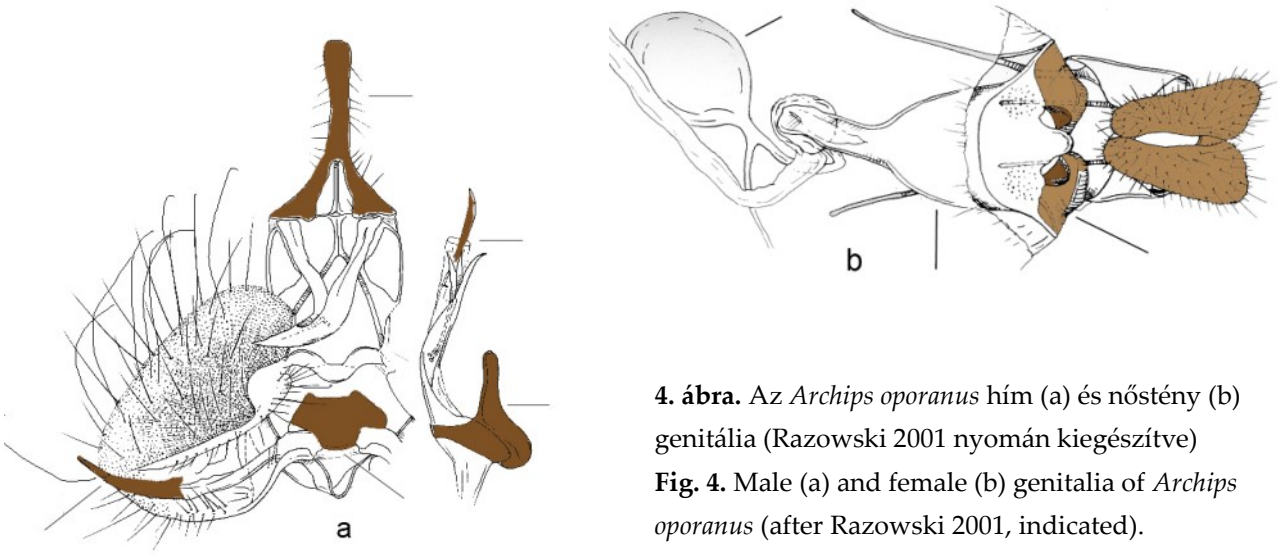
3. ábra. Az *Archips oporanus* elterjedése Magyarországon

Fig. 3. Distribution of *Archis oporanus* in Hungary

Biológia – Biology: A oligofág hernyók augusztus végétől – áttelelés után – tavaszig a következő fenyő - és boróka-félék tűlevelein élnek, s ott is bábozódnak: *Pinus sylvestris* L., *Abies alba* Mill., *Picea albies* (L.) Karst., *Larix decidua* Mill. és *Juniperus communis* L. Kennel (1921) más szerzőkre utalva említést tesz *Rubus, Acer, Fraxinus, Carpinus* tápnövényekről is, de ezt a legújabb európai és palearktikus monográfiák nem erősítették meg (Bradley et al. 1973; Razowski 2001, 2002). Idehaza Szőcs (1977) fenyőkön, borókán figyelte meg hernyóit, s csak májusi és júniusi adatokat közölt, viszont Heringre hivatkozva megjegyezte, hogy ez „…egyáltalán nem valószínű, tekintettel a [faj] repülési idejére…". Szerinte a fiatal lárvák „Coleophora-szerűen" csak a test elejével mennek be az aknába, a levélen kerek lyukat, majd járatokat rágnak, s a későbbi stádiumban az összefont levelek között élnek. A hernyók alapszíne világoszöld, a fej és a nyakpajzs fekete. Az irodalmi adatok szerint az imágók Európában májustól szeptember elejéig repülnek, de DK-Ázsiában két generációs populációkat is találtak (Razowski 2002).

Magyarországi elterjedés: Megvizsgált anyag – Examined material: 1 ex, H–Komló, Hasmány-tető, 2009.05.20., leg. Fazekas, I. A korábbi vizsgálatok során a megyéből nem került elő (Fazekas 2002, 2007). Hazai elterjedés: – Sopronbánfalva, Szombathely, Kaposvár, Makkoshotyka (Szőcs 1977); Kaposvár, Sopron (Szabóky 1983); – Nagyvisnyó, Gyöngyös, Rudolftanya, Mátraszentistván, Fényespuszta (Buschmann 2004); – Aggtelek, Jósvafő (Szabóky 1999); a szerző a fajt a hazai fauna montán elemének tartja. Palearktikus areája, habitatpreferenciája ezt nem erősíti meg, hiszen Eurázsia boreális, szubboreális zónájában, a síkvidéki fenyvesekben, borókásokban is elterjedt.

Földrajzi elterjedés – Geographical distribution: Szőcs (1977) még csak európai elterjedéséről tudott, bár Kennel (1921) már korábban ázsiai adatokat is közölt (= *Cacoecia priceana* L. [sic!], ugyanakkor Szőcs ugyanazon könyvének 201. oldalán már a következőket írta: „Európai és ázsiai faj;…". Transzpaleaktikusan Vietnámtól, Tajvantól, Kínán és Japánon át egészen Európáig (Razowski 2002) el-



4. ábra. Az *Archips oporanus* hím (a) és nőstény (b) genitália (Razowski 2001 nyomán kiegészítve)
Fig. 4. Male (a) and female (b) genitalia of *Archips oporanus* (after Razowski 2001, indicated).

terjedt, de Bradley et al. (1973) és Kuznetzov (1978) megemlítik É-Amerikából is. A Brit-szigeteken már nagyon lokális előfordulású (Bradley et al. 1973).

Jegyzet – Remarks: A lucfenyő (*Picea abies*) és a vörösfenyő (*Larix decidua*) őshonossága csak a nyugati határvidéken feltételezhető, a dealpin jellegű *Abies alba* Soprontól az Őrségig szórványos (Bartha, Mátyás 1995), viszont az erdeifenyő (*Pinus sylvestris*) teljes bizonysággal csak a Nyugat-Dunántúlon őshonos, egyéb előfordulásai erdőtelepítés jellegűek (Bartha, Mátyás 1995). Az *A. oporanus* feltehetőleg az összes nagyobb kiterjedésű, telepített fenyvesünkben megvan, hiszen olyan kisebb, szálanként ültetett fenyőkön is felbukkan, mint az új komlói lelőhely, ahol 60–70 évvel ezelőtt, kerti díszként (4–példány) honosították meg.

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e • Acta Naturalia Pannonica

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Definition and description of new dinoflagellate genus, species and subspecies from the Pannonian Stage (Hungary)

Mária Sütőné Szentai

Abstract – Sütőné Szentai M. 2010: *Definition and description of new dinoflagellate genus, species and subspecies from the Pannonian Stage (Hungary). – e-Acta Naturalia Pannonica 1 (2): 223–239.*
The main focus of the study is the definition of the *Virgodinium* nova genus and the related species *Virgodinium asymmetricum* n. sp., *Virgodinium asymmetricum* subsp. *primus* n. ssp., *Virgodinium asymmetricum* subsp. *tertius* n. ssp., *Virgodinium asymmetricum* subsp. *quatuor* n. ssp., *Virgodinium transformis* n. sp. from the Pannonian formations of the Pannonian Basin. As an additional result, revision of species published formerly and classified into the genus *Millioudodinium,* like *Millioudodinium baltesi* SÜTŐ-SZENTAI 1990, *Millioudodinium foveolatum* SÜTŐ-SZENTAI 1982, *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990, *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990 have been completed, together with their relocation into the genus *Virgodinium.* Another result is the relocation of the taxon *Gonyaulax digitalis* /POUCHET 1883/ KOFOID 1911 subsp. *secundus* SÜTŐ-SZENTAI 1991 into the genus *Virgodinium.*

Összefoglalás – A Pannon-medence Pannóniai formációiból az egyik legfontosabb nemzetség, fajok és alfajok leírását tartalmazza a dolgozat: *Virgodinium* n. gen., *Virgodinium asymmetricum* n. sp., *Virgodinium transformis* n. sp., *V. asymmetricum primus* n. ssp., *V. asymmetricum tertius* n. ssp., *Virgodinium asymmetricum* subsp. *quatuor* n. ssp. A korábban publikált *Millioudodinium* nemzetségből a következõ fajokat soroltam át a *Virgodinium* nemzetségbe: *Millioudodinium baltesi* SÜTŐ-SZENTAI 1990, *Millioudodinium foveolatum* SÜTŐ-SZENTAI 1982, *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990, *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990. Továbbá a *Gonyaulax digitalis* (POUCHET 1883) KOFOID 1911 subsp. *secundus* FUCHS et SÜTŐ-SZENTAI 1991 alfajt is a *Virgodinium* nemzetségbe soroltam át.

Key words – Dinoflagellate, Pannonian, *Virgodinium* n. gen. *Virgodinium asymmetricum n. sp., Virgodinium transformis n. sp., V. asymmetricum primus n. ssp., V. asymmetricum tertius n. ssp., V. asymmetricum quatuor n. ssp.*

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Introduction

Among organic *phytoplankton* of the formations in the Pannonian Stage, in addition to *dinoflagellates*, forms of *Chlorophyceae* and the *Acritarcha* of ambiguous taxonomy can be observed, thus the adequate summarizing term is the *organic microplankton* assemblage.

The first species of this assemblage in the Pannonian Basin have been described by Mrs. LÁSZLÓ NAGY from borehole Hidas-53 (NAGY 1965, 1966, 1969) and by NICOLAE BALTES (BALTES 1971) in Romania. Their taxonomic interpretation is underway currently as a focus of an international research, that is based partly on the work of the referred authors.

Among the more than a hundred morphotypes, designated by numbers temporarily, 26 *dinoflagellates* and 2 *acritarcha* species have been described (SÜTŐ-SZENTAI 1982a, 1982b, 1985, 1986, 1990, 1991, 1994, 1996, 2000).

The first description of the genus *Virgodinium* and the species *V. asymmetricum*, together with the definition of the sub-species, is incorporated as a manuscript into the annual report of the OTKA Nr. T 5498 for 1993-1994. The description of the genus, two species and three subspecies is given below.

Methods

The morphological description and identification of dinoflagellates can be based on the tabulation system of C. A. KOFOID 1911, or on that of W. R. Evitt 1985.

The description of the species is-given according to the tabulation system of C. A. Kofoid 1911; the taxonomical interpretation of them is based on works of L. E. Stover & W. R. Evitt 1978, R. A. Fensome & al. 1993 and G. L. Williams et al. 1998.

The first identifications were made according to the tabulation system of the species Gonyaulax digitalis (C. A. KOFOID 1911, D. WALL & B. DALE 1970), while the subsequent revisions were made according to genera descriptions by L. E. Stover & W. R. Evitt (1978), however, none of the descrip-

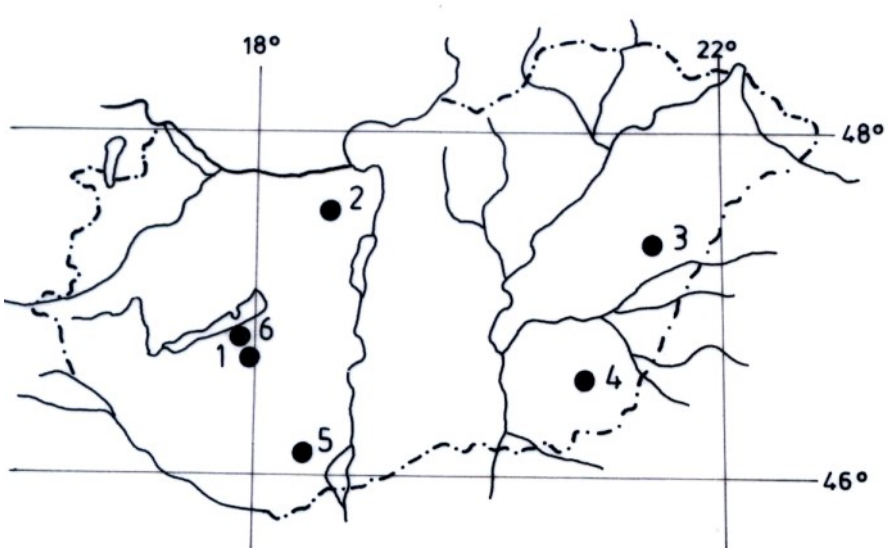

Fig. 1.

Geographic positions of the boreholes: 1. Som No. 1 deep hole, 2. Budajenő No. 2 borehole, 3. Derecske No. 1 deep hole., 4. Csanádapáca Nord No. 2 deep hole, 5. Nagykozár No. 2 borehole, 6. Szólád No. 1 I/1 borehole.

Derecske (3)
▼

tions of any formerly defined genus has been sufficient to identify unambiguously the observed forms, foreshadowing that the dinoflagellates so common in formations of the Pannonian Stage of the Pannonian Basin have to be classified into a new genus.

The genus *Virgodinium* is classified into the family *Gonyaulacaceae.* The subspecies *Virgodinium asymmetricum primus*, as the genotype of the genus *Virgodinium* has been chosen from a bed of the *Spiniferites bentorii oblongus* zone within the *Csákvár Claymarl Formation* in the borehole Nagykozár No. 2; where, 20 m below the targeted sample a rhyodacite tuff bed has been observed and sampled between 263.67 and 263.7 m, the radiometric age of which is 11.6 ± 0.6 m. y. (analyzed by KADOSA BALOGH in VASS et al. 1987) SÜTŐNÉ SZENTAI M. 2002.

The species and subspecies of the genus Virgodinium were separated from the Early Pannonian Csákvár Claymarl in the boreholes Budajenő No. 2, Szólád No. 1 I/1, Som No. 1; and from Nagykörü Claymarl, Endrőd Formations, in the deep holes Csanádapáca É No. 2., Derecske No. 1. (Fig. 1).

Database – Datamanagement

The genotype of the genus *Virgodinium* and the preparations of the holotypes and paratypes together with the photo-negatives are stored at József Attila City Library and Museum Collection,

Local Government Komló, H-7300 Komló, Városház tér 1.

Results – Description of the new genus, species and subspecies

Division: *Dinoflagellata* (BÜTSCHLI 1885) FENSOME et al. 1993
Subdivision: *Dinocaryota* FENSOME et al. 1993
Class: *Dinophyceae* PASCHER 1914
Subclass: *Peridiniphycidae* FENSOME et al. 1993
Order: *Gonyaulacales* TAYLOR 1980
Suborder: *Gonyaulacineae* (Autonym)
Family: *Gonyaulacaceae* LINDEMANN 1928
Subfamily: *Gonyaulacoideae* (Autonym)

Genus: *Virgodinium* n. gen.
Plate I. figs. 1-6., Plate II. figs. 1-6., Plate III. figs. 1-4., Plate IV. figs. 1-6., drawn figures 2 c, d, g, h, i, j, k.

Derivatio nominis: Virgo (lat.) the genus is named after the constellation Virgo.

Locus typicus: Budajenõ No. 2 borehole, Transdanubia, Hungary.

Stratum typicum: Early Pannonian *Spiniferites bentorii pannonicus, Spiniferites bentorii oblongus* and *Pontiadinium pecsvaradensis* zones.

The zone Spiniferites bentorii oblongus is located above the rhyodacite tuff of 11.6 ± 0.6 M.Y. in the borehole Nagykozár No. 2 (VASS et al. 1987; Mrs. SÜTÕ 2002).

According to the analogies the assemblage of this zone in the boreholes Budajenő No. 2, Som No. 1, Szólád No. 1 I/1, Derecske No. 1 is isochronous with the assemblage at Nagykozár (Table 1).

The genotype, the holotypes and paratypes of the species classified into the genus are observed in the Early Pannonian beds above in the *Spiniferites bentorii* pannonicus, *Spiniferites bentorii oblongus and Pontiadinium pecsvaradensis* zones.

The Virgodinium genus passing to Late Pannonian Spiniferites balcanicus main zone too.

Genotype: *Virgodinium asymmetricum* subsp. *primus* n. gen. n. sp. n. ssp., Plate I. fig. 1., drawn figures 2 i.

Diagnosis: The bases of the diagnosis of the genus, in addition to the *Virgodinium asymmetricum* ssp. *primus*, are the *Virgodinium asymmetricum* ssp. *secundus*, *Virgodinium asymmetricum* ssp. *tertius*, *Virgodinium asymmetricum* ssp. *quatuor*, and the tabulation system of the *Virgodinium transformis*.

Shape: It changes from the ovoid to the subspherical, quadrate, the hypotheca is parabolic and the epitheca can be slightly conic, with apical horn.

In the case of ovoid forms, the lateral asymmetry is originated from the inflated appearance of the apical plates 2′, 3′.

As it has been observed on given specimens of the Virgodinium asymmetricum ssp. secundus, the side opposite of the archeopyle can be deformed even in the hypotheca (Plate IV. figs. 4-6.).

Thus its stationary position is sideward and the orientation of the fossilization is lateral. The subspherical forms can be observed in any position, their apical horn cannot be observed always, however, the characteristic plate 6″ of triangle form can be seen regularly adjusting the depth of focus. The well developed apical horn is protruding, rarely small. Marked antapical horn can not be observed. The wall seems to be double-layered at magnification of 600-1000, though at such resolution the description of the fine structure cannot be performed. The sculpture is approximately smooth, finely or coarsely granulated, grits-like, foveolat, sometimes warted. There are observations of specimens with pyritized walls, however, with still determinable tabulation.

The colour is golden yellow – yellow in shallow boreholes. In deep holes their color is brown, dark brown or black.

Tabulation can hardly be observed on their strongly weathered walls; therefore they can be determined only as genera or species.

Tabulation: 4′, 6″, 6c, 6‴, 1p, 1⁗.
The shape of the plate 6″ is definitely triangle.
Within the sulcus, at the boundary of the cingular plates, accessorial plates can also occur.

The development of accessorial plates has been observed on specimens from the *Spiniferites bentorii oblongus* and the *Pontiadinium pecsvaradensis* zones. The sutures of the tabulation are sharp contoured with thickness of 1-3 μm. Membranes cannot be observed on the sutures.

Archeopyle: it is the precingular plate 3″ with polygonal form.

Cingulum: it is helicoid, gradually descending; the difference in height at the ends can reach, or at certain species, can exceed the total width of the cingulum.

Sulcus: The stripe between the apical and antapical poles is straight or gently arched.

Size: ranges between 50-90 μm in length, 40-74 μm in width, however, in extreme cases they can be both smaller and greater.

Differential diagnosis: At the original determination of the fossil *Impagidinium* genus (STOVER and EVITT 1978) the shape of the plate 6" is not entirely triangular, „subtriangular", the apical horn is missing, the form is definitely sub-spherical (drawn figures 2 e, f).

The fossil *Gonyaulacysta* genus has been defined by G. DEFLANDRE (1964), the description according to W. A. S. SARJEANT (1966) has been extended by L. E. STOVER and W. R. EVITT (1978).

At the genera *Gonyaulacysta* and *Millioudodinium* L. E. STOVER and W. R. EVITT 1978, the shape of the plate 6" is „subrectangular".

The tabulation system of the genus occurred in the Pannonian Basin is converging to that of the recent species *Gonyaulax digitalis* (POUCHET 1883) KOFOID 1911.

In the tabulation system of the recent *Gonyaulax digitalis* and *Gonyaulax spinifera* species the shape of the plate 6" is triangle (drawn figures 2 a).

These species were differentiated based on the differences in perforations on the plates 1' and 4', so they can hardly be differentiated from each other (WALL and DALE 1970).

In the recent species the plate 6", next to the cingulum, is elongated towards the sulcus. At the fossil species this plate is conservatively triangle, and elongated towards the apical end. Pores on the plates 4' and 1' have not been observed.

The differences between the recent and Pannonian species give reason to determine the new genus.

Occurrence: it appears in the *Spiniferites bentorii pannonicus* zone only as a few specimens, and it becomes frequent from *Spiniferites bentorii oblongus* zone remaining a persistent form to the upper part of the dinoflagellate bearing tract of the Pannonian Stage.

***Virgodinium asymmetricum* n. gen. n. sp.**

Plate I. figs. 1-3., Plate II. figs. 1-6., Plate III. figs. 1-4., Plate IV. figs. 1-2., 4-6., drawn figures 2 c, d, i, j, k.

Modern synonym: *Gonyaulax digitalis* (POUCHET 1883) KOFOID 1911.

Derivatio nominis: referring to the lateral asymmetry.

Locus typicus: Budajenő No. 2 borehole, Transdanubia, Hungary.

Stratum typicum: Early Pannonian *Spiniferites bentorii pannonicus, Spiniferites bentorii oblongus* and *Pontiadinium pecsvaradensis* zones.

Holotype: *Virgodinium asymmetricum ssp. primus* Budajenõ No. 2 borehole 70,0-77,5 m *Spiniferites bentorii oblongus* zone, Csákvár Claymarl Formation, Plate I. fig. 1. drawn figures 2 i.

Paratypes: *Virgodinium asymmetricum ssp. primus* Szólád No. 1 I/1 borehole 226,4-227,5 m *Spiniferites bentorii oblongus* zone, Csákvár Claymarl Formation, Plate II. figs. 1-4; Som No. 1 deep hole 462,0-467,0 m *Pontiadinium pecsvaradensis* zone, Csákvár Claymarl Formation, Plate II. fig. 5; Derecske No. 1 deep hole 4406,0-4406,3 m, *Spiniferites bentorii oblongus* zone, Endrőd Formation, Plate IV. fig. 1.

Diagnosis: The bases of the diagnosis of the *Virgodinium asymmetricum* are the tabulation systems of the subspecies allocated into the species: *Virgodinium asymmetricum* ssp. *primus, Virgodinium asymmetricum* ssp. *secundus, Virgodinium asymmetricum* ssp. *tertius* and *Virgodinium asymmetricum* ssp. *quatuor*.

The shape ranges from ovoid to sub-spherical and it has lateral asymmetry (Virgodinium asymmetricum ssp. primus Plate II. figs. 1, 5.).

The hypotheca is parabolic and the epitheca can be slightly conic (V. asymmetricum ssp. tertius Plate I. figs. 2-3., Plate II. fig. 6.).

The contour, sculpture and the possible deformity of hypotheca show differences in case of *V. assymmetricum* ssp. *secundus* ssp. (Plate IV. figs. 4-6.).

The apical horn is generally well developed, emerging. The sulcus is gently arched or straight. The wall is double-layered with thickness of 1-2 μm. The sculpture is finely granulated, grits-like, and sometimes warted.

The color is golden yellow – yellow in the Early Pannonian beds of shallow boreholes. In deep holes their color is brown, dark brown or black, and the original sculpture is fractured on cannot be seen (Plate IV. figs. 1, 2, 3).

Tabulation can hardly be observed on their strongly weathered walls; therefore they can be determined only as genera or species.

The archeophyle is always the plate 3" of the epitheca, and it has polygonal appearance.

Tabulation is 4', 6", 6c, 6"', 1p, 1"". Within the sulcus, accessorial plates can also occur at certain subspecies.

Peculiarity of the tabulation: The apical plates 1' and 4' above the sulcus are elongated. The table 6" is markedly triangular and elongated towards the plate 4'. Its apex is in direkt connection with the early apex of the plate 4' or determinated 1-5 μm below.The plates 1", 3", 5" of the epitheca have pentagonal form.The plates 2", 4" of the epitheca and plate 4"'of the hypotheca has nearly trapezoidal shape. The side of the plate 2" is arched alongside the plate 1" and 2" plate is situated early than the plate 4".

The plate 1"' of the hypotheca is aborted, the sides of the plate 2"' are arched. The plate 3"' is quadrate, its sulcus-ward tip is in connection with the inserted plate 1p. The plate 6"' is quadrate trapezoidal.

The antapical plate 1"" is subrectangular. It is in contact with 3"', 4"', 5"', 6"' and 1p plates. The sutures of the tabulation are simple, straight, with various thicknesses ranging between 1-3 μm. Membranes cannot be observed on the sutures. Appendices and stumps on the sutures are characteristic only at a single subspecies, namely the *Virgodinium asymmetricum ssp. secundus*.

The plates of the cingulum are elongated and have never regular rectangle shape, since their margins are gently stretched by the sutures of the plates in the epitheca and hypotheca. The cingulum is gently helicoid.

Sizes: the *Virgodinium asymmetricum* species are 50-90 μm length, 40-74 μm in width. Apical horn is 1-8 μm.

Differential diagnosis: The species *Virgodinium asymmetricum* frequent in the Pannonian strata resembles most of all to the recent *Gonyaulax digitalis*. The similar characteristics are the shape and precingular position of the plate 3", the definitely triangular shape of the plate 6", the lateral asymmetry and the well developed apical horn.

The most marked differences between the *Gonyaulax digitalis* and the *Virgodinium asymmetricum* are the characteristic "S" curve of the sulcus, the elongation of the plate 6" towards the cingulum and the pore-lines at the plate 4' and 1' in the case of the recent *Gonyaulax digitalis*.

Note: The tabulation of the first specimens of the *Virgodinium asymmetricum* in the *Spiniferites bentorii pannonicus* zone is frequently incomplete, and the sutures are markedly thin. The tabulation system of the species is more developed since the *Spiniferites bentorii oblongus* zone.

***Virgodinium asymmetricum* subsp. *primus* n. gen. n. sp. n. ssp.**

Plate I. fig. 1, Plate II. figs. 1-5, Plate IV. fig. 1, drawn figures 2 i.

Syn. *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *primus* SÜTŐ-SZENTAI 1982a Plate II. figs. 1-3. no description. – *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *primus* SÜTŐ-SZENTAI 1988 Pl. III. fig. 2. no description. – *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *primus* SÜTŐ-SZENTAI 1988 Pl. III. fig. 2. – „name not validly published": no description – in Williams et al. 1998. p. 731.

Derivatio nominis: primus (lat.) the first copies appearing in the Pannonian layers.

Locus typicus: Budajenő No. 2 borehole, Transdanubia, Hungary.

Stratum typicum: Early Pannonian *Spiniferites bentorii pannonicus*, *Spiniferites bentorii oblongus* and *Pontiadinium pecsvaradensis* zones.

Holotype: Budajenő No. 2 borehole, 70,0-77,5 m, Early Pannonian, Csákvár Claymarl Formation *Spiniferites bentorii main* zone, *Spiniferites bentorii oblongus* zone, Plate I. fig. 1. drawn figures 2 i.

Paratypes: Szólád No. 1 I/1 borehole 226,4-227,5 m *Spiniferites bentorii oblongus* zone Plate II. Figs. 1-4.; Som No 1 deep hole 462,0-467,0 m Early Pannonian *Pontiadinium pecsvaradensis* zone Plate II. Fig. 5; Derecske No. 1 deep hole 4406,0-4406,3 m *Spiniferites bentorii main* zone, *Pontiadinium pecsvaradensis* zone, Early Pannonian, Endrőd Formation, Plate IV. fig. 1.

Diagnosis: The shape sub-spherical, sometimes oval. Lateral asymmetry is characteristic. The apical horn is remarkable, protruding, with height of 2-5 μm. The sulcus is gently arched or straight. The wall is double-layered, with thickness of about 1 μm. The sculpture seems to be smooth, finely granulated, sometimes warted. The colour is light yellow in the Early Pannonian strata of the shallow boreholes, but change into golden-yellow downward. The color is determined by the thickness of the wall. In deep holes their color is brown, dark brown or black.

The archeophyle is the plate 3″ of polygonal shape on the epitheca.

Tabulation: 4′, 6″, 6c, 6‴, 1p, 1⁗. Accessorial plates within the sulcus can not be observed. The plate 6″ is markedly triangle and elongated towards the apical end. The tip of the plate 6″ is in direct connection with the early tip of the plate 4′.The width of the sutures is 1 μm or smaller. The cingulum is gently helicoid, the descending starts at plate 3c and end at the sulcus, the rate of the descending is one cingulum width.

Sizes: the holotype is 68 μm in length and 59 μm in width, the apical horn is 4 μm. The size of the paratypes ranges between 50 and 90 μm in length and between 43- and 79 μm in width. The size of the paratypes ranges in the *Spiniferites bentorii pannonicus* zone between 53-60 μm in length and 45-50 μm in width, the apical horn between is 2-5 μm. The width/length ratio is 0,89, (based on measuring of 15 specimens leaving the apical horn out of consideration).

Differential diagnosis: The suture of the tabulation is the thinnest at this subspecies. The species *V. asymmetricum* is the most rounded among its subspecies.

***Virgodinium asymmetricum* ssp. *tertius* n. gen. n. sp. n. ssp.**

Plate I. figs. 2-3. Plate II. fig. 6. Plate IV. fig. 2. drawn figure 2 j.

Syn. *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *tertius* SÜTŐ-SZENTAI 1988, no description, Pl. III. fig. 6. – *Gonyaulax digitalis* (POUCHET, 1883) KOFOID 1911 subsp. *tertia* SÜTŐ-SZENTAI 1988 „Name not validly published: no description" – in WILLIAMS et al. 1998, p. 731.

Derivatio nominis: tertius (lat.) the third characteristic one appearing in the Pannonian layers taxa.

Locus typicus: Som No. 1 deep hole, Transdanubia, Hungary.

Stratum typicum: Pannonian, *Spiniferites bentorii oblongus, Pontiadinium pecsvaradensis* zones and in the *Spiniferites balcanicus* main zone.

Holotype: Som No. 1 deep hole 462,0-467,0 m *Spiniferites bentorii* main zone, *Pontiadinium pecsvaradensis* zone, Early Pannonian, *Csákvár Claymarl Formation*. Plate I. fig. 2.

Paratypes: Som No. 1 deep hole 462,0-467,0 m Plate I. fig. 3., drawn figure j., Plate II. fig. 6., Derecske No. 1 deep hole 4406,0-4406,3 m *Spiniferites bentorii* main zone, *Pontiadinium pecsvaradensis* zone Early Pannonian, *Endrőd Formation*, Plate IV. fig. 2.

Diagnosis: Its colour is ovoid, the hypotheca is parabolic and the epitheca can be slightly conic. Protruding apical horn of 1,6-10 μm and lateral asymmetry are the most characteristic features. The wall is double-layered, the sculpture ranges from the gently to coarsely granulated, sometimes warted, but never grit-like or spongy.

The archeopyle is the plate 3″ of polygonal shape. Tabulation: 4′, 6″, 6c, 6‴, 1p, 1⁗. Accessorial plates can also occur within the sulcus, similar to the *Virgodinium transformis*. The sutures of the tabulation are 1-1.5 μm in width, and have marked appearance. The cingulum is gently helicoid, it is ended at the sulcus, with different of one cingulum width.

Size: the holotype is 80 μm in length and 62 μm without apical horn. The apical horn is 4 μm. The size of the paratypes ranges between 48-80 μm in length, 41-67 μm in width. Apical horn 1,6 - 10 μm. The width/length ratio is 0.8 (based on measuring of 15 specimens leaving the apical horn out of consideration).

Differential diagnosis: It can be differentiated from the *Virgodinium asymmetricum* ssp. *primus* based the shape, sharper appearance of the sutures of the tabulation and on the more developed tabulation system. Considering the tabulation systems the differential features are the occurrence of the accessorial plates within the sulcus and the occurrence of apical plates.

***Virgodinium asymmetricum* subsp. *quatuor* n. gen. n. sp. n. ssp.**

Plate III. figs. 1-4, drawn figure 2 k.

Syn. *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911) subsp. *quatuor* SÜTŐ-SZENTAI 1988, no description Pl. III. fig. 3. – *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911)*subsp. quatuor* SÜTŐ-SZENTAI 1988 „name not validly published: no description" – in WILLIAMS et al. 1998. p. 731.

Derivatio nominis: quatuor (lat.) the fourth is well-separated taxon inside the species in Early Pannonian layers.

Locus typicus: Som No. 1 deep hole Transdanubia, Hungary.

Stratum typicum: Early Pannonian, some specimens occur already in the *Spiniferites bentorii oblongus* zone, but it became really frequent only in the *Pontiadinium pecsvaradensis* zone.

Holotype: Som No. 1 deep hole 462.0–467.0 m *Pontiadinium pecsvaradensis* zone Plate III. figs. 1-2. drawn figure 2 k.

Paratype: Som No. 1 deep hole 462,0-467,0 m *Pontiadinium pecsvaradensis* zone Plate III. figs. 3-4.

Diagnoses: The form is ovoidal, with apical horn. The lateral asymmetry is where observable. The apical horn is double on the holotype, and paratypes, reflecting the separaion of the endophragma from the periphragma. (This feature can be related to the ontogenesis, thus should not be regarded as any special feature of the species and/or subspecies.) The wall is smooth or finely granulated.

Tabulation: 4', 6", 6c, 6"', 1p, 1"". The plate 6" is markedly triangular. Archeopyle: 3", polygonal. Sutures are of 1.5 μm in width. The inclination of the cingulum is determined by the plates 5c, 6c. The size of the holotype is 87 μm in length and 63 μm in width. Apical horn of the holotype 4 μm.

The size of the paratypes: Plate III. fig. 3. 85x66 μm, Plate III. fig. 4. 72x55 μm. The largest length is 90 μm. The apical horn of the paratypes 2-4 μm. The length/width ratio is 0.76 (based on measuring of 15 specimens leaving the apical horn out of consideration).

Differential diagnosis: It is allocated to the species *Virgodinium asymmetricum*, due to its lateral asymmetry and based on the tabulation. It differs from the other subspecies in its larger size.

It differs from the species *Virgodinium baltesi* in the more developed apical horn that is hardly observable at the *V. baltesi* holotype moreover the latter has markedly egg-shape (SÜTŐ SZENTAI 1990 Plate V. fig. 3).

Sutures of the species *Virgodinium pelagicum* are thickened; the walls are regularly warty (SÜTŐ SZENTAI 1990 Plate IV. fig. 3).

On species of *Virgodinium transdanuvianum* the thin suture, elongated apical plates and strongly protruded apical horn are characteristic. Its contour is regularly quadrate (SÜTŐ-SZENTAI 1990 Plate IV. figs. 1-2).

***Virgodinium transformis* n. gen. n. sp.**
Plate I. figs. 4-6, drawn figures 2 g, h.

Derivatio nominis: transformis (lat.) transformed.

Locus typicus: Som No. 1 deep hole Transdanubia, Hungary.

Stratum typicum: Early Pannonian, *Spiniferites bentorii* main zone, *Spiniferites bentorii oblongus*, *Pontiadinium pecsvaradensis* zones.

Holotype: Som No. 1 deep hole 462.0-467.0 m; *Spiniferites bentorii* main zone, *Pontiadinium pecsvaradensis* zone, Early Pannonian, *Csákvár Claymarl Formation*, Plate I. figs. 4-5. drawn figures g-h.

Paratype: Som No. 1 deep hole, 462,0-467,0 m Plate I. fig. 6.

Diagnosis: Shape: sub-spherical – oval, with small and rarely observable apical horn of smaller than 1 μm. The wall is thin, 1 μm in thickness, double-layered the sculpture is smooth or finely granulated.

Archeopyle is the plate 3" of polygonal shape.
Tabulation: 4', 6", 6c, 6"', 1p, 1"".

The tabulation system is well developed; especially the well developed gonyaulacoid character of the plate 6" can be regarded as a marked feature. The triangle plate 6" is in direct contact with the tip of plate 4'.

Sutures are 1ìm in width, and their appearance is sharp.

Inserted accessorial plates in the sulcus are also characteristic, occurring below the upper line of the plate 6c and the early line of plate 1c.

The cingulum starts to be descendent at plate 6c ending at the sulcus, with different of smaller than one cingulum width related to the early line of plate 1c.

Sizes: the holotype is 57 μm in length and 48 μm in width. The size of the paratypes ranges between 57 and 75 μm in length and 48 and 67 μm in width. The apical horn 1 μm. The width/length ratio is 0,86 (based on measuring of 15 specimens leaving the apical horn out of consideration).

Differential diagnosis: It can be differentiated from the subspecies of the species *Virgodinium asymmetricum* based on the sub-spherical form, the hardly developed apical horn and on the lack of the lateral asymmetry. These species show transition towards the round species without apical horn.

Relocation of the formerly described or published taxa

***Virgodinium asymmetricum* subsp. *secundus* (SÜTŐ-SZENTAI 1991) nova combination**
Plate IV. figs. 4-6.

Syn. Gonyaulax digitalis (POUCHET, 1883) KOFOID, 1911 subsp. *secundus* SÜTŐ-SZENTAI M. 1991, Pl. 8. figs. 1-5, drawn figs. 2-3.
– *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *secunda* FUCHS and SÜTŐ-SZENTAI M. 1991 in Williams et al. 1998, p. 731.
– *Gonyaulax digitalis* (POUCHET, 1883) KOFOID, 1911 subsp. *secundus* SÜTŐ-SZENTAI 1988 no description, Pl. III fig. 4.
– in Sütőné Szentai M. 1997: Micropaleontological type material of Natural Historical Collection at Komló: 267-278 (p. 269).

Holotype: Aderklaa No. T 1 borehole 760,0 m, Tafel 8 fig. 5; Abb. 2. fig. 2.

Paratypes: Aderklaa No. T 1 borehole 760,0 m, Tafel 8. figures 1, 2; Abb. 3; Aderklaa No. T 1 borehole 610,0 m, Tafel 8 figure 3; Aderklaa No. T 1. borehole 600,0 m Tafel 3. Fig. 5; Som No. 1 deep hole 493,8-495,6 m Tafel 8. figures 4. - in FUCHS, R. & SÜTŐ-SZENTAI M. 1991.

Furtheres Paratypes: Budajenő No. 2 borehole 70,0 - 77,5 m *Spiniferites bentorii* main zone, *Spiniferites bentorii oblongus* zone, Early Pannonian, Csákvár Claymarl Formation, Plate IV. figs. 4-6.

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***Virgodinium baltesi* (SÜTŐ-SZENTAI 1990) n. comb.**

Syn. *Millioudodinium baltesi* SÜTŐ-SZENTAI 1990 p: 851-853. Pl. V. fig. 3. drawn fig. b.
– Millioudodinium baltesii SÜTŐ-SZENTAI 1990 „Name not validly published" in WILLIAMS et al. 1998 p. 405.
– Millioudodinium baltesi SÜTŐ-SZENTAI 1990
in SÜTŐNÉ SZENTAI M. 1997: Micropaleontological type material of Natural Historical Collection at Komló, 267-278 (p. 270).

***Virgodinium foveolatum* (SÜTŐ-SZENTAI 1982) n. comb.**

Syn. Millioudodinium foveolatum SÜTŐ-SZENTAI 1982, p. 219. Pl. II. figs. 1-5.
– *Apteodinium ?foveolatum* (SÜTŐ-SZENTAI 1982) LENTIN and WILLIAMS 1989, p. 21; in WILLIAMS et al. 1998, p. 406.
– *Millioudodinium foveolatum* SÜTŐ-SZENTAI 1982 in SÜTŐNÉ SZENTAI M. 1997: Micropaleontological type material of Natural Historical Collection at Komló 267-278 (p. 270).

***Virgodinium pelagicum* (SÜTŐ-SZENTAI 1990) n. comb.**

Syn. *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990 Pl. IV fig. 3, drawn fig. 78/d.
– *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1982b Pl. 4. figs. 3-4. nomen nudum.
– *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990 „Name not validly published" in Williams et al. 1998 p. 408.
– *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990 in SÜTŐNÉ SZENTAI M. 1997: Micropaleontological type material of Natural Historical Collection at Komló, 267 -278 (p. 271).

***Virgodinium transdanuvianum* (SÜTŐ-SZENTAI 1990) n. comb.**

Syn. *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990 Pl. IV figs. 1-2, drawn fig. 78/b.
– *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990 „Name not validly published" in WILLIAMS et al. 1998 p. 409.
– *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990
– in SÜTŐNÉ SZENTAI M. 1997: Micropaleontological type material of Natural Historical Collection at Komló: 267-278 (p. 271).

Discussion

The appearance of *dinoflagellate* since the Upper Triassic is proved in the Earth and the Pannonian Basin. Within the Pannonian Basin, in the Pannonian Stage, between 6 and 12 million years ten well differentiated assemblages have been developed successively, forming well identifiable stratigraphic zones (Table 1).

The emigration of the here developed, endemic forms is proved only in the *Galeacysta etrusca* zone, since the related forms have been reported out of the Pannonian Basin e.g. in Italy (POPESCU & al. 2007, 2009).

One of the most characteristic *dinoflagellate* species of the Pannonian strata shows taxonomical relations with the recent marine species *Gonyaulax digitalis – Spiniferites bentorii.* It was necessary to define a new genus for the species, though similar to the recent *Gonyaulax digitalis*, but much more variable in form.

The definition and description of the genus *Virgodinium*, two new species, the *Virgodinium asymmetricum* and the *Virgodinium transformis*, together with three subspecies, *Virgodinium asymmetricum* ssp. *primus* , *Virgodinium asymmetricum* ssp. *tertius*, Virgodinium asymmetricum ssp. quatuor are published in this study.

The relocation of formerly published species related to the genus *Virgodinium* is also performed, like the *Gonyaulax digitalis* (POUCHET 1883) KOFOID

1911 subsp. *secundus* SÜTŐ-SZENTAI 1991, *Millioudodinium baltesi* SÜTŐ-SZENTAI 1990, *Millioudodinium foveolatum* SÜTŐ-SZENTAI 1982, *Millioudodinium pelagicum* SÜTŐ-SZENTAI 1990, *Millioudodinium transdanuvianum* SÜTŐ-SZENTAI 1990.

Conclusions

Table 2. Characteristic features of the Virgodinium taxa.
2. Táblázat. A taxa jellemzőtulajdonságainak összefoglalása.

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Table 1. The situation of boreholes of the holotypes and paratypes in organic-walled microplancton zone.

1. táblázat A szervesvázú mikroplankton zonációban a holotípusok és a paratypusok fúrásainak helyzete.

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Key: ☼= ensembles demonstrared in boreholes; a fúrásokban kimutatott együttesek; ♦= the holotypes and paratypes of *Virgodinium* genus int he boreholes; a *Virgodinium* nemzetség holotypusai és

Era and Stage		Organic-walled microplankton zones			Assemblage of the examined boreholes and deep holes					
					1	2	3	4	5	6
LATE MIOCENE	PANNONIAN s.l.	Late Pannonian	Spiniferites balcanicus main zone	Mougeotia laetevirens zone 6-1,8 M.Y.	☼					
				Dinoflagellata-Zygnemataceae inter zone 7-6 Ma	Dinoflagellata-Zygnemataceae interzone					
				Galeacysta etrusca zone 7,9 Ma-7 Ma: Spiniferites cruciformis subzone						
				Galeacysta etrusca zone 7,9 Ma-7 Ma: Spiniferites virgulaeformis subzone				☼		
				Dinoflagellata-Zygnemataceae inter zone				☼	☼	
				Spiniferites tihanyensis zone 8,1 Ma				☼	☼	
				Dinoflagellata-Zygnemataceae inter zone				☼	☼	☼
				Spiniferites validus zone 9,2 Ma	☼			☼	☼	
				Spiniferites paradoxus-S. bentorii coniunctus zone 10,6 Ma	☼	Din.-Zyg.	☼	♦	☼	☼
		Early Pannonian	Spiniferites bentorii main zone	Pontiadinium pecsvaradensis zone 11 Ma	♦		♦		☼	
				Spiniferites bentorii oblongus zone 11,6 ± 0,5 M.Y.	☼	♦	☼		☼	♦☼
				Spiniferites bentorii pannonicus zone 11,8 Ma	☼	☼		☼	☼	
				Mecsekia ultima zone		☼			☼	
				Spiniferites bentorii pannonicus-Lingulodinium machaerophorum zone 12 M.Y.		☼			☼	
	Late Sarmatian			Spiniferites bentorii budajenoensis-Mecsekia incrassata zone 12,5 Ma ?		☼				

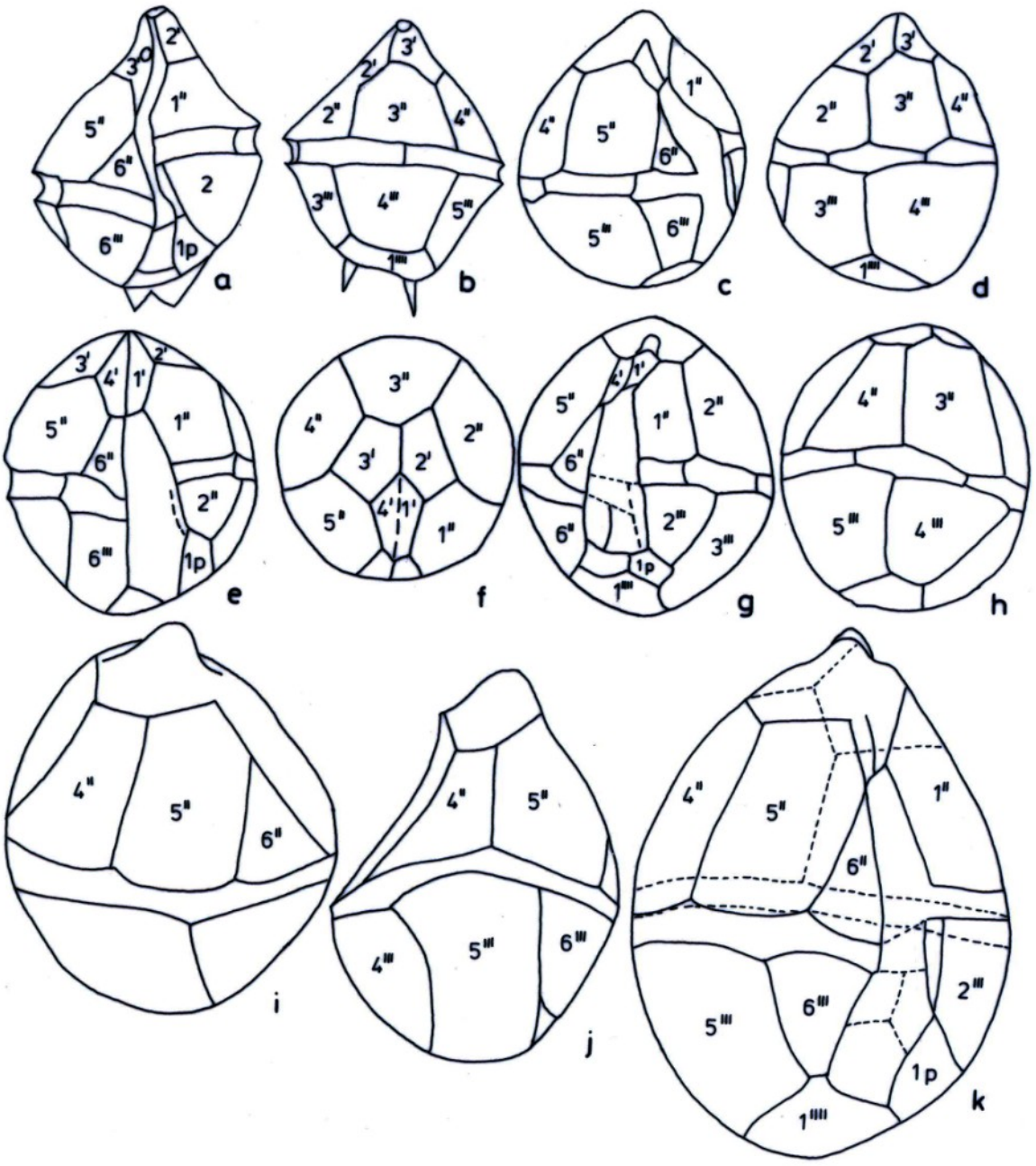

Fig. 2. Drawn figures: **a**. *Gonyaulax digitalis* (Pouchet 1883) Kofoid 1911 ventral side (Loring, Alaska) after C. A. Kofoid Pl 9. fig. 5; **b**. *Gonyaulax spinifera* (Claparede & Lachmann 1859) dorsal side (San Pedro Harbor) after C. A. Kofoid Pl.10. fig.9; **c-d**. *Virgodinium asymmetricum* n. gen. n. sp. ventral and dorsal sides; **e-f**. *Impagidinium* genus after Stover & Evitt 1978; **g-h**. *Virgodinium transformis* n. gen. n. sp. ventral and dorsal sides; **i**. *Virgodinium asymmetricum* subsp. *primus* n. gen. n. sp. n. ssp. ventral side; **j**. *Virgodinium asymmetricum* subsp. *tertius* n. gen. n. sp. n. ssp. ventral side; **k**. *Virgodinium asymmetricum* subsp. *quator* n. gen. n. sp. n. ssp.

Taxa	length	width	contour	sculpture	horn	l/w ratio
Virgodinium genus	50-95 µm	40-74µm	ovoid-sub-spherical, polygonal, drop-shaped, conic, quadrat, asymmetry can or cannot be	smooth, warted, granular, grit-like, foveolate	1-10 µm	0,83
Virgodinium asymmetricum	50-90 µm	40-74 µm	sub-sphaerical, ovoid, conic, asymmetric	smooth, warted, granular, grit-like, foveolate	1-10 µm	0,85
V. asymmetricum primus	50-90 µm	43-79 µm	sub-sphaerical asymmetric	smooth, finely granular, warted	2-5 µm	0.89
V. asymmetricum secundus	60,8-66 µm	54-62 µm	ovoid, asymmetric	grit-like	2-8 µm	0,88
V. asymmetricum tertius	48-80 µm	41-67 µm	ovoid, conic, asymmetric	finely granular, warted	1,6-10 µm	0.80
Virgodinium asymmetricum quatuor	72-90 µm	55-65 µm	ovoid, asymmetric	smooth, finely granular	2-4 µm	0,76
Virgodinium transformis	57-75 µm	48-67 µm	sub-spherical, without asymmetry	smooth, finely granular	1 µm	0,86
Virgodinium baltesi	80-90 µm	60-70µm	ovoid, quadrat	smooth, finely granular	1 µm	0.76
Virgodinium foveolatum	71-80 µm	59-73 µm	dropshaped, conic	foveolate, finely granular,	2-3 µm	0.87
Virgodinium pelagicum	88-95 µm	71-75 µm	Ovoid, polygonal	warted, suture stick	3-5 µm	0.78
Virgodinium transdanuvianum	76-90 µm	63-70 µm	Ovoid, quadrat	finely granular	5-8 µm	0.8

Table 2. Characteristic features of the *Virgodinium* taxa.

2. táblázat. A *Virgodinium* taxa jellemző tulajdonságainak összefoglalása

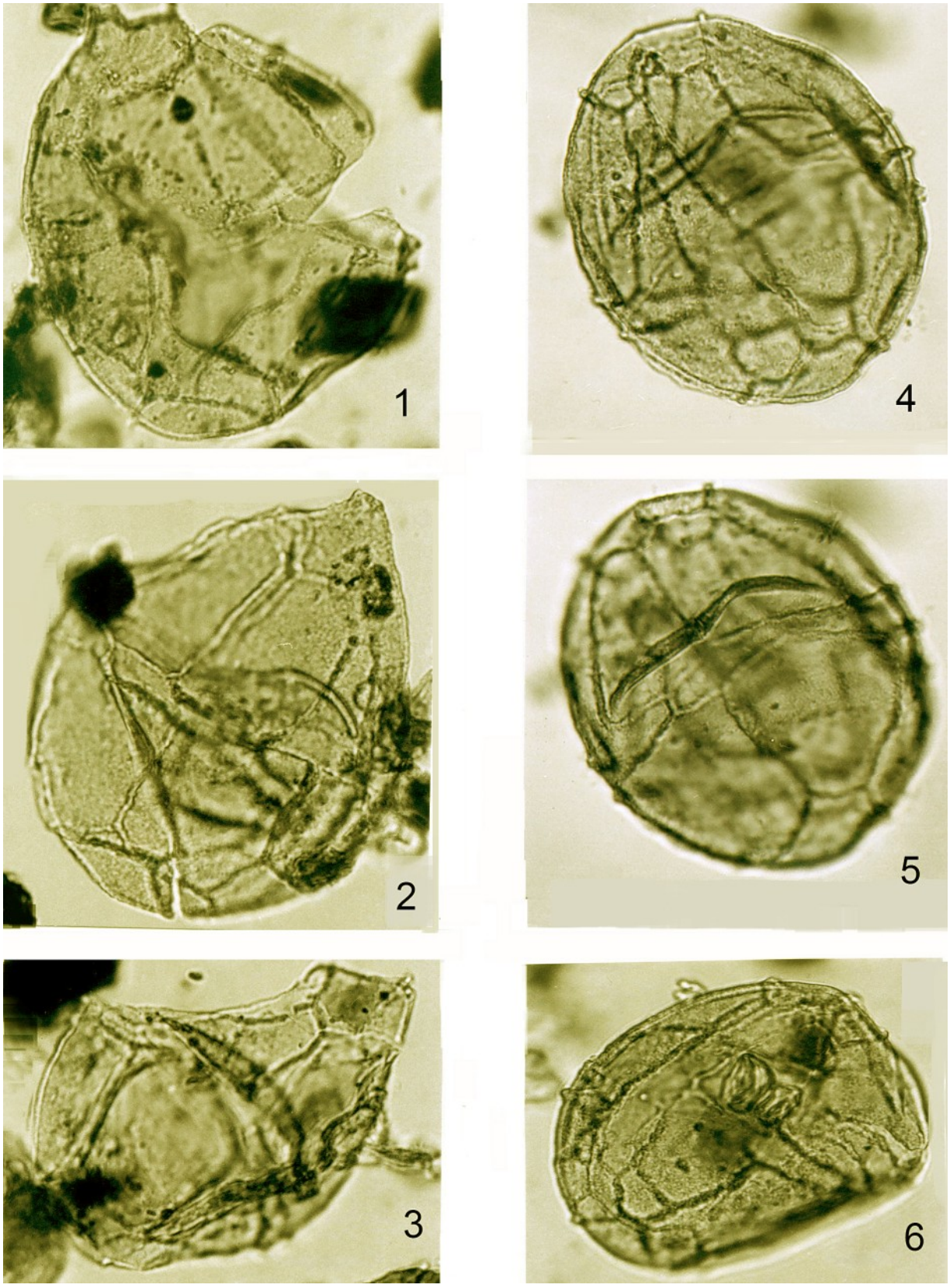

Plate I. 1. *Virgodinium asymmetricum primus,* Budajenő, No. 2 borehole 70,0-77,5 m, Holotype 68 x 59 μm; **2.** *Virgodinium asymmetricum tertius,* Som No. 1, deep hole 462,0-467,0 m, Holotype 80 x 62 μm; **3.***Virgodinium asymmetricum tertius,* Som No. 1, deep hole 462,0-467,0 m, Paratype 67 x 51 μm; **4–5.** *Virgodinium transformis,* Som No. 1, deep hole 462,0-467,0 m, Holotype 57 x 48 μm; **6.** *Virgodinium transformis,* Som No. 1, deep hole 462,0-467,0 m, Paratype 62 x 55 μm.

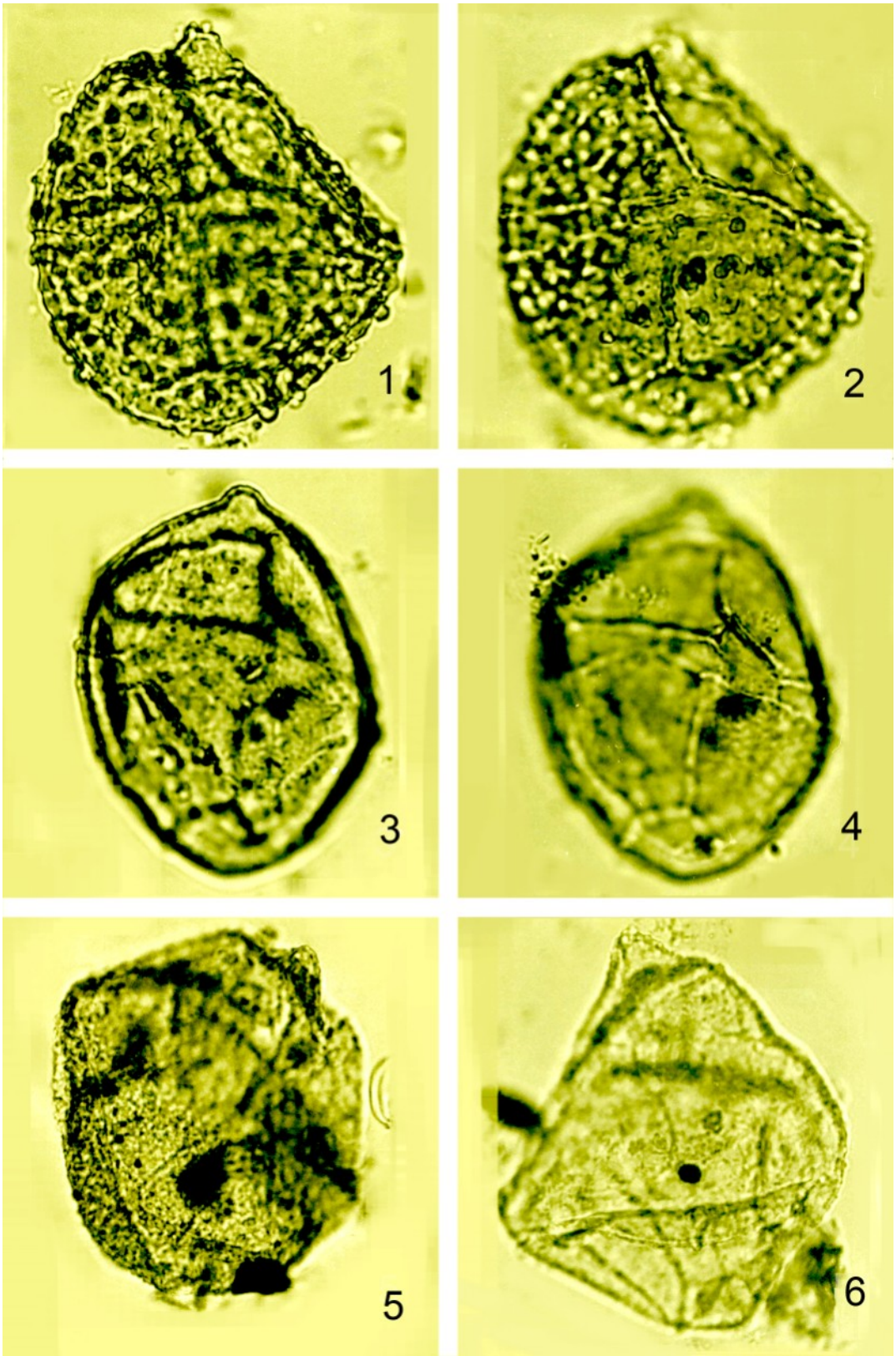

Plate II. 1—5. *Virgodinium asymmetricum primus* **1–4.** Szólád No.1 I/1 borehole 226,4-227,5 m. figs. **1–2.** paratype 63x59 μm, figs. **3–4.** paratype 62x47 μm, **5.** Som No. 1 deep hole 462,0-467,0 m paratype 58x57 μm. **6.** *Virgodinium asymmetricum tertius* Som No. 1 deep hole 462,0-467,0 m, Paratype 65 X 56 μm.

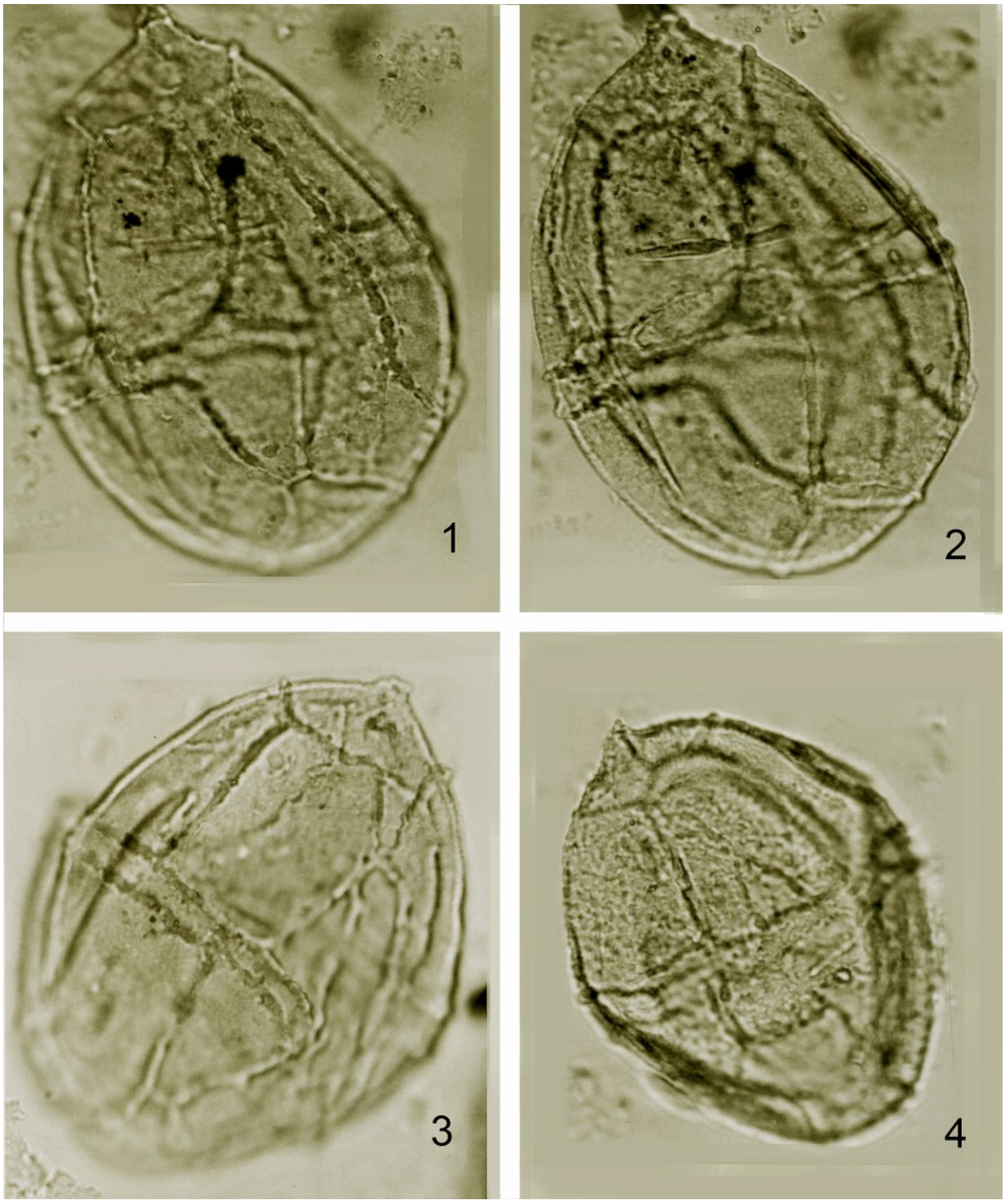

Plate III. figs. **1–4.** *Virgodinium asymmetricum quatuor* Som No. 1, deep hole 462,0-467,0 m, figs, **1–2**. Holotype 87x63 μm, fig, **3.** paratype 85x66 μm, **4.** paratype 72x55 μm.

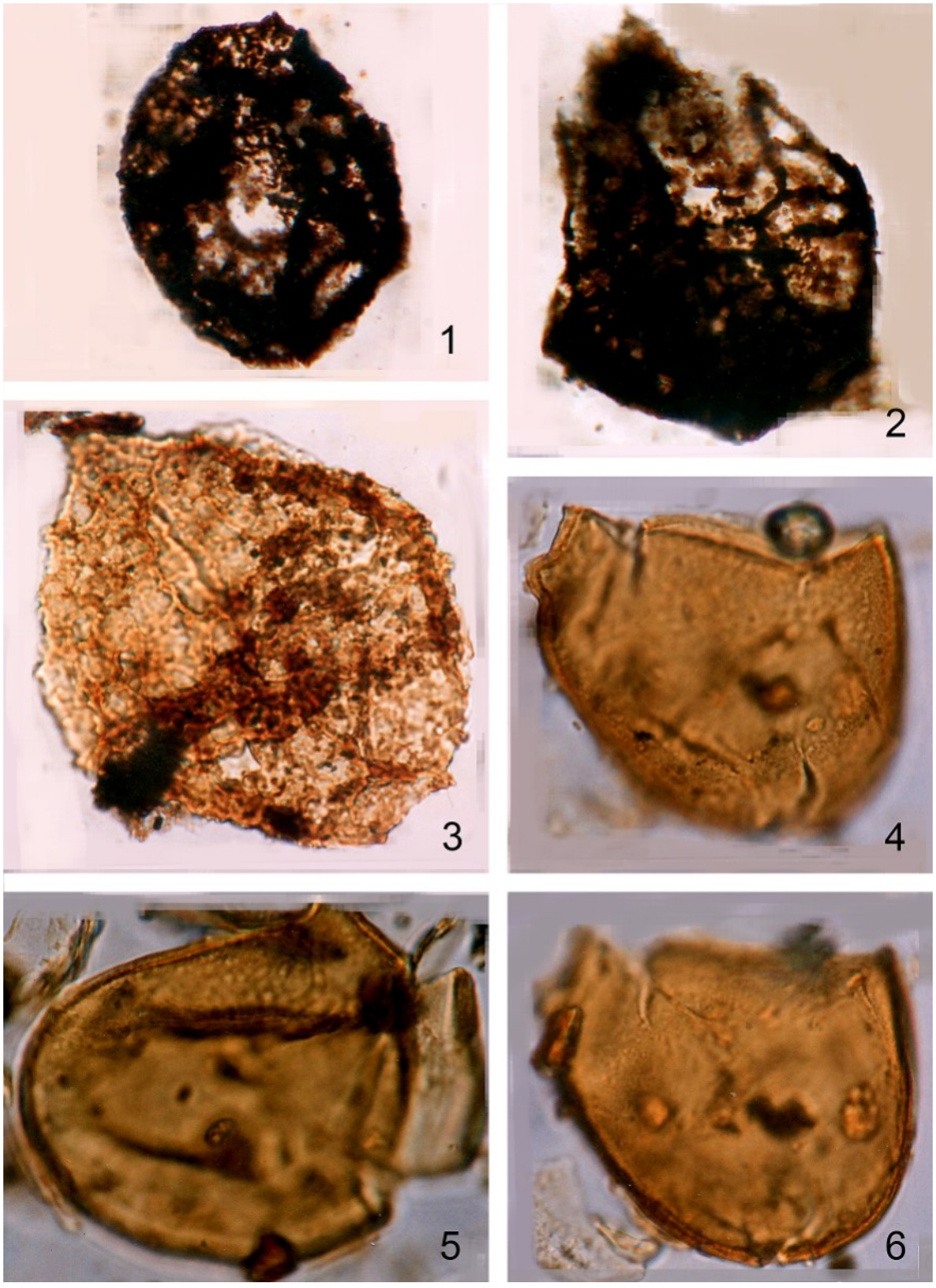

Plate IV. 1. *Virgodinium asymmetricum primus,* Derecske No. 1, deep hole 4406,0-4406,3 m 57 x 45 μm. **2.** *Virgodinium asymmetricum tertius,* Derecske No. 1, deep hole 4406,0-4406,3 m 67 x 57 μm. **3.** *Virgodinium transdanuvianum,* Csanádapáca É-No. 2, deep hole 2237,5-2237,6 m 80 x 66 μm. **4–6.** *Virgodinium asymmetricum secundus,* Budajenő No. 2, borehole 70,0-77,5 m 4-5. 66 x 57 μm, 6. 63 x 63 μm.