

# Late Ladinian fish faunas from Lombardy (North Italy): stratigraphy and paleobiology

Andrea TINTORI & Cristina LOMBARDO

## Abstract

The Ladinian (Middle Triassic) turns out to be the richest period for Mesozoic fishes. Besides well known faunas, such as that from the early Ladinian of the Besano-Monte S.Giorgio Grenzbitumenzone, new fossiliferous levels have been exploited in the last years. One of these levels, the latest Ladinian Kalkschieferzone, yielded a bounty of fossil fishes, that were collected both at Ca' del Frate (Viggiù, Italy) and Meride (Canton Ticino, Switzerland) fossil sites. This latter large collection of well preserved specimens allows detailed paleobiological studies: a restoration of the ontogenesis and the identification of sexual dimorphism, e.g., were achieved. All the well represented species of fishes show year-class sampling, with a sequence of character states (squamation becoming complete, body and fin shape modifications) which are interpreted as due to the growth process, herein, and not considered to represent different species in the same genus. Adult specimens of some of these same species are also known from the area of Perledo, where, in the last century, a few dozens of fishes have been found during quarry works. The Perledo fauna is only partially contemporary with the one of the Kalkschieferzone, yielding also lower Ladinian species. The different composition of both respective Late Ladinian fish faunas, together with sedimentology, are best explained by different paleoenvironments. At Perledo only adults are found, which indicates a more open sea, whereas at Ca' del Frate - Meride juveniles are common, suggesting that this more protected area was used for reproduction and nursery.

## Introduction and historical review

Since the middle of the last century, the Triassic of Lombardy yielded a large amount of vertebrates, initially from the Perledo (Grigna Sett., Lecco) area, then also from the Besano (Varese) area, which adjoins the Monte San Giorgio (Canton Ticino) across the Italy-Switzerland border (Fig. 1).

Most of the described Perledo fossils (BALSAMO CRIVELLI 1839, BELLOTTI 1857, DEECKE 1889, ALESSANDRI 1910) were collected before 1850, probably in small commercial quarries whose precise location is now unknown. Quarries probably opened in the Perledo Member, the upper part of the 500 m thick Perledo-Varenna Formation, as most specimens are on thin slabs (GAETANI et al. 1992). Larger quarries are still visible in the formation at different stratigraphical levels, so a few specimens may also be from older beds. However, no attention was paid to the possibility of a dual origin and ALESSANDRI (1910), the author who last gave a comprehensive description of the fauna, considered it a single fossil assemblage. The following long period of disinterest in Middle Triassic marine fishes was broken only by BROUGH (1939), who wrote a monography on Besano. Recently, TINTORI (1990a) realized that the so called Perledo fauna actually comprised at least two assemblages artificially put together in old collections. RIEPPEL (1985, 1992) and BÜRGIN (1990a, 1992) described species which are found both in the Perledo-Varenna Formation and in the Besano Formation (the Grenzbitumenzone of many authors) or in the lower Meride Limestone, but they never discussed the faunal implications of their similarity. The very few recent finds in the Perledo area that were well defined concerning their stratigraphical position, confirm the presence of Grenzbitumenzone or lower Meride Limestone species in the lower part of the Perledo-Varenna Formation (the Varenna Limestone Member) (TINTORI 1998), as well as Ca' del Frate species in the Perledo Member (Table 1).

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