

## The northernmost fossil locality of fruit bats (Megachiroptera, Mammalia) in the Miocene of Bełchatów (Poland)

Barbara RZEBIK-KOWALSKA and Kazimierz KOWALSKI

Received: 28 Dec., 2001

Accepted for publication: 7 Feb., 2001

RZEBIK-KOWALSKA B., KOWALSKI K. 2001. The northernmost locality of fruit bats (Chiroptera, Mammalia) in the Miocene of Bełchatów (Poland). *Acta zoologica cracoviensia*, 44(1): 59-63.

**Abstract.** An isolated tooth (probably P<sub>4</sub>) of a fruit bat was found in the Miocene sediments of the brown-coal mine of Bełchatów (Central Poland). The absolute date and the accompanying fauna of mammals suggest the early Miocene age (MN4). Bełchatów (51° 15'N, 19° 20'E) is the northernmost locality of fossil Megachiroptera. Their presence indicates a tropical climate and forest vegetation. The size of the tooth is similar to that of the recent species *Rousettus aegyptiacus* (E. GEOFFROY-ST. HILAIRE, 1810), but the scarce material is insufficient for precise identification.

**Key words:** Megachiroptera, Miocene, Poland.

Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Sławkowska 17, Kraków, Poland.

E-mail: rzebik@isez.pan.krakow.pl

### I. INTRODUCTION

Fruit bats (Megachiroptera) are numerous and diversified in the tropical regions of the Old World. Their fossil remains, however, are extremely rare. The oldest remains of Megachiroptera known to date are from the Eocene of Thailand (DUCROCQ S. et al., 1993). The systematic position of *Archaeopteropus transiens* MESCHINELLI, 1903 from the Oligocene of northern Italy was the subject of discussion, but recently the opinion that it was a member of Megachiroptera prevails (HABERSETZER and STORCH 1987). Upper Pliocene of Ethiopia yielded a tooth identified as belonging to the Recent genus *Eidolon* RAFINESQUE, 1815 (WESSELMAN 1984).

Recently fossil Megachiroptera were found in Miocene localities of southern France: La Colombière and Sainte-Catherine 2 (Early Miocene; SIGÉ and AGUILAR 1987) as well as in Lo Fournas 2 and 8 (Middle Miocene; AGUILAR et al. 1986). It was also reported from Bouzigues 1 (SIGÉ et al. 1997).

Miocene mammal fauna localities are very rare in Poland and remains of Chiroptera have never so far been identified in them. In 1994 one damaged premolar was discovered in Bełchatów by washing sediments for botanical research and kindly handed over to the authors of the present paper for study.

The presence of Megachiroptera was mentioned for Bełchatów by KOWALSKI (1995) in a short note in Polish and listed by the same author in a paper discussing rodent fauna of this locality (KOWALSKI 1997).

**A c k n o w l e d g e m e n t s.** The authors are grateful to Dr Krzysztof WOROBIEC (Kraków) for the specimen described in the present paper, which he found during palaeobotanical research in Bełchatów and to Dr Bernard SIGÉ (Montpellier) for confirmation of the systematic position of this specimen.

## II. THE LOCALITY AND ITS AGE

The brown coal mine at Bełchatów is situated in Central Poland (51° 15'N, 19° 20'E). The brown coal sedimentary basin is formed in Jurassic and Cretaceous rocks. During the Alpine orogenesis the formation of the Carpathians was connected with important tectonic movements. At the Oligocene-Miocene limit an extensive depression was formed in the region of Bełchatów. It is now filled with Neogene and Quaternary deposits with alternating coal seams and lacustrine sediments (KOWALSKI 1997).

Two volcanic tuffite horizons can be traced in the profile of Bełchatów sediments and were dated by the fission-track method (BURCHART et al. 1988). The lower one is dated at  $18.1 \pm 1.7$  MA and the upper at  $16.2 \pm 1.5$  MA.

According to palaeobotanical investigation, several cycles of vegetation, changing from open landscape through forest of dry habitat to swamp forest, took place in Bełchatów (STUCHLIK et al. 1990). Lacustrine sediments contained numerous fresh-water and terrestrial molluscs (STWORZEWICZ and SZYNKIEWICZ 1989). Among them are several taxa belonging to genera now extinct in Europe but still represented in the modern fauna of Africa and tropical Asia.

Fossil mammals are known in Bełchatów from three horizons. The uppermost, Bełchatów A, contained several taxa of insectivores (RZEBIK-KOWALSKA 1994) and at least 20 taxa of rodents representing 20 species (KOWALSKI 1997). The fauna points to mammalian zone MN 9.

Intermediate horizon B, situated between two tuffic layers contained nearly exclusively small mammals and represented mammalian zone MN 5/6 (MEIN 1993).

The lowermost fauna (Bełchatów C) represents mammalian zone MN4 (MEIN 1999). Among large mammals were *Gomphotherium angustidens* (CUVIER, 1806) and *Hyotherium soemmeringi* (MEYER, 1829). Small mammals included insectivores (RZEBIK-KOWALSKA 1994, 1996) and numerous rodents (KOWALSKI 1997). This horizon is situated below the lower tuffite layer.

The tooth of Megachiroptera was collected in a grey-green silt layer immediately above the lower tuffite one and belongs to the faunal assemblage Bełchatów C.

## III. SYSTEMATIC PALEONTOLOGY

Chiroptera BLUMENBACH, 1779

Megachiroptera DOBSON, 1875

Pteropodidae GRAY, 1821

(Fig.1)

Bełchatów C, MN4

**M a t e r i a l.** Damaged lower left P<sub>4</sub> (ISEZ. MF/2260/1).

**D e s c r i p t i o n.** The tooth, most probably right lower P<sub>4</sub>, is damaged in its anterolingual side and devoid of roots. The crown is elongated and concave in occlusal view. The basin

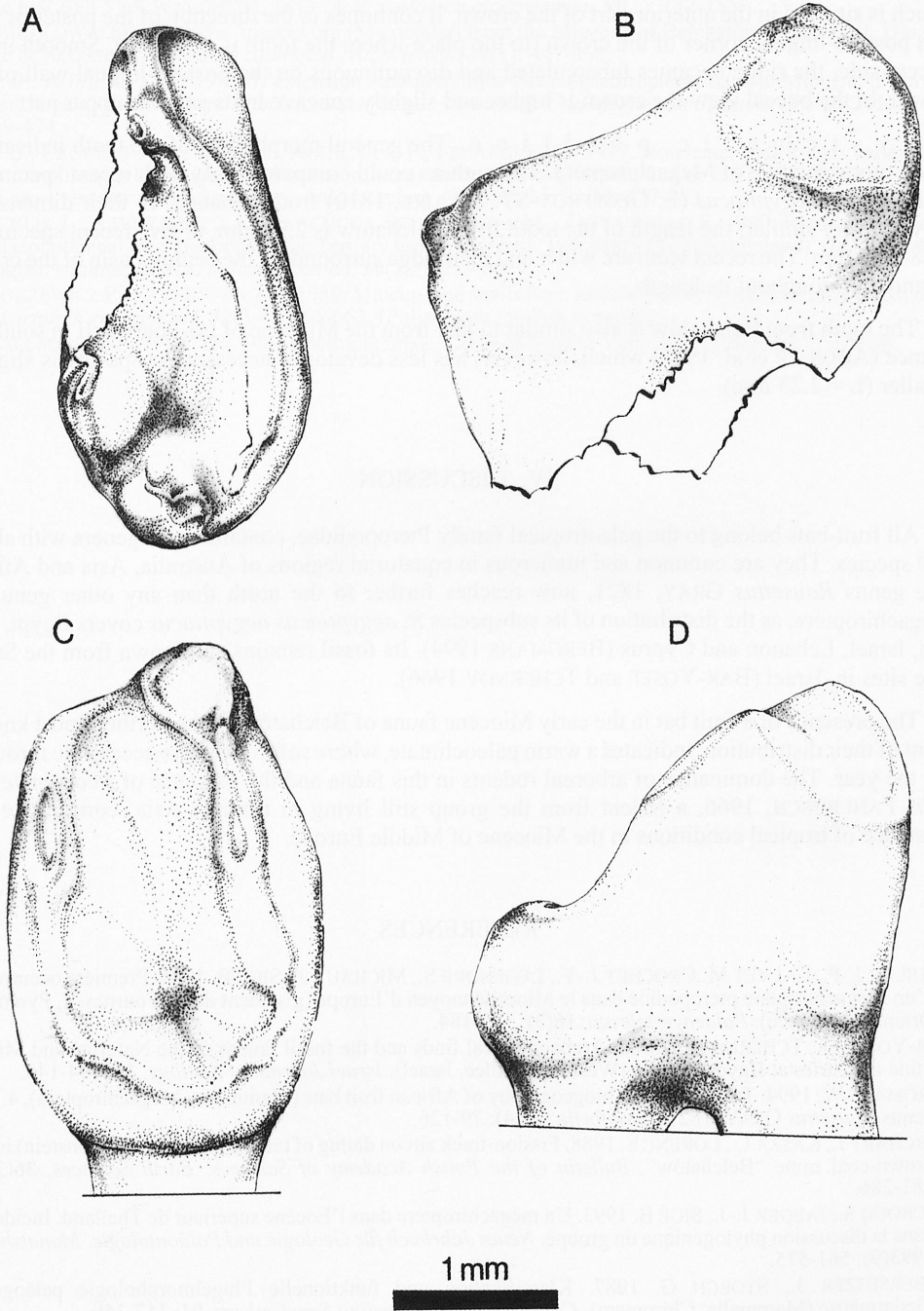


Fig. 1. A-B: Pteropodid from Belchatów C. Right P<sub>4</sub> (MF/2260): A – occlusal view, B – buccal view. C-D: *Roussettus aegyptiacus* from Lebanon. Right P<sub>4</sub> (M/1036): C – occlusal view, D – buccal view.

occupying the central part of the crown is limited by a ridge originating at the top of the main cusp which is situated in the anterior part of the crown. It continues in the direction of the posterior wall and postero-lingual corner of the crown (to the place where the tooth is damaged). Smooth in the buccal side, the ridge becomes tuberculated and discontinuous on the postero-lingual wall of the crown. In the buccal view the crown is higher and slightly concave in its anterior upper part.

**S y s t e m a t i c p o s i t i o n.** The general morphology of the tooth indicates a small representative of Megachiroptera. The authors could compare it only with recent specimens of *Rousettus aegyptiacus* (E. GEOFFROY-ST. HILAIRE, 1810) from Lebanon. In their dimensions they are very similar: the length of the tooth from Bełchatów is 2.99 mm, of five recent specimens 2.68-2.99 mm. The recent teeth are wider and their ridge surrounding the central basin of the crown is smooth throughout its length.

The tooth from Bełchatów is also similar to that from the Miocene of Lo-Fournas II in southern France (AGUILAR et al. 1986) which, however, has less developed accessory cusps and is slightly smaller (L = 2.23 mm).

#### IV. DISCUSSION

All fruit-bats belong to the paleotropical family Pteropodidae, containing 41 genera with about 160 species. They are common and numerous in equatorial regions of Australia, Asia and Africa. The genus *Rousettus* GRAY, 1821, now reaches further to the north than any other genus of Megachiroptera, as the distribution of its subspecies *R. aegyptiacus aegyptiacus* covers Egypt, Jordan, Israel, Lebanon and Cyprus (BERGMANS 1994). Its fossil remains are known from the Stone Age sites in Israel (BAR-YOSEF and TCHERNOV 1966).

The presence of a fruit bat in the early Miocene fauna of Bełchatów C, the northernmost known point of their distribution, indicates a warm paleoclimate, where soft fruits were accessible throughout the year. The dominance of arboreal rodents in this fauna and the presence of *Neocometes similis* FAHLBUSCH, 1966, a rodent from the group still living in tropical Asia, corroborate the existence of tropical conditions in the Miocene of Middle Europe.

#### REFERENCES

- AGUILAR J.-P., CALVET M., CROCHET J.-Y., LEGENDRE S., MICHAUX J., SIGÉ B. 1986. Première occurrence d'un Mégachiroptère ptéropodidé dans le Miocène moyen d'Europe (gisement de Lo Fournas-II, Pyrénées-Orientales, France). *Palaeovertebrata*, **16**(3): 173-184.
- BAR-YOSEF O., TCHERNOV E. 1966. Archaeological finds and the fossil faunas of the Natufian and Microlithic industries at Hayonim cave (Western Galilee, Israel). *Israel Journal of Zoology*, **15**: 104-140.
- BERGMANS W. 1994. Taxonomy and biogeography of African fruit bats (Mammalia, Megachiroptera). 4. The genus *Rousettus* GRAY, 1821. *Beaufortia*, **44**(4): 79-126.
- BURCHART J., KASZA L., LORENC S. 1988. Fission-track zircon dating of tuffitic intercalations (tonstein) in the brown-coal mine "Bełchatów". *Bulletin of the Polish Academy of Sciences, Earth Sciences*, **36**(3-4): 281-286.
- DUCROCQ S., JAEGER J.-J., SIGÉ B. 1993. Un mégachiroptère dans l'Eocène supérieur de Thaïland. Incidence dans la discussion phylogénique du groupe. *Neues Jahrbuch für Geologie und Paläontologie. Monatshefte*, **1993**(9): 561-575.
- HABERSETZER J., STORCH G. 1987. Klassifikation und funktionelle Flügelmorphologie paläogener Fledermäuse (Mammalia, Chiroptera). *Courier Forschungsinstitut Senckenberg*, **91**: 117-150.
- KOWALSKI K. 1995. Fossil Megachiroptera in the Miocene of Poland (In Polish). *Wszechświat*, **96**(3): 81.
- KOWALSKI K. 1997. Rodents of the Miocene locality Bełchatów in Poland. [In:] J.-P. AGUILAR, S. LEGENDRE, J. MICHAUX (eds) – Actes du Congrès BiochroM'97. *Mémoires et travaux de l'Institut de Montpellier de l'École Pratique des Hautes Études*, **21**: 697-703.
- MEIN P. 1999. European Miocene mammal biochronology. [In:] G. E. RÖSSNER, K. HEISSIG (eds) – The Miocene land mammals of Europe. F. PFEIL Verl. München, 25-38 pp.

- RZEBIK-KOWALSKA B. 1994. Insectivora (Mammalia) from the Miocene of Bełchatów in Poland. II. Soricidae FISCHER VON WALDHEIM, 1817. *Acta zoologica cracoviensia*, **37**(1): 137-155.
- RZEBIK-KOWALSKA B. 1996. Insectivora (Mammalia) from the Miocene of Bełchatów, Poland. III. Dimyliidae SCHLOSSER, 1887. *Acta zoologica cracoviensia*, **39**(1): 447-468.
- SIGÉ B., AGUILAR J.-P. 1987. L'extension stratigraphique des mégachiroptères dans le Miocène d'Europe méridionale. *Comptes rendus hebdomadaires des séances de l'Académie des Sciences (Paris)* **211**, D (9): 469-474.
- SIGÉ B., CROCHET J.-Y., SUDRE J., AGUILAR J.-P., ESCARGUEL G. 1997. Nouveaux sites d'âges variés dans les remplissages karstiques du Miocène inférieur de Bouzigues (Hérault, Sud de la France). Partie I: sites et faunes 1 (insectivores, chiroptères, artiodactyles). *Geobios, M. S.*, **20**: 477-483.
- STUHLIK L., SZYNKIEWICZ A., ŁAŃCUCKA-ŚRODONIOWA M., ZASTAWIAK E. 1990. Results of hitherto palaeobotanical investigations of the Tertiary brown coal bed "Bełchatów" (Central Poland). (In Polish with English summary). *Acta palaeobotanica*, **30**(1,2): 259-305.
- STWORZEWICZ E., SZYNKIEWICZ A. 1989. Miocen land snails from eastern part of Bełchatów brown coal delf. *Kwartalnik geologiczny*, **32**(3-4): 655-662. (Polish with English summary).
- WESSELMAN H. B. 1984. The Omo micromammals. *Contributions to Vertebrate Evolution*, **7**: 220 pp.

