

- Thon A., Kostelníček P. (1976): Projekt geologických prací — Hluboký strukturní průzkum jižních svahů ždánické elevace, 1. etapa, MS MND Hodonín
- Thon A., Kostelníček P. (1980): Nové poznatky o geologické stavbě a ropoplynnosti autochtónních útvarů ve Ždánickém lese. Geol. Průzk., roč. 22, č. 6, Praha
- Thon A. (1985): Das Aufsuchen von Erdöl und Erdgas Lagerstätten im Paläozoikum auf dem Gebiet der ČSSR. (Hydrocarbon Exploration in the Paleozoic in Czechoslovakia) Erdoel — Erdgas 10 1.Jg., Heft 9, Sept. 1985 Wien
- Zukalová V., Kalvoda J., Galle A., Hladil J. (1981): The Biostratigraphy of the Paleozoic rocks in the Deep Boreholes Southeast of Brno. Knihovna — Biostratigraphie paleozoika na jihovýchodní Moravě. Hodonín

Abstrakt

Na jihovýchodních svazích Českého masivu, v úseku Střed a přilehlých částech úseku Jih, je část průzkumných prací zaměřena na variské patro. V článku je v samostatných kapitolách zhodnocena stratigrafie, litologie a dále ložiska, významné přítoky a indicie přírodních uhlovodíků. Na bazální klastika devonu je vázáno ložisko v oblasti Ždánice. V karbonátovém vývoji paleozoika se akumulace ropy a zemního plynu vyskytují v tektonicky porušených a dolomitizovaných partiích karbonátů. V těchto horninách byla nalezena ložiska Nitkovic, Uhřice-západ, Uhřice-východ a průmyslových přítoků bylo dosaženo z vrtů Němčičky-1 a Letošov-1. I přes specifika, zvyšující nároky na metodu průzkumu, technologii vrtných prací a otvírku jednotlivých horizontů, zůstává perspektivita variského patra pro nalezení dalších akumulací přírodních uhlovodíků nesporná.

Zusammenfassung

An SO-Hängen der Böhmischen Masse, im Abschnitt Mitte und in anliegenden Gebieten des Abschnitts Süd, ist ein Teil der Erkundungsarbeiten auf das variszische Stockwerk orientiert. In selbständigen Kapiteln werden Stratigraphie, Lithologie, ferner Lagerstätten, bedeutsame Zuflüsse und Anzeichen natürlicher Kohlenwasserstoffe behandelt. An basale Trümmergesteine des Devons ist die Lagerstätte im Gebiet von Ždánice gebunden. In der Karbonatentwicklung des Paläozoikums kommen Erdöl- und Erdgasakkumulationen in tektonisch gestörten und dolomitisierten Karbonatgesteinspartien vor. In diesen Gesteinen wurden die Lagerstätten Nitkovic, Uhřice-West und Uhřice-Ost entdeckt, und förderwürdige Zuflüsse wurden in den Bohrungen Němčičky-1 und Letošov-1 ermittelt. Trotz spezifischer Erscheinungen, durch welche die Ansprüche an die Erkundungsmethodik, Bohrtechnologie und Erschließung einzelner Horizonte erhöht werden, bleibt die Höflichkeit des variszischen Stockwerks in Hinsicht auf Entdeckung weiterer Akkumulationen natürlicher Kohlenwasserstoffe unstreitig.

* In this line, the results of mathematical modelling of the conversion of kerogen to oil hydrocarbons conducted by M. Strnad are of interest. In the first version of a mathematical model using the parameters of the Rock-Eval temperature maximum pyrolysis $T_{max} = 430-440^{\circ}C$ the author placed the oil window interval to a depth of 3.7 to 5 km in the Czechoslovak part of the Vienna Basin, the genesis of oil hydrocarbons culminating in the period of 15.5 — 17.6 million years after the commencement of sedimentation.

PALEO GEOGRAPHIC ASPECTS OF THE STUDY OF OTOLITH FAUNAS IN THE MIOCENE BASINS OF THE CENTRAL PARATETHYS

Rostislav Brzobohatý, Ústřední ústav geologický, Praha, Czechoslovakia

The hitherto assembled knowledge on the otolith faunas of the Miocene sediments of the Central Paratethys affords several remarks on the interpretation of the paleogeographic conditions of individual basins and on their changes with time. These remarks are mostly based on the fact that the epipelagic, mesopelagic and bathypelagic habitat of recent fish faunas has been formulated as early as in the Miocene in general characters (Brzobohatý 1981 inter alii) and that the composition of water and the character of surface

water are decisive determinants in the composition of pelagic assemblages of fishes (Robison 1972).

In the sediments of the Eggenburgian, the finds of purely marine otolith faunas have been rather sporadic so far. This can be due to the small degree of investigation and possibly also to problems of fossilization. Biofacies deliberations of a broader scope are therefore not admissible. Recently, however, a very rich otolith fauna has been found near Maigen in the Horn Basin in Niederösterreich, the appreciation of which contributes to the better understanding of the relationships in the western part of the Central Paratethys of this time interval.

The Maigen otolith fauna is composed of 30 species of bony fishes that are represented in various parts of the Molt Beds and Loibersdorf Beds. Except for the Molt Beds, where more prominent brackish influences appear, it has a purely marine character of a very shallow sublittoral without any influence of deeper waters and it documents sedimentation in a very warm subtropical climate. It is mostly composed of Atlantic-Mediterranean and cosmopolitan elements with southward inclination (genus *Brachydeuterus*). It differs from the Lower Miocene faunas of the Aquitaine Basin and the Mediterranean area (Steurbaud 1981, Nolf et Cappetta 1980) by a substantially lesser proportion of Paleogene Indo-pacific relicts. This fact is obviously connected with the regressive tendencies in the Alpine-Carpathian region in the higher Egerian (Rögl et Steiniger 1983) and with the forming of new fish assemblages in this region at the beginning of the Miocene. The presence of an isolated Indo-Pacific representative (genus *Acropoma*) is evidently the result of direct migration from the Indo-Pacific region. The shallow-water assemblages of fishes of the marginal developments of the Eggenburgian at the SE margins of the Bohemian Massif are typical in the decrease of purely marine elements from the SW to the NE. This tendency, which is connected with the absence of Eggenburgian deposits in the region of the Vyškov depression, evokes here the idea of a relatively isolated bay which is closed from the W and the N, and which communicates S and southeastward with a more marine environment.

In the Eggenburgian of the Central Paratethys so far nowhere associations of otoliths of deep-sea fishes have been established. We may establish practically the same for the deposits of the Ottnangian. An individually poor assemblage of mesopelagic elements witnessed in the last-named level in the schlieren of Oberösterreich (vicinity of Ottnang) can be conceived as allochthonous (predators, currents, etc.). If not considering the state of the low degree of investigation, or taphonomic problems, we may interpret this fact so that the configuration of the basins in the Eggenburgian and Ottnangian (hydrographic or bathymetric conditions) was not suitable for the existence of deeper-living fish assemblages, or that the studied basins divided from seas represented for this type of fauna an unsurmountable barrier. Acceptable is the idea of relatively high sills between the Bohemian Massif and the Alpine arch on the connecting region of the present-day Austrian molasse (comp. Rögl et Steiniger 1983).

In the sediments of the Karpatian and Badenian of the Central Paratethys, deep-sea fishes, whose assemblages form here a significant component of all fish fauna, can be encountered on the other hand. Their composition generally reminds of the so-called reduced deep-sea fish faunas (Marshall 1957) composed of the genera participating in the forming of ichthyocoenoses of the higher layers of oceanic waters and occurring also in the basins outside the free oceans but with a good communication with them.

In the Karpatian, these assemblages display a surprising coincidence in the representation of the most frequent elements with assemblages of the Gulf of California (Robison 1972). They indicate the existence of a more or less semi-closed basin with a deep-seated communication with the free sea, with sufficient depth of the basin itself and evidently with the so-called estuarine type of circulation of

water masses (sensu Schopf 1980). According to this interpretation, the transgression would procede from the Mediterranean region (comp. Rögl et Steininger 1983) from the SW. The intrusion of the lower waters of the open sea (from the oxygen minimum zone) penetrated permanently into this basin near the bottom, propagated on it and caused low-oxygen conditions. The evaporation was evidently lower than the influence and the surface streams led away the warmer, and possibly even less salty water from the basin into the open sea. A sufficient dotation in organic matter from the dry land contributed to a relatively long-term regimen that was poor in oxygen. This concept is also supported by the character of microfauna of the Karpatian (relatively low diversity of assemblages, relatively great individual frequency, an indistinct and often dwarfish plankton, frequent occurrence of groups of benthic foraminifera or of elements tolerant with respect to low oxygen contents, which has, compared with the Badenian, a higher content of organic substance and a lower content of CaCO₃ in the sediments and a considerable content of laminated sediments. To the NE, the basin became generally more shallow and the influence of the open sea became less prominent.

In the Lower Badenian, the deep-sea component of the fish fauna became substantially more diversified and had a different composition. Over 20 genera of mesopelagic and archibenthic fishes occur in them which not only with respect to their composition, but also with respect to the frequency of their representatives correspond to the ecologically related ichthyocoenoses of the recent Mediterranean Sea. It may thus be assumed, that in the Lower Badenian the water regimen significantly changed compared with the Karpatian. The substantially more extensive Paratethys communicated in the W with the Mediterranean and in the SE with the Indopacific region. The communications between this region and the open sea did not necessarily attain greater depths than 300 m, the communication in the W, however, was decidedly deeper than in the SE. Inside the basin, however, partial basins must have existed with a depth reaching up to 1000 m. From the point of view of water circulation, the Central Paratethys became a Mediterranean type basin in the sense of Schopf (1980). Above all surface water of the free sea penetrated into them, partly they evaporated, subsided to the depth and flew out near the bottom. The supply of organic matter was evidently lower than in the Karpatian and the waters had a high oxygen content. In favour of this type of circulation of water witnesses not only the homogenized character of sediments generally rich in CaCO₃ and poor in organic matter, but also rich and highly diversified biotes of the bottom of various depths, considerably diversified plankton and evidently the most populated pelagial from all levels of the Central Paratethys.

In the Middle Badenian, the deep-sea component of the fish fauna is distinctly reduced and delimited above all to the western region of the Central Paratethys. The presence of some of the archibenthic fishes, however, still witnesses in favour of the considerable depth of the sedimentary region and of the communication paths into the Mediterranean region. The occurrence of otoliths of mesopelagic fishes in the Czechoslovak part of the Vienna Basin, the Dráva-Depression, in the Polish Foredeep, belongs exclusively to the juvenile stages of fishes which are transported by streams over enormous distances.

In the Upper Badenian, the mesopelagic elements appear only sporadically in the otolith faunas of Roumania, in the western part of the Central Paratethys they are practically missing. This fact is controversial to the interpretation offered by Kókay (1984) on the communication of the Upper Badenian sedimentary region and they explain rather the interpretation offered by Rögl et Steininger (1983)-

More detailed data on the discussed problems are in the paper by Brzobohatý (1987).

References:

- Brzobohatý R. (1981): Zur Paläoökologie der fossilen Myctophiden (Myctophidae, Teleostei). — Záp. Karpaty, Paleontol. 6, 31–48, Bratislava.
- Brzobohatý R. (1987): Poznámky k paleogeografii miocenních pávní Centrální Paratethydy z pohledu otolitových faun. — „Miscellanea micropaleontologica II“, Knih. Zemní Plyn Nafta 6b, 101–111, Hodonín.
- Kókay J. (1984): Central and Eastern Paratethyan interrelations in the light of Late Badenian salinity conditions. — Geol. Hungar., Palaeontol. 48, 9–95, Budapest.
- Marshall N.B. (1957): Tiefseebiologie. — Jena.
- Nolf D., Cappetta H.C. (1980): Les Otolithes de téléostéens du Miocène de Montpeyroux (Hérault, France). — Palaeovertebrata 10,1,1–28, Montpellier.
- Robison B.H. (1972): Distribution of the Midwater fishes of the Gulf of California. — Copeia 3, 448–461.
- Rögl F., Steininger F. (1983): Vom Zerfall der Tethys zu Mediterran und Paratethys. Die neogene Paläogeographie und Palinspastik des zirkum-mediterranen Raumes. — Ann. Naturhistor. Mus. Wien 85/A, 135–163, Wien.
- Schopf T. J. M. (1980): Paleocyanography. — Cambridge, Massachusetts, London.
- Steurbaut E. (1981): De Teleostei-otolieten uit het Oligo-Mioceen van Aquitaine (Zuidwest-Frankrijk). — Proefschr. Doct. Univ. Gent (MS), Gent.

Abstrakt

Autochtonní asociace otolitů mezopelagických a archibentálních ryb byly v centrální Paratethyde prokázány dosud pouze v sedimentech karpatu a spodního a středního badenu. Jejich složení v konfrontaci s údaji mikrobiocenními, sedimentologickými a geochemickými umožňuje interpretovat hydrodynamický režim jednotlivých pávní. Během karpatu převládá estuáiový typ cirkulace vod s relativně nízkým stupněm prokysličení. Ve spodním a středním badenu převládá mediteránní typ cirkulace vod s vysokými obsahy kyslíku a výbornou komunikací s volným mořem.

Zusammenfassung

Autochthone Assoziationen der Otolithen mesopelagischer und archibenthaler Fische wurden in der zentralen Paratethys bisher nur in Sedimenten des Karpatiens sowie des unteren und mittleren Badenians nachgewiesen. Der Vergleich ihrer Zusammensetzung mit mikrobiocenními, sedimentologischen und geochemischen Angaben ermöglicht eine Interpretation des hydrodynamischen Regimes in einzelnen Becken. Im Karpatien überwog der Ästuartyp des Wasserkreislaufs mit einem verhältnismäßig niedrigen Durchlüftungsgrad. Im unteren und mittleren Badenian überwog der mediterrane Typ des Wasserkreislaufs mit hohem Gehalten an Sauerstoff und einer ausgezeichneten Verbindung mit der hohen See.

NEW STUDIES OF THE OTOLITHS FROM THE MARINE OTTNANGIAN (LOWER MIOCENE, UPPER AUSTRIA)

Rostislav Brzobohatý, Ústřední ústav geologický Praha, Czechoslovakia
 Maria Heinrich, Geologische Bundesanstalt Wien, Austria
 Reinhard Roetzel, Geologische Bundesanstalt Wien, Austria

Preface

From the end of the 1970's onward, some coal cuttings were found in hydrocarbon wells, particularly north and west of the Hausruck region in Upper Austria. All of these coal occurrences are located in sandy beds of the predominantly muddy Robulus Schlier s.l. (Innviertel Group, Ottnangian) at depths ranging between 150 and 500 m.

In 1982, a cored hole (Kemating K 1) was drilled by the Geological Survey of Austria to explore the potential for coal occurrences; well logging was also done. Intensive sedimentological investigations were subsequently carried out; the total floral and faunal assemblage was examined by specialists for the purpose of environmental analysis. The fossil content of cuttings of hydrocarbon wells in the distant surroundings was also determined; field work on