

KRZYSZTOF STEFANIAK

## Natural endocranial cast of a delphinid (Cetacea, Delphinidae) from the Pińczów Limestones (Middle Miocene; Holy Cross Mountains, Central Poland)

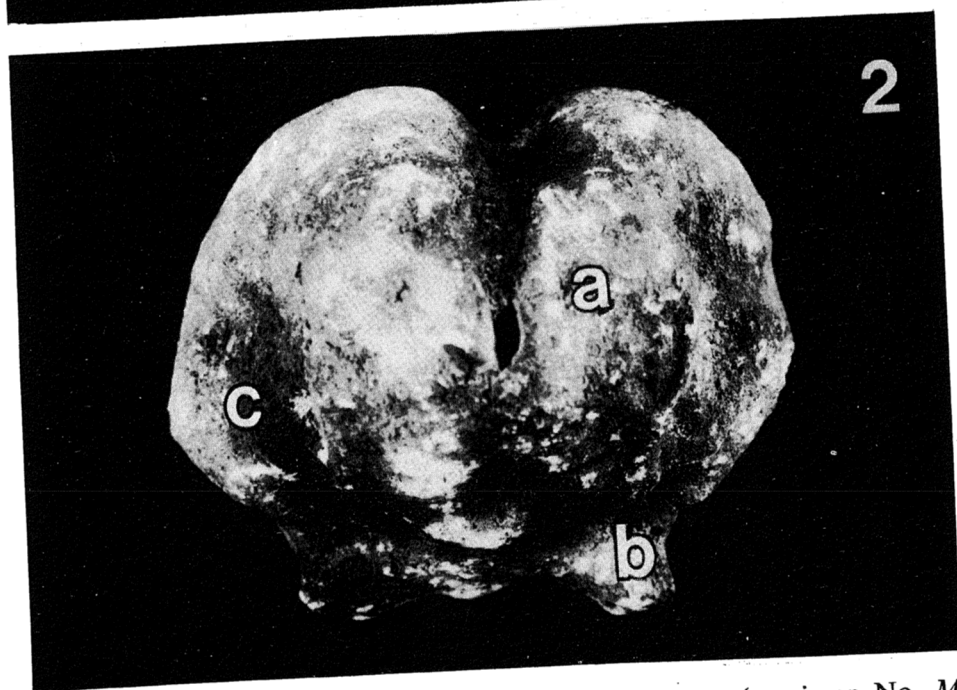
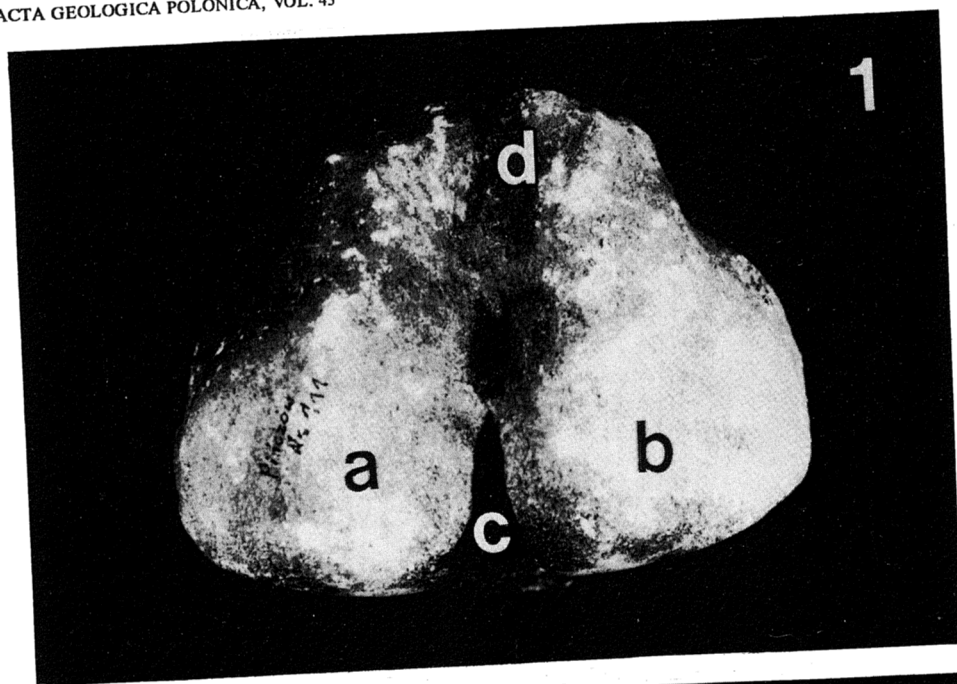
**ABSTRACT:** A description and interpretation of the natural endocranial cast of an undetermined delphinid (Delphinidae, gen. et sp. indet.) is presented from the Middle Miocene (Badenian) deposits (the Pińczów Limestones) situated on the southern slopes of the Holy Cross Mountains, Central Poland. The cast originated in the skull of a delphinid whose body length is estimated as about 1.5 m. Some remarks on the evolutionary position of that delphinid, and its relation to the extant forms are also offered.

### INTRODUCTION

The aim of this paper is to analyze a natural endocranial cast of a Middle Miocene (Badenian) delphinid coming from the Pińczów Limestones, southern slopes of the Holy Cross Mountains, Central Poland.

The geologic setting of the Pińczów Limestones, their faunal content and depositional environment have been outlined concisely by RADWAŃSKI (1977), CZYŻEWSKA (1988) and CZYŻEWSKA & RADWAŃSKI (1991) who recognized shallow-marine life conditions under which a rich assemblage of both invertebrates and vertebrates had successfully developed. In regard to the marine vertebrates other than fishes, the Pińczów Limestones represent a unique case within the whole occurrence area of the Middle Miocene (Badenian) deposits in the Fore-Carpathian Depression of Poland (see RADWAŃSKI 1977, CZYŻEWSKA & RADWAŃSKI 1991).

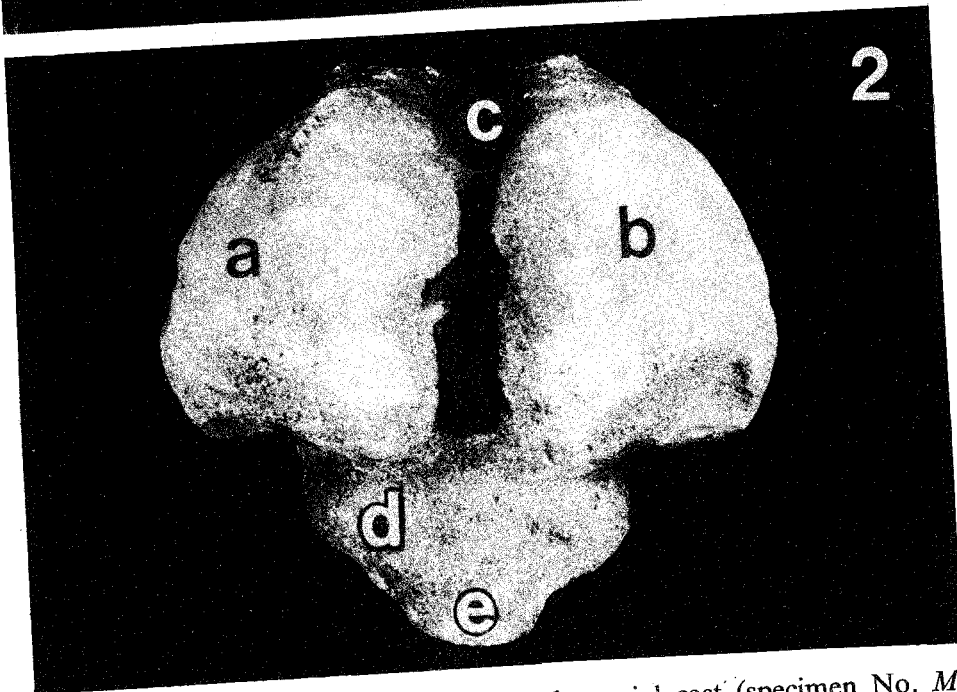
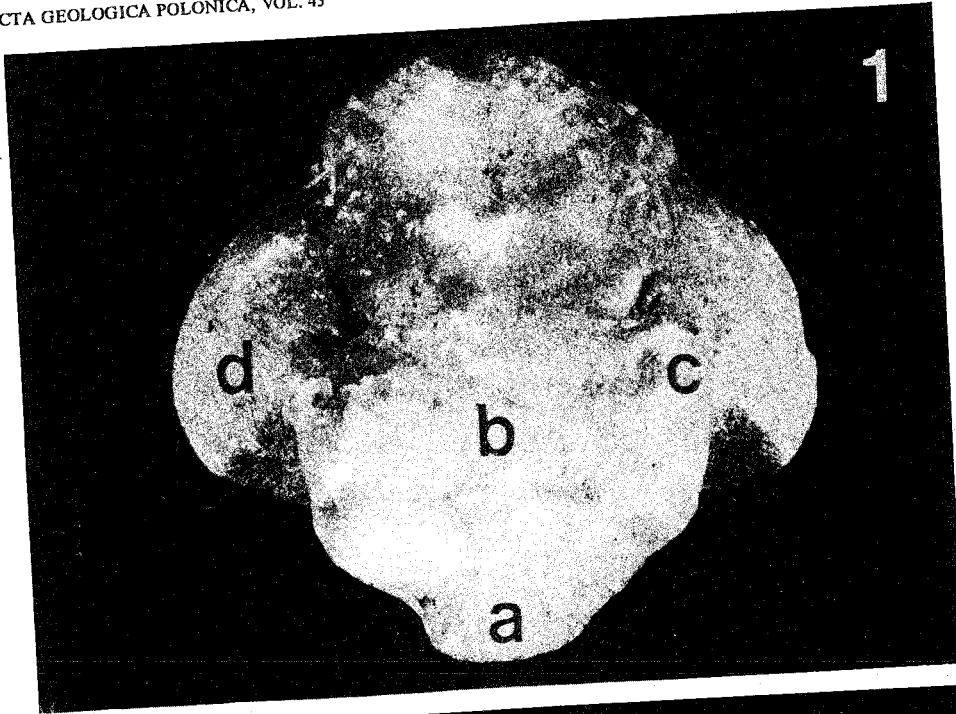
The whale remains from the Pińczów Limestones have first been reported by KOWALEWSKI (1930), who collected various delphinid bones. Subsequent findings delivered one, almost complete skeleton of the baleen whale, *Pinocetus*



Delphinidae, gen. et sp. indet.; natural endocranial cast (specimen No. MZ VIII/Vm-111), taken  $\times 0.7$

1 - Dorsal view: a - left cerebral hemisphere, b - right cerebral hemisphere, c - *fissura longitudinalis cerebri*, d - broken cast of *fossa olfactoria*

2 - Anterior view: a - broken cast of *fossa olfactoria*, b - cast of 5th cerebral nerve, c - annexed mass



Delphinidae, gen et sp. indet.; natural endocranial cast (specimen No. MZ VIII/Vm-III), taken  $\times 0.7$

- 1 - Ventral view: a - cast of *medula oblongata*, b - cast of bones of the skull base (*basioccipitale, sphenoideum*), c - cast of 5th cerebral nerve, d - annexed mass
- 2 - Postero-dorsal view: a - left cerebral hemisphere, b - right cerebral hemisphere, c - *fissura longitudinalis cerebri*, d - left cerebellar hemisphere, e - cast of *medula oblongata*, f - annexed mass

The underside of the specimen (see Pl. 3, Fig. 1) is furnished with imprints of some elements of the skull base (*basioccipitale*, *sphenoideum*) and anteriorly, below the annexed mass, the casts of the 5th cerebral nerve are visible.

The upper surface of the cerebral hemispheres, as observed in its side view (see Pl. 2, Fig. 1), declines towards the *fossa olfactoria*, while the occipital surface is nearly vertical. These two surfaces are angled at about 85°, and the inclination of the upper surface attains about 5°.

#### COMPARATIVE REMARKS

An attribution of the studied specimen to the family Delphinidae GRAY, 1821, rests on such features as: (i) a remarkable width of the cerebral hemispheres, (ii) their small antero-posterior dimension; (iii) vertical posterior surface of these hemispheres; and (iv) the size and position of the cerebellum.

The studied specimen reveals a very limited amount of morphological details and, thus, it may be determined to the family level only. Consequently, it cannot be estimated whether it was specifically and/or generically compatible with any of the delphinid teeth and bones (vertebrae and bulla tympani) recently described from the same locality by CZYZEWSKA & RADWAŃSKI (1991).

The size of the studied endocranial cast corresponds to the body length about 1.5 m of a dolphin. Such a length is met in many extant representatives of the dolphins.

The brain of the present-day dolphins is characterized by big, strongly bent hemispheres, the width of which is larger than the length, and the hemispheres are asymmetric. The cerebellum is partly covered by the posterior part of these hemispheres. The olfactory region is completely reduced (see BREATHNACH 1955, MCHEDLIDZE 1976, GABUNYA & MCHEDLIDZE 1986). In the Miocene genus *Cyrtodelphis* DAL PIAZ, 1903, the brain is slightly bent, and the length of the endocranial cast exceeds its width; it was tapering anteriorly, and the olfactory region was well developed, and situated in the anterior part of the hemispheres; the cerebellum was not covered by cerebral hemispheres (see MCHEDLIDZE 1976, GABUNYA & MCHEDLIDZE 1986). Most of the Miocene dolphins were inhabitants of coastal waters, quite often also brackish. The brain evolution since the Miocene progressed through the reduction of the olfactory region, development of hearing, and through the acquisition of an ability to swim fast.

The studied endocranial cast from the Pińczów Limestones is characterized by its relatively small cerebral hemispheres which are distinctly asymmetric, like in extant forms. The cast tapers anteriorly, and the imprint of the *fossa olfactoria* indicates that the olfactory region was small. The cerebellum is also small and partly covered by the cerebral hemispheres. All these features suggest that the brain of the dolphin to which it belonged, was progressively advanced. The skull asymmetry was certainly a result of adaptation to fast swimming, like in modern forms. The development and location of the cerebellum in the studied specimen was also similar to those of the present-day dolphins. Further

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## NATURALNY ODLEW ENDOKRANIUM DELFINA Z WAPIENI PIŃCZOWSKICH

(Streszczenie)

Przedmiotem pracy jest analiza anatomiczna naturalnego odlewu endokranium bliżej nieoznaczonego delfina (ujętego taksonomicznie jako Delphinidae, gen. et sp. indet.), a pochodzącego z wapieni pińczowskich. Odlew ten (patrz pl. 1–3) odznacza się znaczną szerokością półkul mózgowych w stosunku do długości przednio-tylnej oraz asymetrią tych półkul, których tylna powierzchnia ustawiona jest pionowo. Odlew mózdzku (*cerebellum*) jest mały i znajduje się w pobliżu oraz poniżej tylnej powierzchni półkul mózgowych. Długość osobnika posiadającego czaszkę, w której powstał badany odlew, szacować należy na około 1,5 metra. W pracy podano także kilka uwag dotyczących filogenetycznego rozwoju tego mioceńskiego delfina, wskazując na dość zaawansowane stadium jego rozwoju.

Przedstawione znalezisko rozszerza listę znanych dotychczas z wapieni pińczowskich szczątków waleni, reprezentowanych zarówno przez walenie uzębione - delfiny (patrz KOWALEWSKI 1930, RADWAŃSKI 1977, CZYZEWSKA & RADWAŃSKI 1991) i morświny (patrz CZYZEWSKA & RADWAŃSKI 1991), jak również przez wieloryby fiszbinowe (patrz RYZIEWICZ 1969, CZYZEWSKA & RYZIEWICZ 1976, CZYZEWSKA 1988).