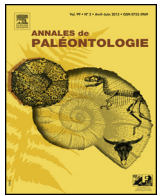




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Original article

## Blanquillos (Teleostei, Malacanthidae) from the Middle Miocene of St. Margarethen in Burgenland, Austria: Palaeoenvironmental implications



*Matajuels (Teleostei, Malacanthidae) du Miocène moyen de St. Margarethen im Burgenland, Autriche : implications paléoenvironnementales*

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### ARTICLE INFO

#### Article history:

Received 2 September 2015

Accepted 22 January 2016

Available online 20 February 2016

#### Keywords:

Teleostei

Malacanthidae

†*Malacanthus carosii* sp. nov.

Middle Miocene

Badenian

St. Margarethen in Burgenland

Austria

### ABSTRACT

Fishes of the genus *Malacanthus*, also known as blanquillos are widespread circum-tropically in shallow waters with sandy bottoms. Blanquillos are diurnal territorial and sedentary fishes that build burrows in open and flat sandy areas near coral and rocky reefs and seagrass beds. The burrows are roofed by mounds constructed of shell and coral fragments, creating a peculiar habitat for benthic invertebrates and fishes on the sand-flat. A new species of blanquillo, †*Malacanthus carosii* sp. nov., is described from the Middle Miocene (Badenian, about 14 Ma) laminated marls of the Leitha Limestone cropping out in the nearby of the town of St. Margarethen in Burgenland, Austria. The three specimens of this Paratethyan taxon are the first articulated skeletons belonging to the malacanthid genus *Malacanthus* ever recorded as fossils. †*M. carosii* sp. nov. is typified by a unique combination of morphological and meristic features, including dorsal-fin with three or four spines and 48–49 rays, anal-fin with a single short spine and 44–45 rays, predorsal formula //2/1 + 1/, first haemal spine above the eighth anal-fin ray, and caudal-fin emarginated. The presence of fishes of the genus *Malacanthus* in the laminated marls of the Leitha Limestone is indicative of a depositional depth located at about 30 m. The fossil record and the complex Cenozoic palaeogeographic and biogeographic history of the Tethys Realm concur to suggest that the modern fragmented distribution of blanquillo species probably originated during the Miocene, with the emergence of the Western Atlantic, Paratethyan, and Indo-Pacific species.

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### R É S U M É

Les poissons du genre *Malacanthus*, aussi connus sous le nom de blanquillos, sont largement répandus dans les régions circumtropicales, dans des eaux peu profondes à fonds sablonneux. Les blanquillos sont des poissons diurnes sédentaires qui construisent des terriers sur des fonds sableux près de récifs coralliens ou rocheux et de prairies d'algues. Les terriers sont recouverts par des monticules faits de fragments de coquilles et de coraux, qui forment un habitat particulier pour des invertébrés et des poissons sur le fond sablonneux. Une nouvelle espèce de blanquillo, †*Malacanthus carosii* sp. nov., est décrite dans les marnes finement litées du Calcaire de la Leitha d'âge Miocène moyen (Badénien, environ 14 Ma) affleurant aux environs de la ville de St. Margarethen, dans le Burgenland (Autriche). Les trois spécimens de ce taxon de la Paratéthys sont les premiers squelettes articulés du genre *Malacanthus* jamais signalés à l'état fossile. †*M. carosii* sp. nov. est caractérisé par une combinaison unique de caractères morphologiques et méristiques, dont une nageoire dorsale avec trois ou quatre épines et 48–49 rayons, une nageoire anale avec une seule épine courte et 44–45 rayons, une formule prédorsale de type //2/1 + 1/, la première hémaphyse située au-dessus du huitième rayon de la nageoire anale et une nageoire caudale émarginée. La présence de poissons du genre *Malacanthus* dans les marnes finement litées du Calcaire

#### Mots clés :

Teleostei

Malacanthidae

†*Malacanthus carosii* sp. nov.

Miocène moyen

Badénien

St. Margarethen in Burgenland

Autriche

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<http://dx.doi.org/10.1016/j.annpal.2016.01.003>

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de la Leitha suggère une profondeur de dépôt d'environ 30 m. Le témoignage des fossiles et l'histoire paléogéographique et biogéographique complexe du domaine téthysien au Cénozoïque conduit à suggérer que la distribution actuelle fragmentée des blanquillos remonte probablement au Miocène avec l'apparition des espèces de l'Atlantique occidentale, de la Paratéthys et de l'Indo-Pacifique.

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## 1. Introduction

Miocene fishes from the Leitha Limestone cropping out near the village of St. Margarethen in Burgenland, Austria are known since the first half of the 19th century (Münster, 1846), primarily due to the efforts of Johann Jakob Heckel and Rudolf Kner (Heckel, 1850, 1856; Heckel and Kner, 1861; Kner, 1862). Fossil fishes have been primarily collected in the Kummer quarry (47°48'01.76"N, 16°37'59.12"E), along the Rust Hills. The Leitha Limestone mainly consists of rhodolite facies or maerl-type deposits (calcarene consisting mainly of branching red algae; Schmid et al., 2001). The Leitha Limestone exposed in the Kummer quarry were deposited during the Middle Miocene along the western side of the Fertörákos Platform, a small carbonate platform located at the western margin of Central Paratethys. These deposits primarily document carbonate shoals surrounding small depressions (Schmid et al., 2001). A detailed study of the stratigraphic section exposed in the Kummer quarry has been provided by Schmid et al. (2001), who described it as a sequence of yellow, poorly cemented and highly porous, bioclast-bearing calcarenites alternated with greenish-whitish laminated marls. These laminated marls contain abundant exceptionally well-preserved invertebrates and articulated skeletal remains of fishes that accumulated during calm phases with reduced water energy and turbulence within large channels originated as a consequence of storm-triggered debris flows (Schmid et al., 2001). The excellent preservation of fishes was probably due to the concurrent effect of episodic events of bottom hypoxia and reduced water turbulence. Periodic increased input of nutrients deriving from variation in river outflows possibly triggered phytoplanktonic blooms that resulted in the development of bottom hypoxia. Bottom hypoxia was responsible of the mass mortalities of the benthic fauna also allowing the exquisite preservation of the fish skeletons (Schmid et al., 2001). The calcareous nannoplankton contained in the laminated marls suggests an age comprised between 14.0 and 13.5 Ma, around the Langhian/Serravallian boundary (see Schmid et al., 2001), corresponding to the late Badenian of the Paratethys stratigraphy (see Piller et al., 2007).

The fish assemblage of St. Margarethen comprises slightly less than 50 taxa belonging to more than 35 families (Carnevale and Collette, 2014). Only a small part of this assemblage has been described to date (Heckel, 1850, 1856; Heckel and Kner, 1861; Kner, 1862; Gorjanović-Kramberger, 1902; Bachmayer, 1980; Bellwood and Schultz, 1991; Schultz, 1993, 2006a, 2006b; Chanet and Schultz, 1994; Carnevale et al., 2012; Carnevale and Harzhauser, 2013; Carnevale and Collette, 2014; Carnevale, 2015; Carnevale and Tyler, 2015). The assemblage is dominated by round herrings, sardines, scorpionfishes, cods, seabreams, and wrasses. Mass mortalities with abundant lanternfishes or gobies are also present. The structure and composition of the fish assemblage suggests a complex palaeoenvironment with sandy bottoms, rocky reefs and seagrass beds, which were present near the depositional environment. During the revision of the fossil fishes from St. Margarethen housed in the Naturhistorisches Museum in Vienna, three specimens belonging to the family Malacanthidae were recognized. A detailed analysis of the osteology of this material revealed that these specimens are the members of a new species of the genus *Malacanthus*, which is described below.

Fishes of the family Malacanthidae are extremely rare in the fossil record. Both the otolith and skeletal records date back to the Middle Eocene (Bartonian; Bannikov, 1997; Nolf, 2013). The Oligocene record is solely restricted to otoliths (see Nolf, 2013), while skeletal remains are known from the Miocene of Algeria (Arambourg, 1927), New Zealand (Eagle, 1997), and United States (Carnevale and Godfrey, 2014), and the Pliocene of United States (Purdy et al., 2001). The new species described herein from the Middle Miocene Leitha Limestone constitutes the oldest documented record of the genus *Malacanthus*.

## 2. Material and methods

The specimens are stored in the Geologisch-Paläontologische Abteilung, Naturhistorisches Museum, Vienna. The available material consists of three partially complete articulated skeletons preserved on greenish-whitish laminated marls with bones that appear dark orange or brown. Some specimens required matrix removal before examination in order to allow investigations of their structure in as much detail as possible; this was achieved using thin entomological needles. The fossils were examined using a Leica MZ6 stereomicroscope equipped with camera lucida drawing arm and measurements were taken with a dial calliper, to the nearest 0.1 mm. All extinct taxa are marked with a dagger (†) preceding their name.

**Institutional abbreviations:** NHMW: Naturhistorisches Museum, Vienna; USNM: National Museum of Natural History, Smithsonian Institution, Washington.

**Comparative materials examined (radiographs):** *Malacanthus brevirostris* Guichenot: USNM 88260; USNM 321156; USNM 334628; USNM 334628; USNM 392460; USNM 411100. *Malacanthus latovittatus* (Lacépède): USNM 405885. *Malacanthus plumieri* (Bloch): USNM 357652.

## 3. Systematic palaeontology

Subdivision Teleostei *sensu* Patterson and Rosen, 1977

Order Perciformes *sensu* Johnson and Patterson, 1993

Family Malacanthidae Günther, 1861

Genus *Malacanthus* Cuvier, 1829

†*Malacanthus carosii* sp. nov. (Figs. 1–3)

**Synonymy:** 2013 – *Malacanthus* sp. – Schultz, p. 280; Pl. 58, fig. 1.

**Holotype:** NHMW 1976/1837/79a + b, partially complete articulated skeleton in part and counterpart lacking most of the head skeleton (Fig. 1A–B).

**Paratype:** NHMW 1976/1691/30a + b, partially complete articulated skeleton in part and counterpart lacking most of the head and the caudal skeleton (Fig. 1C–D).

**Referred specimen:** NHMW 1975/1696/0130, single specimen, partially complete, poorly preserved articulated skeleton.

**Diagnosis:** A *Malacanthus* with dorsal-fin with three or four spines and 48–49 rays; anal-fin with a single short spine and 44–45 rays; predorsal formula //2/1 + 1/; first haemal spine above the eighth anal-fin ray; caudal-fin emarginate.

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