

Character variation in some Messel fishes

Norbert MICKLICH & Gottfried KLAPPERT

Abstract

Comparative investigations into the morphology of *Thaumaturus intermedius* WEITZEL, 1933 and *Atractosteus trausi* (KINKELIN, 1884) from the Messel Formation (Middle-Eocene) reveal a high degree of variation within both nominal species, which is exemplified by different skeletal details. This variation exceeds that reported from contemporaneous fossils as well as the variation reported from related extant species. It cannot be explained by “regular” intraspecific variation (inclusive rare phenotypes), artefacts of fossilisation, or preservation and preparation; nor is it a result of time averaged sampling. For the gars, some specimens share outstanding morphological peculiarities and, therefore, were delimited from all other *Atractosteus* as a new genus and species (MICKLICH & KLAPPERT 2001). All of the other specimens within both nominal taxa are interpreted as morphotype complexes. They may represent sibling species or perhaps foreshadow future speciation events. Basing on different hypotheses concerning the genesis of the Messel Lake, scenarios are discussed which may explain the observed variation. In contrast to the results of drilling projects, which demonstrate that ancient Messel Lake originated in a maar and remained isolated for a long period of time, some different developmental stage in the history of this lake seems to be represented by the specimens described here. At the time these specimens were alive, Messel Lake probably was part of a drainage system, at least for restricted periods of time. Such an interpretation is in good correspondence with peculiarities concerning the general composition of the fish fauna, growth characteristics and length-frequency distributions of the different species, the morphological variation in other fishes from Messel Lake, as well as the stratigraphic positions of the oil shale sections, from which came most of the materials described in this paper.

Introduction

Messel Pit is located close to the small village of Messel, about 9 km NE of Darmstadt (Hessian State, S Germany). It is an ancient opencast mine in which oil shales were quarried until the end of 1971. These oil shales originated from sludge deposits at the bottom of a freshwater lake that existed some 49 million years ago. The locality was inscribed into the World Heritage List of the UNESCO in 1995, mainly because of its mammalian fossils, which became world-famous because they frequently are completely articulated and exhibit excellent soft-tissue preservation. There is also an important record of fossil fishes from Messel, which comprises “primitive” forms as well as representatives of more advanced groups (MICKLICH, KLAPPERT & ARRATIA 1999, MICKLICH, ARRATIA & KLAPPERT 1999). In the last few years, paleoichthyological investigations in the Department of Geology, Palaeontology and Mineralogy of Hessian State Museum have focused on the morphology, phylogeny, systematics and ecology of two different taxa of Messel fishes: A small teleost, which was described as *Thaumaturus intermedius* by WEITZEL (1933), and gars, which were assigned to the species *Atractosteus trausi* by WILEY (1976). The ancestry of both taxa probably dates back deep into the Mesozoic, and preceding relatives may have been broadly distributed before the breaking up of Pangaea (WILEY 1976, WILEY & SCHULTZE 1984, ARRATIA 1996, GREENWOOD & WILSON 1998). The Messel taxa retain several primitive morphological features and are furthermore characterised by an extraordinarily high degree of morphological variation, which also was reported for Messel percoids (MICKLICH 1996). Some examples of this variation discovered will be discussed here because this phenomenon and the processes that may have promoted it are of general interest for the interpretation of fossil fish associations and are not restricted to Cenozoic faunas.

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