

Vizsgálataim témája „Júra faunák visszatérése a toarci anoxikus sokk után (magyarországi vizsgálatok)”.

Magyarországon pliensbachi és toarci képződmények a Bakony, Gerecse és Mecsek hegységek rétegsoraiban tanulmányozhatók.

Bakony hegység

A Bakony hegység alapszelvényének a bakonycsérnyi Tűzköves árkot vettem.

A bakonycsérnyi Tűzköves árok júra rétegsorának valamennyi mintája sok ostracodát tartalmaz.

A szelvény alsó, pliensbachi emeletbe sorolható részéből (X-D réteg) a következő fajok kerültek elő:

Polycope sp.

Pseudohealdia acuticauda Monostori, 1996

Ogmoconcha amalthei (Quenstedt, 1958)

Ogmoconcha? sp.

Ogmoconchella? sp.

Cardobairdia liassica (Drexler, 1958)

Bairdia longoarcuata Monostori, 1996

Bairdia michelseni arcuatocauda Monostori, 1996

Ptychobairdia lordi Monostori, 1996

Ptychobairdia sp.

Lobobairdia rotundata Monostori, 1996

Macrocypris? sp.

Liasina lanceolata Apostolescu, 1959

Fabalicypis? sp.

Bythocypris? cf. *faba* Knitter, 1983

Isobythocypris? aff. *postera* Herrig, 1979

Paracypris redcarensis Blake in Blake and Tate, 1876

Paracypris sp.

A fauna közel felét olyan fajok teszik ki, melyek eddig csak a Bakony hegységből (Magyarország) kerültek elő (Monostori, 1996).

A pliensbachi rétegsor jellegzetessége, hogy alsó részében (X-B réteg) a faunában domináns faj a *Lobobairdia rotundata*, mellette gyakori az *Ogmoconcha amalthei*, *Polycope* sp., *Cardobairdia liassica*, *Isobythocypris* aff. *postera*. A pliensbachi emelet felsőbb rétegeiben (C-D réteg) tömeges az *Isobythocypris* aff. *postera*, a *Cardobairdia liassica*, a *Paracypris redcarensis* és a *Polycope* sp., viszonylag gyakori az *Ogmoconcha amalthei*, de a *Lobobairdia rotundata* viszonylag ritka.

A toarci emelet faunájában a következő fajok fordulnak elő:

Polycope sp.

Cytherella sp.

Cardobairdia cf. *inflata spinosa* Monostori, 1995

Cardobairdia sp.

Bairdia cf. *guttulae* Herrig, 1979

Bairdia cf. *michelseni* Herrig, 1979

Bythocypris? *faba* Knitter, 1983

Paracypris sp.

Pontocyprilla cf. *cavata* Donze, 1967

A toarci emelet faunájában tömegesek a *Pontocyprilla* cf. *cavata*, *Bythocypris?* *faba*, gyakori a *Cardobairdia* sp., *Bairdia* cf. *michelseni*, *Polycope* sp., *Paracypris* sp.

Határozottan elkülöníthető a toarci anoxikus esemény előtti és utáni ostracoda fauna.

Változás három alapvető elemet tartalmaz:

1.) Végleg eltűnnek a *Healdidae*-k, mégpedig úgy, hogy a pliensbachi emelet végén ezt egyedszámnövekedés előzi meg. A *Healdidae*ek jellegzetes és a pliensbachiban még gyakran domináns formáinak eltűnését Európa sok szelvényében említik (Andreu, Quajoun et Cubaynes (1995), Arias et Lord (1999), Arias et Whatley (2005), Bodergat (1997), Bodergat, Bonnet, Colin et Cubaynes (1998), Boomer (1992), Boomer, Ainsworth et Exton (1998), Harloff (1994), Lord (1974), Lord (1988), Lord et Boomer (1990), Riegraf (1985)).

2.) A triástól kezdve gyakori jellegzetes díszített Bairdiák (*Lobobairdia*, *Ptychobairdia*) velük párhuzamosan tűnnek el a faunából.

Ez a változás kevésbé markáns, mert egyéb díszített Bairdiaceae-ék később is megtalálhatók pl. a bakonyi Somhegy bajóci faunájában, sőt vannak ma is élő formáik is.

A triástól felvirágzó díszített Bairdidae csoport hanyatlása a triász karbonátplatformok szétseése és elmerülése miatt következett be, az ehhez a speciális környezethez hosszú ideig jól alkalmazkodott faunák a mélyüléssel egyre kevésbé tudtak alkalmazkodni, helyüket jellegzetesen olyan fauna foglalta el a toaraci emelet itt vizsgált képződményeiben, mely sokkal kevésbé diverz volt, az alakok kevésbé voltak díszítettek, a kis fajszámot nagy egyedszám kísérte.

3.) A toaraci emelet mintáiból nyert ostracoda fauna fajszegény, de nagy egyedszámú, a sima vázú fajok dominánsak. Feltűnő a Cytheraceák hiánya a bakonycsernyei szelvényben az ammonitessel igazolható tenuicostatum zónából származó mintában, mert a toaraci képződményeket Európaszerte az *Ogmoconcha-Ogmoconchella* genusoknak az emelet alsó részén való eltűnése mellett éppen ennek a csoportnak felvirágzása jellemzi. A bakonycsernyei szelvényben anoxia nyilvánvaló jelei e szintben nem mutatkoznak, a képződmény vörös márga. Cytheraceák a bakonycsernyei rétegsor toaraci képződményeiben feljebb sem jellemzőek, hiányuk mélyvízi képződési körülményeknek is tulajdonítható. A magasabb toaraci rétegekben nagyobb méretű egyedek jellemzők, mint a tenuicostatum zónában, a simavázú formák változatlan uralma mellett.

A Gerecse és Mecsek hegység pliensbachi és toarci ostracoda faunájának összehasonlító vizsgálata.

A Bakonycsernyén végzett ostracoda vizsgálatok (Monostori in Galáczy et al. 2008) észlelték a fauna összetétel változását a pliensbachi/toarci határ után. Ennek legfontosabb eleme a pliensbachiban meghatározó Healdidae formák eltűnése a toarci emeletben.

Eltérés a nyugat-európai előfordulásoktól, hogy ez az eltűnés ott csak a tenuicostatum zóna után következik be (Nyugat-Európában e zóna jellegzetes alakjai a Healdidae-k, Bakonycsernyén – bár a zóna jól kimutatható – teljesen hiányoznak).

Ennek valószínű oka a tenger jelentős kimélyülése volt, mely a healdidaek számára alkalmatlan környezetet teremtett.

A Gerecse hegységben is gazdag ostracoda fauna fosszilizálódott.

A Tölgyháti kőfejtő pliensbachi emeletében *Acratia* sp., *Polycope* aff. *pelta*, *Polycope* sp., *Ogmoconcha amalthei*, *Ogmoconcha contractula*, *Ogmoconcha* sp., *Ogmoconchella* cf. *aequalis*, *Ledachia bispinosa*, *Cardobairdia liassica*, *Cardobairdia* sp., *Lobobairdia rotundata*, *Ptychobairdia szentgalensis*, *Bairdia* cf. *carinata*, *Bairdia donzei*, *Bairdia* cf. *herrigi*, *Bairdia* ex gr. *hilda*, *Bairdia* cf. *inflata*, *Bairdia* ex gr. *jurassica*, *Bairdia longoarcuata*, *Bairdia michelseni*, *Bairdia michelseni arcuatocauda*, *Bairdia thuringica*, *Isobythocypris?* *postera*, *Isobythocypris* sp., *Paracypris redcarensis*, *Paracypris* sp. fordul elő.

A szintén Gerecsében található Pisznice ostracoda faunája szegényesebb: *Polycope* sp., *Ogmoconcha amalthei*, *Ogmoconcha* sp., *Cardobairdia harskutensis*, *Cardobairdia* sp., *Lobobairdia rotundata*, *Ptychobairdia szentgalensis*, *Ptychobairdia* sp., *Bairdia* cf. *clio*, *Bairdia* aff. *herrigi*, *Bairdia michelseni arcuatocauda*, *Bairdia* cf. *inflata*, *Bairdia okmerti*, *Bairdia trigonosymmetrica*, *Bairdia* sp., *Isobythocypris?* *postera*, *Isobythocypris* cf. *elongata*, *paracypris redcarensis*.

A toarci fauna gyakran nagyon nagy egyedszámú, de a fajok száma kicsi.

A Tölgyháti kőfejtőből ismert: *Bythocypris faba*, *Bythocypris* sp.

A Pisznice kőfejtőjének faunája valamivel gazdagabb: *Polycope* sp., *Cardobairdia* cf. *inflata*, *Bairdia donzei*, *Bairdia* aff. *hilda*, *Bairdia michelseni*, *Bythocypris faba*, *Cytherocypris* aff. *postera*, *Bythocypris* sp., *Paracypris* sp.

A Gerecse pliensbachi ostracoda faunája nagyon hasonlít a Bakony hegységihez. A toarciban észlelt változás is hasonló: eltűnnek a Healdidae formák és a Bakonyhoz hasonlóan hiányoznak a Cytheridae formák.

A Healdidaek eltűnése kihalási esemény, a Cytheridae-k viszont ma is virágzó csoport, hiányuk e helye az erős kimélyülés következménye.

Magyarország harmadik júra kifejlődési területe a **Mecsek** hegység. Jellemző pliensbachi ostracoda fauna van a Kasado és Réka völgy lelőhelyeken: *Ogmoconcha amalthei*, *Ogmoconchella aequalis*, *Ogmoconchella* sp., *Pseudohealdia acuticauda*, *Pseudohealdia septenaria*, *Cardobairdia liassica*, *Ptychobairdia lordi*, *Bairdia donzei*, *Bairdia guttulae*, *Bairdia* sp., *Cytheropteron* sp., *Acrocythere?* sp., *Bythocypris faba*, *Bythocypris* sp., *Paracypris redcarensis*, *Fabalicypis* sp., *Bairdiacypris* aff. *postera*, *Bairdiacypris* sp.

A toarci fauna gazdagabb. A Cseresnyák és Réka völgy lelőhelyeken található fajok: *Cytherella perennis*, *Cytherella toarcensis*, *Cytherella* sp., *Cardobairdia* aff. *inflata*, *Cardobairdia* sp., *Bairdia* cf. *herrigi*, *Bairdia* aff. *michelseni arcuatocauda*, *Bairdia thuringica*, *Gramanicythere* aff. *aubachensis*, *Acrocythere troestlri*, *Acrocythere* sp., *Cytheropteron* sp., *Gramanella?* sp., *Kinkelinella* (*Ectyphocythere*) cf. *kintteri*, *Kinkelinella* (*Ectyphocythere laqueata*, *Kinkelinella* (*Ectyphocythere*) sp., *Kinkelinella sermoisensis*, *Kinkelinella* sp., *Bythocypris?* *faba*, *Bythocypris* sp.

A fauna agyagban és agyagos aleuritban található. Mint Bakonycsernyén, itt is megtalálható a tenuicostatum zóna, de az anoxikus palában a szintjelző ammonitesek emlílt mikrofauna nem ismert. Az e feletti toarci rétegek (Cseresnyák, Réka völgy) már a radikális faunaváltozást mutatják, a Healdidae-k hiányát és a Cytheridae-k uralmát. A Cytheridae-k alárendelten már a pliensbachi faunában is szerepelnek, de a toarciban uralkodóvá válnak.

Összehasonlítás a nyugat-európai ostracoda faunákkal

Nyugat-Európában a leírt ostracoda faunák nagy része epikontinentális tenger szublitorális zónáiban élt. Michelsen (1975) Dánia pliensbachijában bőségesen Healdidae-kat tartalmazó faunát írt le. Számos faj (*Ogmoconcha amalthei*, *Ledahia bispinosa*, *Ogmoconchella aequalis*, *Pseudohealdia septenaria*) Magyarországon is gyakori.

Pliensbachi és toarci ostracodákat ismertettek Nagy-Britanniából Lord (1974), Bate et Coleman (1975), Boomer (1991, 1992), Boomer et Whatley (1992). A

pliensbachi *Ogmoconcha contractula* és a toarci *Kinkelinella sermoensis* a magyarországi anyagban is előfordul.

Svájcban Richter (1987) végzett vizsgálatokat. Gyakoriak a Magyarországról is ismert *Ogmoconcha* és *Ogmoconchella* fajok a pliensbachiban, a toarciban pedig a *Kinkelinella sermoensis*.

Németországban a Magyarországról ismert formák közül a pliensbachiban és a legelső toarci zónában gyakori az *Ogmoconcha amalthei*, a *Kinkelinella sermoensis* pedig a későbbi toarciban.

Portugáliában előkerült az *Ogmoconcha amalthei* a pliensbachiból, a *Kinkelinella sermoensis* a toarciból, mint Magyarországon is.

Spanyolország toarcijából ismert a Magyarországon is gyakori *Kinkelinella sermoensis*.

Az *Ogmoconcha amalthei* Algériából is ismert.

Magyarországi ostracoda faunaváltozások értelmezése

A toarci radikális faunaváltozást a *Healdidae*-k eltűnése jellemzi a tenuicostatum zóna végén. A Dunántúli-Középhegységben a *Healdidae*-k viszont jellegzetesen hiányoznak a tenuicostatum zónából is, nyilván a süllyedő medence gyors kimélyülése miatt. Ez egyúttal a *Cytheridae*-k hiányát is eredményezte, szemben azok nyugat-európai gazdagságával.

A Mecsek toarci faunája gazdag *Cytheridae* faunájú, mint a nyugat-európai lelőhelyek. A két magyarországi óra között jelentős mélységkülönbség volt. A Dunántúli-Középhegységben a mélység növekedésére utal a diverz pliensbachi együttes felváltása elszegényedett a toarciban. A Mecsek hegységben a sok *Healdidae*-t tartalmazó pliensbachi együttesek rokonok a Bakonyiakkal, mélyszublitorális jelleggel, a toarci együttesek viszont a sekély szublitorális *Cytheridae*- uralmával sekélyedést mutatnak a tenuicostatum zóna felett.

Irodalomjegyzék

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Subject of my investigations: The return of Jurassic fauna after the Toarcian Anoxic Shock.

The Jurassic sequences in Transdanubian Hungary occur in two main areas: in the Transdanubian Central Range with the Bakony and Gerecse Mountains and in the southern Transdanubia in the Mecsek Mountains and Villány Hills.

Bakony Mountains

Basic section of my investigations is the Tűzköves Ravine, Bakonycsernye.

All bed of the here studied section yielded rich ostracod material. The lower, Pliensbachian part (X to D beds) gave the following forms.

Polycope sp.

Pseudohealdia acuticauda Monostori, 1996

Ogmoconcha amalthei (Quenstedt, 1858)

Ogmoconcha? sp.

Ogmoconchella? sp.

Cardobairdia liassica (Drexler, 1958)

Bairdia longoarcuata Monostori, 1996

Bairdia michelseni arcuatocauda Monostori, 1996

Ptychobairdia lordi Monostori, 1996

Ptychobairdia sp.

Lobobairdia rotundata Monostori, 1996

Macrocypris? sp.

Liasina lanceolata Apostolescu, 1959

Fabalicypis? sp.

Bythocypris? cf. *faba* Knitter, 1983

Isobythocypris? aff. *postera* Herrig, 1979

Paracypris redcaensis Blake in Blake & Tate, 1876

Paracypris sp.

Nearly the half of these species are known hitherto from the Bakony Mts (Monostori 1996). The lower (X to B) beds of the pliensbachian part of the section is characterised by the dominance of *Lobobairdia rotundata*, with the common *Ogmoconcha amalthei*, *Polycope* sp., *Cardobairdia liassica* and *Isobythocypris?* aff. *postera*. In the uppermost Pliensbachian beds (C and D) *Isobythocypris?* aff. *postera*, *Cardobairdia liassica*, *Paracypris redcarensis* and *Polycope* sp. occur in great quantities, *Ogmoconcha amalthei* is relatively common, while *Lobobairdia rotundata* is comparatively rare.

The Toarcian bed (E) yielded the following species:

Polycope sp.

Cytherella sp.

Cardobairdia cf. *inflata spinosa* Monostori, 1995

Cardobairdia sp.

Bairdia cf. *guttulae* Herrig, 1979

Bairdia cf. *michelseni* Herrig, 1979

Bythocypris? *faba* Knitter, 1983

Paracypris sp.

Pontocyprilla cf. *cavata* Donze, 1967

In the fauna *Pontocyprilla* cf. *cavata* and *Bythocypris?* *faba* show mass occurrence, and *Cardobairdia* sp., *Bairdia* cf. *michelseni*, *Polycope* sp. and *Paracypris* sp. are common elements. The Pliensbachian and Toarcian ostracod faunas show significant differences which are usually interpreted as related to the Lower Toarcian anoxic event.

The main change is the disappearance of the Healdidae in the Lower Toarcian. The disappearance of this characteristic and frequently dominant Pliensbachian group has been recorded from several European sections (see Riegraf 1985, Lord 1988, Lord

& Boomer 1990, Boomer 1992, Harloff 1994, Lord 1994, Andreu et al. 1995, Bodergat 1997, Bodergat et al. 1998, Boomer et al 1998, Arias & Lord 1999, Arias & Whatley 2005.)

The characteristically sculptured Bairdiids (*Lobobairdia*, *Ptychobairdia*), which are common from the triassic, disappear with Healdidae. However, this less conspicuous change, because other sculptured Bairdiaceae occur later (e. g. in the Bajocian of the Somhegy, Bakony Mts, see Monostori 1995), and some even live today. The fall of the formerly flourishing sculptured Bairdiidae can be connected to the break up and submersion of the Triassic carbonate platforms. The faunas, having been long adapted to this special environment, could not stand the bottom deepening, and were substituted in the here studied Toarcian beds by a less diverse, moderately sculptured fauna of low species and high specimen number.

The difference from the mentioned West European faunas is in the representation of the genera *Ogmoconcha* and *Ogmoconchella*. These are still present in the West European *Tenuicostatum* zone, but are missing from the same level in Bakonycsérnye, in spite of the otherwise high specimen numbers of the fauna.

Remarkable is the lack of Cytheracea in the sample dated as of *Tenuicostatum* Zone, because the flourishing of this group in the lowermost Toarcian is the other characteristic feature in other European sections besides the disappearance of the genera *Ogmoconcha* and *Ogmoconchella*. The Bakonycsérnye section, with the red calyey marl present, does not show evident signs of anoxia. The fact that the Cytheracea remain subordinate also in the higher Toarcian beds of the section can be due to the deep water conditions. Otherwise, in the higher Toarcian beds the smooth forms remain dominant, while specimens with bigger individual sizes become characteristic.

Conclusions

The re-investigated Csernye sections show that in condensed sequences, where thicknesses are reduced and diagnostic fossils are rare, the representation of short stratigraphic intervals is occasional. The intermittent sedimentation left only fragmentary record of the reduced deposits and embedded faunal elements alike. In the short distance (ca. 20-30 m) which separates the here described sections differences of at least subzonal scale may appear. The new discoveries indicate that the time of nondeposition above the Upper Pliensbachian limestone which was enough to develop a ferromanganese-encrusted hardground in Section a could have been restricted to a shorter diasteme in Section N, quite understandable in this case of facies change from limestone to clayey marl.

The ammonite faunas show the general tendencies. some lineages (e.g. those of *Zetoceras*, *Calliphylloceras*, *Protogrammoceras* → *Paltarpites*) endure into the Toarcian, other elements (e.g. *Emaciaticeras*) are restricted to the upper Pliensbachian, while new, dominantly toarcian groups appear already in the uppermost Pliensbachian (e.g. *Dactylioceras* aff. *pseudocommune*).

The ostracod fauna, indicating a continuous subsidence in the Middle Liassic, now shows a significant change which can be probably due to abrupt deepening of the bottom from sublittoral to bathyal depth. this is reflected by the phenomenon that the ostracod elements so characteristic to the sublittoral faunas in the *Tenuicostatum* Zone of Western Europe, are completely missing from the lowermost Toarcian beds in both Csernye sections.

Comparative study of the Pliensbachian and Toarcian ostracods in the Gerecse and Mecsek Mountains, Hungary

The Jurassic sequences in Transdanubian Hungary occur in two main areas: in the Transdanubian Central Range with the Bakony and the Gerecse Mountains, and in southern Transdanubia in the Mecsek Mountains and the Villány Hills. The Bakony and Gerecse Mts, having been belonged to the southern, Gondwana margin of the

Jurassic Western Tethys display pelagic sequences, with ammonitico rosso limestones and marls as dominant lithofacies in the Early Jurassic. The studied Transdanubian localities are stratigraphically well known by recent works based on ammonite studies in the Bakony and the Gerecse Mts (GALÁ CZ et al. 2008, GÉ CZY 1988, GÉ CZY & SZENTE 2006), and stratigraphic data on some Mecsek Mts sequences are also available (DULAI et al. 1992). Here the formations (spotted marls, siltstones, black shales, etc.) and the ammonite faunas indicate the European, i.e. northern margin of the Jurassic Western Tethys. A comparison of ostracod faunas from these two areas may shed light on some further differences in paleobiogeography and events in microfaunal development.

Another studied sections in Transdanubia were in the **Gerecse Mts**, where rich and well-preserved faunas occur. In the Tölgyhát quarry the ostracods occur in limestones and in the higher part of the section in marls. The following forms were identified:

Acratia sp.

Polycope aff. *pelta* FISCHER, 1961

Polycope sp. div.

Ogmoconcha amalthei (QUENSTEDT, 1858)

O. contractula TRIEBEL, 1941

O. sp. div.

Ogmoconchella cf. *aequalis* HERRIG, 1969

Ledachia bispinosa GRÜNDEL, 1964

Cardobairdia liassica DREXLER, 1958

C. sp.

Lobobairdia rotundata MONOSTORI, 1996

Ptychobairdia szentgalensis MONOSTORI, 1996

P. sp.

Bairdia cf. *carinata* DREXLER, 1958

B. donzei HERRIG, 1979

B. cf. herrigi MONOSTORI, 1996
B. ex gr. hilda JONES, 1884
B. cf. inflata KNITTER, 1983
B. ex gr. jurassica JONES, 1884
B. longoarcuata MONOSTORI, 1996
B. michelseni HERRIG, 1979
B. michelseni arcuatocaudata MONOSTORI, 1996
B. thuringica HERRIG, 1979
Isobythocypris? postera HERRIG, 1979
I. sp.
Paracypris redcarensis (BLAKE, 1876)
P. sp. div.
 Ostracoda gen. et sp. indet.

The Pliensbachian ostracod fauna of the Pisznice quarry is less diverse. The following species are present:

Polycope sp. div.
Ogmoconcha amalthei (QUENSTEDT, 1858)
O. sp. div.
Cardobairdia harskutensis MONOSTORI, 1996
C. sp.
Lobobairdia rotundata MONOSTORI, 1996
Ptychobairdia szentgalensis MONOSTORI, 1996
P. sp. div.
Bairdia cf. clio BIZON, 1960
B. aff. herrigi MONOSTORI, 1996
B. michelseni arcuatocaudata MONOSTORI, 1996
B. cf. inflata KNITTER, 1983
B. ohmerti KNITTER, 1984
B. trigonosymmetrica MONOSTORI, 1996
B. sp. div.

Isobythocypris? postera HERRIG, 1979

I. cf. elongata (BLAKE in TATE & BLAKE, 1876)

Paracypris redcarensis (BLAKE, 1876)

The ostracod faunas of the Toarcian beds yielded specimens in profusion, often they are more abundant than in the Pliensbachian, but the species number is low.

The Toarcian beds of the Tölgyhát quarry yielded the following species:

Bythocypris faba KNITTER, 1983

B. sp.

The Toarcian of the Pisznice quarry gave some more species:

Polycope sp.

Cardobairdia cf. inflata MONOSTORI, 1995

Bairdia donzei HERRIG, 1979

B. aff. hilda JONES, 1884

B. michelseni HERRIG, 1979

Bythocypris faba KNITTER, 1983

B. aff. postera HERRIG, 1979

B. sp. div.

Paracypris sp.

Ostracoda gen. et sp. indet.

The Pliensbachian ostracod fauna of the Gerecse Mountains is very similar to that in the Bakony, and the Toarcian fauna indicates a change comparable to that recognized in the Bakony Mts: the Healdidae are missing, and also typical is the lack of Cytheridae.

The disappearance of the Healdidae is an extinction, but the lack of Cytheridae can be probably due to the radical subsidence of the basin. Recent Cytheridae are dominant in sublittoral environments, and they have even characteristic shallow bathyal forms, too.

In the Tölgyhát quarry there is a manganiferous black clay at base of the Toarcian, without any faunal elements. The underlying Pliensbachian limestone beds are characterised by the Healdidae, while the overlying Toarcian marl has a taxonomically poor, but abundant ostracod fauna, without Healdidae.

The third area of Lower Jurassic in Hungary is the **Mecsek** Mountains, where the Pliensbachian and Toarcian beds gave rich ostracod faunas. The following Pliensbachian ostracods were determined in the faunas from the Kasadó and the Réka valley:

Ogmoconcha amalthei (QUENSTEDT, 1858)

Ogmoconchella aequalis HERRIG, 1969

O. sp. div.

Pseudohealdia acuticauda MONOSTORI, 1996

P. septearia GRÜNDEL, 1964

Cardobairdia liassica (DREXLER, 1858)

Ptychobairdia lordi MONOSTORI, 1996

Bairdia donzei HERRIG, 1997

B. guttatae HERRIG, 1979

Bairdia sp. div.

Cytheropteron sp.

Acrocythere? sp.

Bythocypris faba KNITTER, 1983

B. sp.

Paracypris redcarensis (BLAKE in TATE & BLAKE, 1876)

Fabalitypris sp.

Bairdiacypris aff. *postera* HERRIG, 1979

B. sp.

Ostracoda gen. et sp. indet.

The Toarcian ostracod fauna is richer. The species yielded by the the Cseresnyák and Réka Valley sections are as follows:

Cytherella perennis BLASZYK, 1967
C. toarcensis BIZON, 1959
C. sp.
Cardobairdia aff. *inflata* MONOSTORI, 1995
C. sp.
Bairdia cf. *herrigi* MONOSTORI, 1996
B. aff. michelseni arcuatocauda MONOSTORI, 1996
B. thuringica HERRIG, 1979
Gramanicythere aff. *aubachensis* RIEGRAF, 1984
Acrocythere troestleri RIEGRAF, 1984
A. sp. div.
Cytheropteron sp.
Gramanella? *sp.*
Kinkelinella (Ectyphocythere) cf. *knitteri* RIEGRAF, 1984
K. (E.) laqueata KLINGER & NEUWEILER, 1959
K. (E.) sp.
K. sermoisensis APOSTOLESCU, 1959
K. sp. div.
Paracypris sp. div.
Isobythocypris sp. div.
Bythocypris? faba KNITTER, 1984
B. sp. div.
 Ostracoda gen. et sp. indet.

This rich and diverse fauna contained in clays and clayey siltsontes. Just as in Bakonycsernye, the lowermost Toarcian Tenuicostatum Zone is represented (DULAI et al. 1992), but here in the anoxic clay only ammonites are present, determinable microfauna is missing. The overlying lower and higher Toarcian beds in the Cseresnyák and Réka Valley sections positively show the radical faunal change, i.e. the disappearance of the Healdidae and the dominance of the Cytheridae. These latter

appear subordinately in the Upper Pliensbachian beds, but in the Toarcian they turn into dominant.

Comparisons

In the West European region most of the described ostracod faunas are from sublittoral zones of an epicontinental sea. MICHELSEN (1975) determined a Pliensbachian fauna of Denmark with rich representation of Healdidae of which some species (*Ogmoconcha amalthei*, *Ledachia bispinosa*, *Ogmoconchella aequalis*, *Pseudohealdia septenaria*) known also from Hungary. In the Toarcian the rich representation of Cytheridae is characteristic. This group is represented in Hungary with *Kinkelinella sermoisensis*.

The Pliensbachian and Toarcian ostracods of Great Britain are known by LORD (1974), BATE & COLEMAN (1975), BOOMER (1991, 1992) and BOOMER & WHATLEY (1992). From the Pliensbachian forms *Ogmoconcha contractula*, from the Toarcian ones *Kinkelinella sermoisensis* are known also from Hungary.

The Pliensbachian and Toarcian ostracods of Switzerland were studied by RICHTER (1987). In the Pliensbachian *Ogmoconcha* and *Ogmoconchella* are characteristic and in the Toarcian Cytheridae are abundant, with *Kinkelinella sermoisensis*, a form occurring also in Hungary.

The Pliensbachian and Toarcian ostracods were investigated by KNITTER & OHMERT (1983), RIEGRAF (1985) and HARLOFF & JÄGER (1994) in Germany. Among the forms known to occur in Hungary, *Ogmoconcha amalthei* is present in the Pliensbachian and lowermost Toarcian, and *Kinkelinella sermoisensis* is frequent in the higher Toarcian.

EXTON & GRADSTEIN (1984) and BOOMER et al. (1998) reported on ostracods from Portugal. They mentioned the occurrence of *Ogmoconcha amalthei* in the Pliensbachian and *Kinkelinella sermoisensis* from the Toarcian - two species known also from Hungary.

In the Toarcian ostracod fauna of Spain (see ARIAS 1991, 1997, ARIAS & COMAS-RENGIFO 1992) species *Kinkelinella sermoisensis*, which is known from

Hungary, is frequent. The same is true for the Toarcian ostracod faunas of France known by GALBRUN et al. 1994, and ANDREU et al. 1995.

Ogmoconcha amalthei is reported also from Algeria (BALOGE 1980).

BODEGART (1977) has investigated the distribution of Lower Jurassic ostracods in Western Europe. He found *Ogmoconcha amlthei* as characteristic in the Pliensbachian, just as in Hungary. A further similarity of the Hungarian Pliensbachian faunas is the rich representation of Healdidae, with several species common.

Interpretation of the Pliensbachian-Toarcian faunal change in Hungary

Investigation of ostracods from the Tűzkövesárok (Bakonycsérnye, Bakony Mts) found profound change in the faunal composition at the Pliensbachian/Toarcian boundary (MONOSTORI in GALÁ CZ et al. 2008). Here Healdidae, which take a prominent part up to the Pliensbachian, disappear from the fauna.

In typical West European sequences this change occurs above the Tenuicostatum Zone. The Tenuicostatum Zone is represented in the Tűzkövesárok, but its fauna is free of Healdidae. In my opinion this difference is the result of a significant deepening of the sea around the Pliensbachian/Toarcian boundary. The deep-water environment was probably unsuitable for Healdidae. In the Tűzkövesárok section there is no trace of anoxia (the facies are red limestones and marls), so the oxygen content could not be the cause of the change. (In West European areas anoxia is evidenced in some levels).

In the Toarcian a radical change occurs with the disappearance of Healdidae at the end of the lowermost Toarcian Tenuicostatum Zone. However in Transdanubian Hungary the Healdidae are characteristically missing in the Tenuicostatum Zone, probably because of sudden deepening of the bottom of a sinking basin. This environmental change also resulted in the lack of Cytheridae in this region, in contrast to the West European communities which remained rich in Cytheridae in the higher Toarcian.

The Toarcian fauna of the Mecsek Mts yielded Cytheridae in profusion, with several species, just as in Western Europe. This can be due to the differences in water

depth between the two Hungarian areas. The increase of water depth in Transdanubia is indicated by the change of diverse Pliensbachian communities into impoverished ones in the Toarcian. In the Mecsek Mts the Pliensbachian faunas with rich Healdidae show similarities with those in the Bakony, possibly because of the deep sublittoral environments. The representation of shallow sublittoral Cytheridae as dominant group in the Toarcian suggests a shallowing of water above the *Tenuicostatum* Zone.

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