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**THYLACOCEPHALAN CRUSTACEANS FROM THE BESANO
FORMATION, MIDDLE TRIASSIC, N. ITALY.**

The Besano Fm (= *Grenzbitumenzone* of Swiss authors), Middle Triassic in age, outcrops in the Besano area (Varese Province, Lombardy, N. Italy) and in the adjacent Monte San Giorgio area (Kanton Tessin, Swiss). The serie consists of a 12-17 mtrs thick alternance of dolomitic and highly bituminous layers, which deposited in an anoxic basin (Bernasconi, 1994). The formation is well known for its vertebrate fauna (fishes and reptiles), and is dated Upper Anisian-Lower Ladinian by its ammonite fauna (Rieber, 1973). Discovered in the middle '80s, fossils of the Besano Fm were quarried both in mines and in two small excavations in the second half of last century in Besano; all fossils from Besano were kept in the Museo Civico di Storia Naturale di Milano (MSNM). After the I World War, and until the 60s, field excavations were carried in Monte San Giorgio by the Palaeontological Institut of Zurich, which led to the publication of an extensive scientific literature.

The collection of the MSNM went almost entirely lost owing to the destruction of the museum itself during the II World War. In 1973 new excavations began in Besano, in order to arrange a new collection (Rio Ponticelli quarry). In 1985 a new quarry was opened in the Besano mountains, the so called Sasso Caldo quarry. This excavation, which is still currently going on, started from the top of the series and, embracing a surface of about 30-40 mq, yielded a great deal of fossil material, mostly vertebrates (Dal Sasso & Teruzzi, 1995), but also interesting invertebrates not yet known in the literature concerning Besano-Monte San Giorgio, such as a sample of thylacocephalan crustaceans from the Middle Besano FM, which are the object of the present communication.

The material at our disposal consists mostly in a number (35) of thylacocephalan crustacean remains from levels 62-68 of Sasso Caldo quarry; two more specimens are at our disposal: one from the top of the Sasso Caldo series and one from punkt 902 of Monte San Giorgio, this latter from the collection of the Institut of Palaeontology of Zurich.

Thylacocephalan crustaceans were first recognized as such in 1983 on specimens from the Lower Sinemurian, Lower Jurassic of Osteno (Como Province, Lombardy, N. Italy; Arduini, Pinna & Teruzzi, 1980). These somewhat enigmatic, extinct crustaceans are known from Cambrian to Cretaceous (Arduini & Pinna, 1989), and their exact taxonomic position is still debated, as well as their palaeoecology and anatomy. In the Triassic Southern Alps they are sometime quite abundant in Norian anoxic basins of Lombardy (Stefani et alii, 1992) and of NE Italy (Muscio & Dalla Vecchia, 1990).

According to most authors (e.g. Bernasconi 1994), the Besano Fm deposited in an anoxic sea bottom. Benthic organisms, such as pelecypods and rare gastropods are to be

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considered allocthonous; they were transported into the basin from the surrounding reefs or carbonate platforms. Thylacocephalan crustaceans are thought to be benthic, scavenger animals (e.g. Alessandrello & alii, 1989); in the Besano Fm they are to be found almost exclusively in well developed bituminous levels, and in these levels their number is such that we cannot consider their presence as accidental. Their supposed benthic way of life would seemingly be in contrast with anoxic conditions at the sea bottom. Yet their peculiar preservation led us to believe that they too are allocthonous. Specimens consist usually of crushed fragments of the carapace. We have found some of them (5 specimens) in partially molten coprolites (Fig.1). In these specimens, fragments are included in the portion of the coprolite which fossilized, while those included in the molten and no more detectable portion are scattered on the bedding plane. In 30 specimens there are no remains of original coprolites at all; specimens consist of fragmented parts of the carapace of variable size; some specimens (Fig.2) consist of more or less crushed bits of carapaces associated with millimetric fragments; some other appear very crushed, with all the carapace reduced in very small fragments (Fig.2) ; in some case specimens consist of more scattered fragments; they are however sparse within a range of few (4-5) cm.

We therefore argue that all the thylacocephalan specimens arrived to the sea bottom included in coprolites. This explains because fragments are always sparse over a very small area of few cm in diameter: usually coprolites melted without preserving their original form, and the virtual absence of bottom currents prevented the fragments of the thylacocephalan carapace to be scattered.

Owing to the absence of recognizable signs of bites on the carapaces, and to the fact that many specimens, whose original length can be estimated to be 3-4- cm, seem to be swallowed after being crushed, we can argue that predators of these thylacocephalans could be middle sized vertebrates with large, more or less rounded teeth, such as placodont reptiles or hybodont sharks, which predated upon thylacocephalans living on the reef or on the platform. It is probable that after feeding, predators returned to the basin, where coprolites were deposited.

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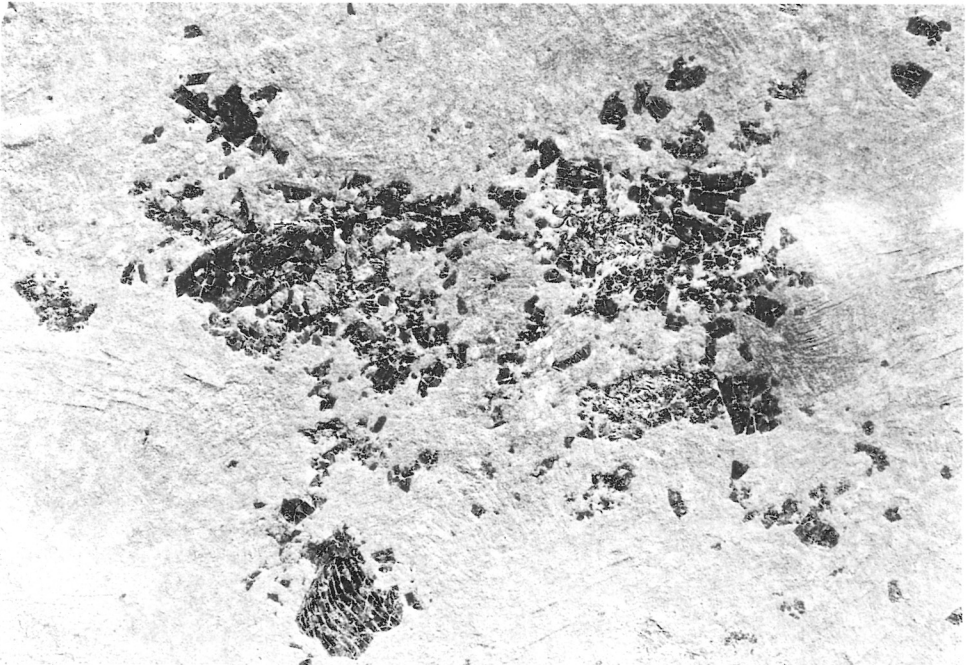
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A coprolite with fragments of the carapace of thylacocephalan crustaceans, with some fragments lying on the outside contour in the bedding plane (n.cat.BES SC 612); x5,4.



A crushed thylacocephalan carapace (n.cat. BES SC 508); x 3,3.



Very fragmented thylacocephalan carapace(s) (n.cat. BES SC 470); x 1,2.