

## THE EOCENE DECAPOD CRUSTACEAN FAUNA OF THE "MAIN" QUARRY IN ARZIGNANO (VICENZA – NE ITALY) WITH THE DESCRIPTION OF A NEW SPECIES OF RANINIDAE

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**Key words:** Crustacea, Decapoda, Raninidae, Eocene, NE Italy.

### Abstract

The Eocene crustacean fauna found in the "Main" quarry of Arzignano (Vicenza – NE Italy) has been studied for twenty years and the number of species is still increasing. Up to now the known species are 53 and belong to 20 families: Callianassidae, Albuneidae, Diogenidae, Dromiidae, Dynomenidae, Raninidae, Calappidae, Hepatidae, Majidae, Dairidae, Parthenopidae, Retroplumidae, Cheiragonidae, Portunidae, Carpiliidae, Goneplacidae, Pilumnidae, Xanthidae, Palicidae and Grapsidae. The new discovery of a very well preserved specimen of great size has allowed the creation of *Lophoranina maxima* sp. nov. and a better placement of the specimens previously known as *L. cf. reussi*. The new species is characterized by the number and the distribution of the transverse ridges on the dorsal surface of carapace and the shape and distribution of the little spines on the ridges which vary in the different phases of growth. The genus *Lophoranina* is widely spread in the Eocene deposits of Veneto. The great size of the studied specimen let us say that *L. maxima* sp. nov. is the greatest fossil Raninidae that has ever been found.

### Riassunto

**La fauna eocenica a crostacei decapodi della cava "Main" di Arzignano (Vicenza – Italia nordorientale) con la descrizione di una nuova specie di Raninidae.**

La fauna a crostacei di età eocenica rinvenuta nella cava "Main" di Arzignano (Vicenza – Italia nordorientale) viene studiata ormai da vent'anni e si arricchisce continuamente di nuove forme. Le specie finora riconosciute sono 53 e appartengono a 20 famiglie: Callianassidae, Albuneidae, Diogenidae, Dromiidae, Dynomenidae, Raninidae, Calappidae, Hepatidae, Majidae, Dairidae, Parthenopidae, Retroplumidae, Cheiragonidae, Portunidae, Carpiliidae, Goneplacidae, Pilumnidae, Xanthidae, Palicidae e Grapsidae. Il rinvenimento di un nuovo esemplare di grandi dimensioni e molto ben conservato ha consentito di istituire *Lophoranina maxima* sp. nov. (Crustacea, Brachyura, Raninidae) e una migliore collocazione degli esemplari finora noti come *L. cf. reussi*. La nuova specie si caratterizza per il numero e la disposizione delle creste presenti sulla superficie dorsale del carapace e per la disposizione e la forma delle spine presenti sulle creste, che variano a seconda della fase di accrescimento. *Lophoranina* Fabiani, 1910 è un genere molto diffuso nei livelli eocenici del Veneto. Le grandi dimensioni dell'esemplare esaminato ci consentono di affermare che *L. maxima* sp. nov. è il più grande rappresentante fossile della famiglia Raninidae finora noto.

### Introduction

Twenty years ago fossil crustaceans were found in the Lutetian deposits of the "Main" quarry in Arzignano. Among the 53 specimens analyzed in BUSULINI *et al.* (1982) 13 species were recognized; soon afterwards, in the following year, 14 further species were added to the list (BUSULINI *et al.*, 1983). Other new findings and publications followed: they dealt with both known and new species coming from the same quarry (BESCHIN & DE ANGELI, 1984; BUSULINI *et al.*, 1984; BESCHIN *et al.*, 1985, 1988, 1991, 1996a, 1996b; DE ANGELI & BESCHIN, 1998, 1999; RIZZOTTO, 1998; TESSIER *et al.*, 1999).

These works allowed to increase greatly the knowledge of the "Main" quarry fauna but also of the whole Italian Eocene crustaceans. The large amount of not yet studied material deposited in the Museo Civico "G. Zannato" in Montecchio Maggiore (Vicenza) has recently brought to the issue of other contributions (BESCHIN *et al.*, 2002; DE

ANGELI & BESCHIN, 2002).

Now the study of a very well preserved specimen of great size found in the same outcrop allows the re-examination of *Lophoranina cf. reussi* (BESCHIN *et al.*, 1988) and the consequent creation of a new species.

As reported in the following general survey of the fauna, up to now the crustacean species found in the "Main" quarry are 53 and represent 20 different families.

### Geological setting

The "Main" quarry is located at the base of the southern slope of the Monte Main, on the left side of the valley of the Chiampo stream; it is a little north of the built-up area of Arzignano (Vicenza – NE Italy). Some years ago it was exploited for the quarrying of the "Chiampo Marbles", but now it is in disuse and in environmental restoration.

In the section of this quarry, three main calcarenite horizons are visible; they are separated by volcanoclastic

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materials that are the deposits of the volcani-tectonic structure called "graben" or "semigraben" of the Alpone-Agno (BARBIERI & ZAMPIERI, 1992).

A limestone level attributed to the Lower Eocene is visible nowadays in the lower part of the sequence: this is the layer quarried in the past. The series goes on with volcanoclastic materials alternated with the other two Middle Eocene nummulitic calcarenite horizons whose thickness decreases from the bottom to the top.

The crustacean remains come from the upper fossiliferous volcanoclastic level of the sequence, of Lutetian age. It is rich not in crustaceans only but in other macrofossils too: foraminifera, corals, molluscs, echinids and coralline algae.

### Systematics

The systematic palaeontology used in this paper follows the recent classification proposed by MARTIN & DAVIS (2001).

Order Decapoda Latreille, 1802  
Infraorder Brachyura Latreille, 1802  
Section Eubrachyura de Saint Laurent, 1980  
Subsection Raninoida de Haan, 1839  
Superfamily Raninoidea de Haan, 1839  
Family Raninidae de Haan, 1839  
Genus *Lophoranina* Fabiani, 1910

Type species: *Ranina marestiana* König, 1825.

Discussion - *Lophoranina* Fabiani, 1910 is an extinct genus which shows a close relationship with the fossil and living genus *Ranina* Lamarck, 1801. Very abundant during Eocene, it is spread from Upper Cretaceous to Oligocene. The differences among the known species are based above all on the shape of the anterior and lateral spines, on the distribution of the transverse ridges and on the shape and size of the tubercles or little spines that adorn the dorsal ridges.

Six are the known species coming from the Indo-Pacific area [*L. persica* (Withers, 1932): Eocene from Iran, *L. bakeri* (A Milne Edwards in Withers, 1932): Middle Eocene from Pakistan, *L. soembaensis* (Van Straelen, 1938): Lower Eocene from Indonesia, *L. toyosimai* (Yabe-Sugiyama, 1935): Eocene from Japan, *L. kemmerlingi* (Van Straelen, 1932): Eocene from Borneo, *L. quinquespinosa* (Rathbun, 1945): Neogene from Fiji Islands], eleven forms from the Euro-African region [*L. marestiana* (König, 1825): Eocene from Spain, Italy and Northern Africa and *L. marestiana* var. *avesana* Bittner, 1883: Middle Eocene from Italy, *L. bittneri* (Lörenthey, 1902): Middle Eocene from Spain, Italy and Hungary, *L. reussi* (Woodward, 1866): Middle/Upper Eocene from Spain, Italy and Hungary, *L. straeleni* Via, 1959: Lower/Middle Eocene from Spain and Italy, *L. aculeata* (A. Milne Edwards, 1881) and *L. barroisi* (Brocchi, 1877): Eocene from France, *L. aldrovandii* (Ranzani, 1820): Eocene? from Northern Italy?, *L. laevifrons* (Bittner, 1875) and *L. maxima* sp. nov.: Middle Eocene from Italy, *L. tchihatcheffi* (A. Milne Edwards, 1866): Eocene from Greece, *L.*

*levantina* Lewy, 1977: Middle Eocene from Israel] and seven species from America [*L. precocious* Feldmann, Vega, Tucker, García-Barrera & Avendaño, 1996: Late Cretaceous from Mexico, *L. cristaspina* Vega, Cosma, Coutiño, Feldmann, Nyborg, Schweitzer & Waugh, 2001: Middle Eocene from Mexico, *L. bishopi* Squires & Demetron, 1992: Eocene from Mexico, *L. raynoriae* Blow & Manning, 1996 and *L. rossi* Blow & Manning, 1996: Middle Eocene from Carolinas (U.S.A.), *L. georgiana* (Rathbun, 1935): Lower Oligocene from Alabama (U.S.A.), *L. porifera* (Woodward, 1886): Lower Oligocene from Trinidad].

*L. reussi* var. *gonii* (Ruiz De Gaona, 1943) from Eocene of Spain is now considered a synonym of *L. reussi* Woodward (VIA, 1959, 1966, 1969).

*Lophoranina bittneri*, *L. laevifrons*, *L. marestiana*, *L. marestiana* var. *avesana*, *L. maxima* sp. nov., *L. reussi*, *L. straeleni* (and probably *L. aldrovandii* too) have been found in deposits of Veneto.

### *Lophoranina maxima* sp. nov.

Figs. 1, 2, pl. 1, figs. 1-3, pl. 2, figs. 1, 2.

1983 *Lophoranina reussi* – Busulini *et al.*: 61, pl. 2, fig. 1 (non Woodward, 1866).

1988 *Lophoranina* cf. *reussi* – Beschin *et al.*: 185, fig. 8, pl. 5, fig. 1, pl. 8, figs. 1-4, pl. 9, fig. 1.

Types: the holotype (MCZ1127 - I.G.211663) is deposited in the Museo Civico "G. Zannato" of Montecchio Maggiore (Vicenza); one paratype is deposited in the Musco "P. Aurelio Menin" of Chiampo (Vicenza) (no catalogue number); the other paratypes are the specimens SV37, SV318, SV319, SV320, SV321, SV322 considered in BESCHIN *et al.* (1988).

Type locality: "Main" quarry in Arzignano (Vicenza).

Geological age: Middle Eocene.

Etymology: *maximus* - a - um (lat.) (superl. of *magnus*) = the greatest; it is referred to the great size that the specimens of this species can reach.

Material and measurements (in mm): the holotype (MCZ1127 - I.G.211663) (represented in BESCHIN *et al.*, 1988, pl. 8, fig. 1) shows the well preserved carapace (maximum width = 52.5; maximum length = 67.1; orbital width = 31.5) and the right cheliped; the Museo Chiampo paratype preserves the carapace (maximum width = 109.0; maximum length = 140.5; orbital width = 70.0), the ventral parts, the partly supplemented chelipeds and fragments of the other pereopods. For the other paratypes see BESCHIN *et al.* (1988).

Diagnosis - Carapace subovate, weakly vaulted, longer than wide; anterior margin a little concave and dentate, rostrum short with three spines, supraorbital margin with two fissures; anterolateral margins diverging, with two spines; dorsal regions not well defined with numerous subparallel transverse ridges: the first four ridges have a median convexity; the middle ones are nearly straight and continuous; the rear ones are concave and interrupted. The ridges are adorned by long and pointed small spines which

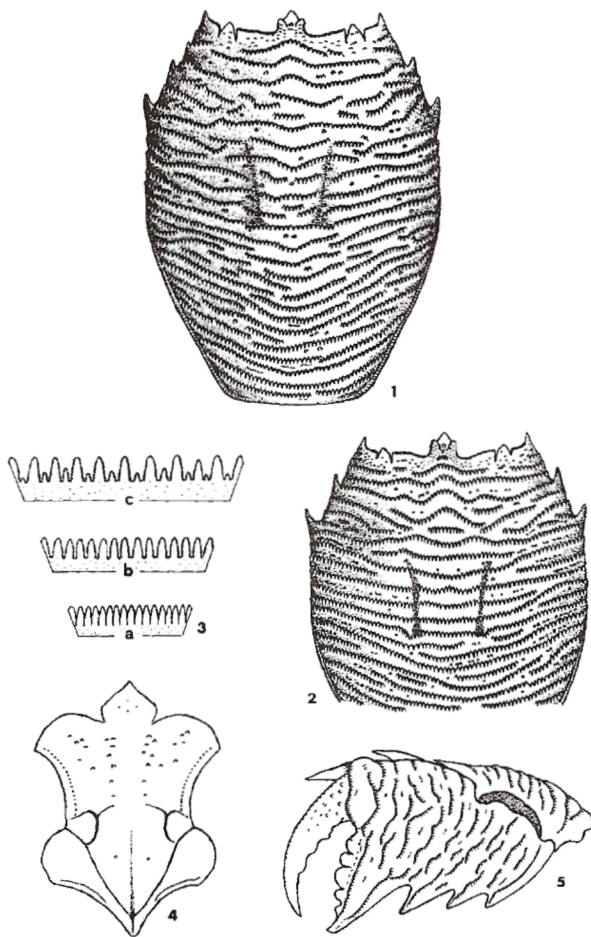


Fig.1 - *Lophoranina maxima* sp. nov. - 1: holotype, dorsal view of carapace; 2: paratype SV320, dorsal view of carapace; 3: distribution of the spines of the transverse ridges in the different phases of growth; 4: sternum; 5: cheliped. Drawings from BESCHIN *et al.* (1988).

are fastened to one another in the smallest specimens, by spines that become round, far from one another and alternated by a smaller one in the largest specimens. On the largest carapaces three notches are visible on each epibranchial region. Lower margin of propodus with four spines (including the fixed finger).

**Description** - Carapace subovate, weakly vaulted, longer than wide; anterior margin a little concave and dentate, rostrum short with three spines (the median one downturned), supraorbital margin with two fissures; supraorbital spine subtriangular, round; outer orbital spine with a small spine near its base. Anterolateral margins diverging, with two pointed spines; posterolateral margins long and converging, with a granulate rim; posterior margin straight and shorter than the anterior one. The dorsal regions are not well defined; the pronounced and weakly converging branchiocardiac grooves are the sole visible furrows; the frontal area is only a little developed and adorned by some granules.

The shield is characterized by subparallel transverse ridges (which in the median line are 25-27; in the biggest specimen among the main ridges some short intermediate

small ridges are visible); the first four ridges are sinuous with a median convexity; the first one is present in the median part only, the second and the third ones are continuous from one side to the other of the carapace, the fourth and the fifth are interrupted; the sixth, continuous and almost straight, joins the bases of the second lateral spines. The following ridges, in the middle part of the shield, are relatively continuous and straight; the rear ones are concave and interrupted.

The ridges are ornamented by clear spines directed forward which change features with the size of the specimens: as BESCHIN *et al.* (1988) note, in the smallest ones (length till 60-70 mm) they are long and pointed, very close to one another; in the specimens whose length is from 70 to 100 mm, they are separated from each other; in the largest specimen (length 140.5 mm) these spines are short, round and alternated by smaller ones. On the largest carapace three notches arranged on a transverse line are visible on each epibranchial region.

The subhepatic and pterigostomial regions are ornamented by small oblique granulate ridges. The sternal plate has the typical shape with anterior points (lily-shape); it is wide between the base of the chelipeds and becomes suddenly narrow between the second pereopods. The chelipeds are stout; the propodus is flattened, with small transverse ridges on the outer side of the hand; on the upper margin it has a pointed spine and on the lower margin three triangular ones; the fixed finger is short and dentate; the dactylus is long, curved, with a spine on the upper margin. The abdomen is triangular, long, made of six segments

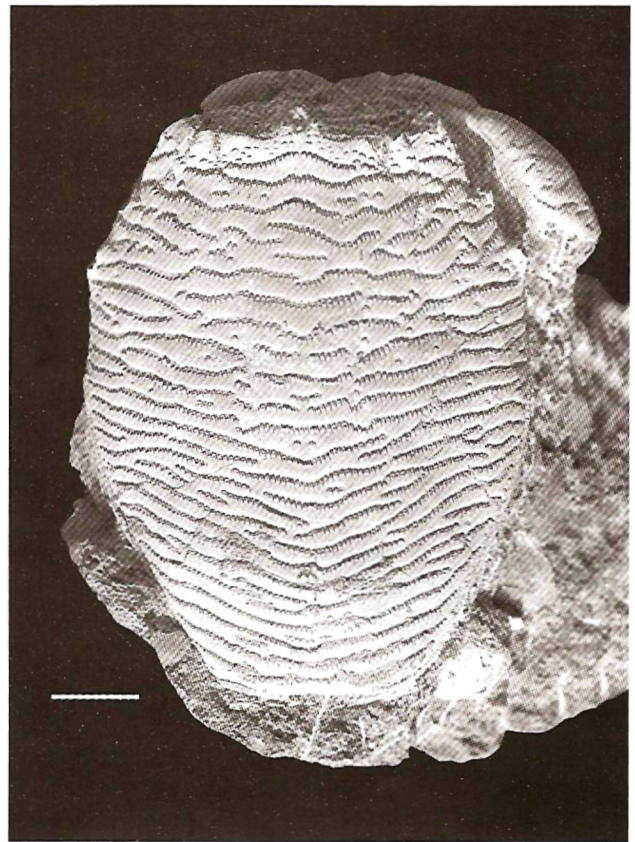
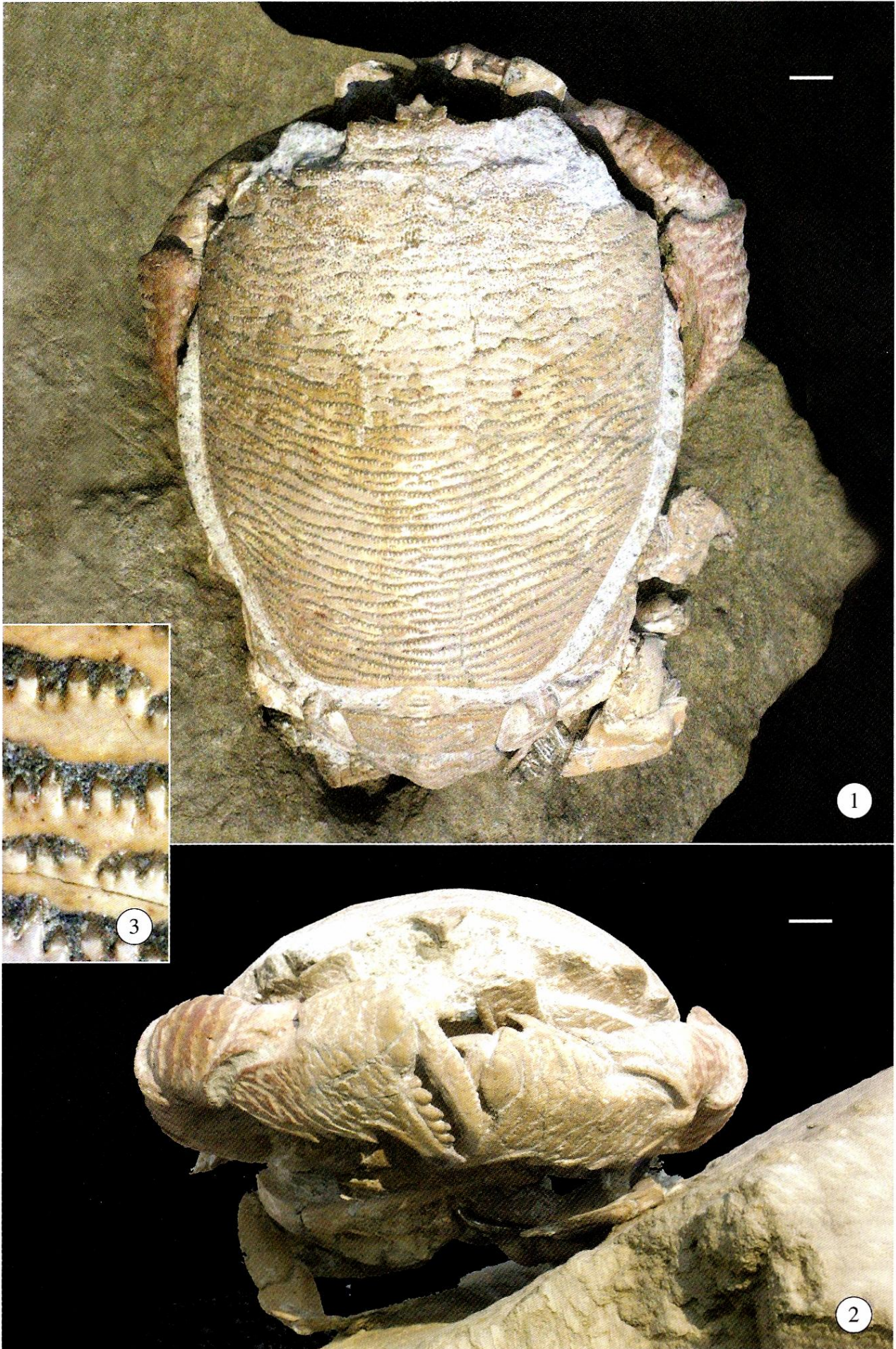
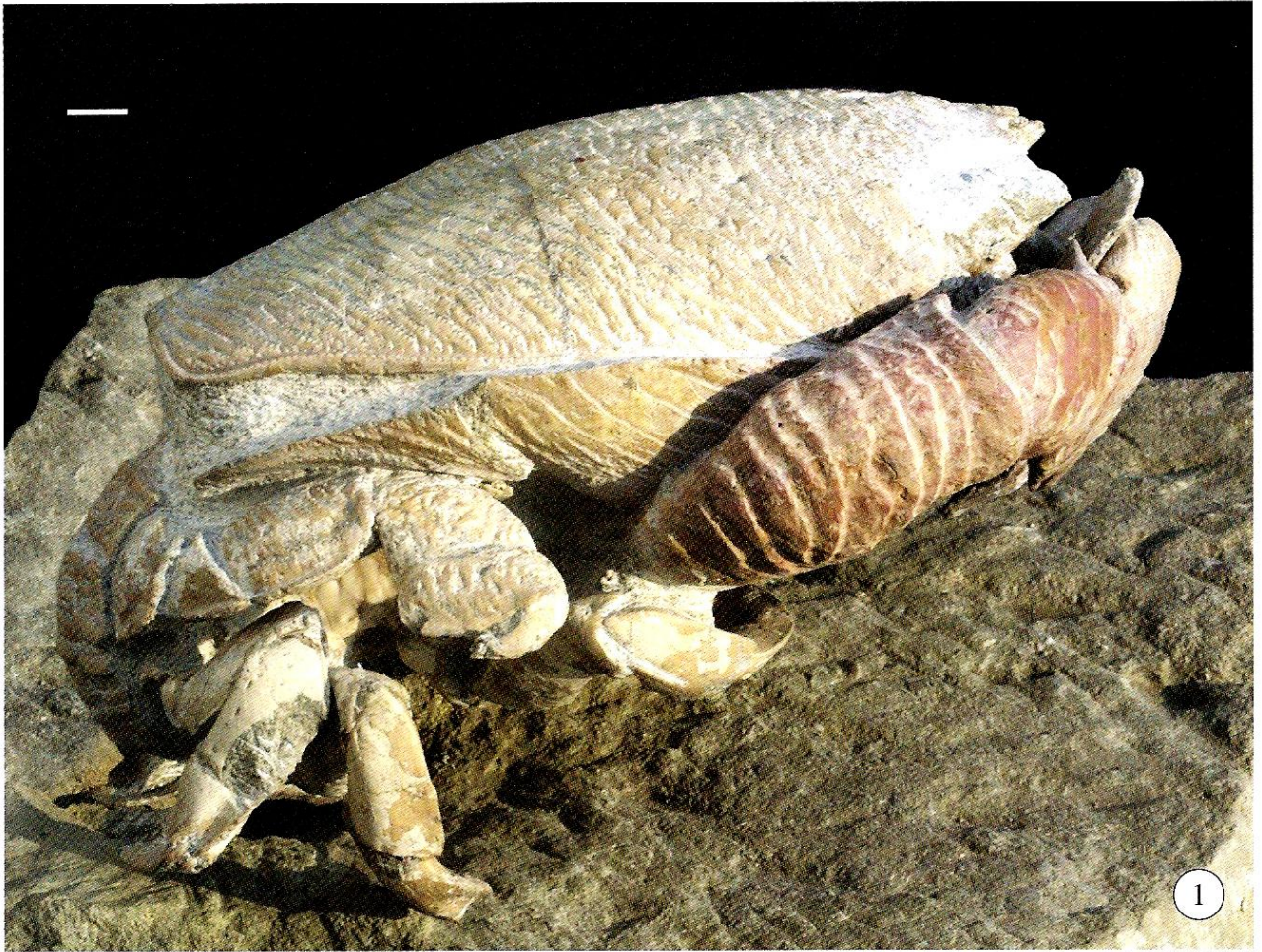


Fig. 2 - *Lophoranina maxima* sp. nov. - holotype (MCZ1127 - I.G. 211663) dorsal view. Scale bar equals 1 cm.





without telson; for a more complete description of the ventral and abdominal parts, chelipeds and other pereopods see BESCHIN *et al.* (1988).

Discussion - BESCHIN *et al.* (1988) described and illustrated *L. cf. reussi* on the base of seven specimens coming from the Middle Eocene of the "Main" quarry of Arzignano (Vicenza). The particular structure of the first transverse ridges (sinuous with a median convexity) led to identify a close relationship above all with *L. reussi* (Woodward, 1866). However, the studied specimens had some peculiarities that made them a little different from *L. reussi* and so we decided to leave the specific assignation uncertain.

The finding of a new specimen coming from the same outcrop and a careful analysis of the species that show the first ridges with a median convexity allow the creation of a new species.

The type of *L. aldrovandii* (Ranzani) deposited in the Biblioteca Centrale della Università di Bologna (Central Library of the University of Bologna), already examined in BESCHIN *et al.* (1988), shows the presence of a lower number of dorsal ridges which are discontinuous, less raised and adorned by very reduced spines. *L. reussi* (Woodward) of the Middle and Upper Eocene of Spain, Italy, Hungary and probably Northern Africa, has carapace proportionally shorter and lateral margins more convex; the frontal region is more developed and the first three ridges are sinuous and continuous; the spines adorning the transverse ridges are shorter and spaced from each other. *L. soembaensis* (Van Straelen) of the Lower Eocene of Indonesia has anterior and posterior margins of the same length, the anterolateral margins with three spines, branchiocardiac grooves very arched with outer concavity. *L. straeleni* Via found in the Lower and Middle Eocene of Spain and Italy has the frontal region more developed, the first dorsal ridges interrupted and the propodus of the cheliped with five spines on the lower margin. *L. tchihatcheffi* (A. Milne Edwards) of the Eocene of Greece has in the anterior half of the shield transverse ridges more regular and continuous, and the small spines present on these ridges more round.

*Lophoranina maxima* sp. nov. shows differences in the ornamentation of the ridges during the growth as a result of the numerous moults made during its life.

The new specimen that is here studied is the greatest fossil Raninidae that has ever been found.

### The Crustacean fauna of the "Main" quarry: a general survey

Up to now the decapod species found in the "Main" quarry are 53; 28 of them have been recognized for the first time in this quarry, the other 25 were already known. They represent 40 genera: 11 of them were created on the base of species discovered in this outcrop. They are distri-

buted in three infraorders: Thalassinidea Latreille, 1831, Anomura MacLeay, 1838 and Brachyura Latreille, 1802; the families represented are 20 most of them (17) belonging to the Brachyura.

**Callianassidae:** the findings of thalassinids, always rare as fossils, appeared extremely interesting: the genera *Neocallichirus* Sakai, 1988 (*N. fortisi* Beschin, Busulini, De Angeli & Tessier, 2002) and *Eucalliax* Manning & Felder, 1991 (*E. vicetina* Beschin, Busulini, De Angeli & Tessier, 2002) have been reported in Italy and in the Mediterranean area for the first time; both still extant, they were known as fossils in the Cainozoic of Japan.

**Albunidae:** the type species of the genus *Italialbunea* Boyko, 2002 is *Albunea lutetiana* Beschin & De Angeli, 1984 which is present in the "Main" quarry (BOYKO, 2002).

**Diogenidae:** *Eocalcinus cavus* Beschin, Busulini, De Angeli & Tessier, 2002 is the second species attributed to the genus *Eocalcinus* Via, 1959; the type species *E. eocenicus* Via, 1959 was known in the Eocene of Spain and Veneto (VIA, 1959, 1969; BESCHIN *et al.*, 1994). In BESCHIN *et al.* (2002) *Pagurus mezi* Lörenthey, 1909 known in the Eocene of Egypt (LÖRENTHEY, 1909) and Veneto (BESCHIN *et al.*, 1994) was placed within the genus *Petrochirus* Stimpson, 1859 for the lack of one longitudinal ridge on the upper margin of propodus and the features of the fixed finger.

**Dromiidae:** the family is here represented by *Basinotopus lamarcki* (Desmarest, 1822) and by two species of the genus *Dromilites* H. Milne Edwards, 1837: *D. hilarionis* Bittner, 1883 and *D. pastoris* Via, 1959.

**Dynomenidae:** *Kromtitis tetratuberculatus* Beschin, Busulini, De Angeli & Tessier, 2002, a species recently discovered in the "Main" quarry, allowed the enlargement of the distribution of the genus *Kromtitis* Müller, 1984, which was previously represented by two species only: *K. pentagonalis* Müller & Collins, 1991 of the Upper Eocene of Hungary and *K. koberi* (Bachmayer & Tollmann, 1953) of the Miocene of Austria, Hungary and Poland. This genus, originally referred to the family Dromiidae (MÜLLER, 1984), is better placed within the Dynomenidae: in fact the shape of the front and of the orbits, the well defined dorsal regions characterized by granulate lobes reveal a close relationship with the living *Paradynomene* Sakai 1963.

**Raninidae:** with the presence of ten species, this is the Brachyura family most represented in the diversified fauna of the "Main" quarry: together with the two species of *Cyrtorhina* Monod, 1956 (*C. globosa* Beschin, Busulini, De Angeli & Tessier, 1988 (RIZZOTTO, 1998) and *C. oblonga* Beschin, Busulini, De Angeli & Tessier, 1988), the first reports of the genus as fossil, there are further species belonging to six other genera: *Cosmonotus eocaenicus* Beschin, Busulini, De Angeli & Tessier, 1988, *Laeviranina pulchra* Beschin, Busulini, De Angeli & Tessier, 1988, *Lianira convexa* (Beschin, Busulini, De Angeli, Tessier & Ungaro 1991), *Lophoranina laevifrons* (Bittner, 1875), *L. maxima*, sp. nov., *Notopus beyrichi* Bittner, 1875, *Quasilaeviranina arzignanensis* (Beschin, Busulini, De Angeli & Tessier, 1988) and *Q. simplicissima* (Bittner, 1883). It is probable that the environment was very suitable to these animals: living raninids prefer sandy grounds into which they burrow.

Plate 1 - *Lophoranina maxima* sp. nov. - Musco Chiampo-paratype - 1: dorsal view; 2: frontal view (the chelipeds are partly supplemented); 3: particular of the spines of the transverse ridges on the carapace. Scale bar equals 1 cm.

**Calappidae:** this family in the “Main” quarry is represented by *Bittnerilia eoacaena* (Bittner, 1883) and by three species of *Calappilia* A. Milne Edwards, 1873: *C. dacica* Bittner, 1893, *C. cf. incisa* Bittner, 1886 and *C. subovata* Beschin, Busulini, De Angeli & Tessier, 2002. The latest known is characterized by the structure of the margins and the ornamentation made of small and regular granulation and of irregular tubercles.

**Hepatidae:** three species are referred to this family: two of them belong to the genus *Hepaticiscus* Bittner, 1875 (*H. neumayri* Bittner, 1875, *H. pulchellus* Bittner, 1875); another one is attributed to the recently created genus *Mainhepaticiscus* (*M. zannatoi* De Angeli & Beschin, 1999) whose name reminds exactly the quarry where it was discovered: it is characterized by the subhexagonal carapace, the bilobed and projecting front and the presence of six conical swellings on the dorsal regions.

**Majidae:** the presence in the outcrop of the “Main” quarry of a great number of specimens (45) belonging to the genus *Micromaia*, Bittner, 1875 distributed in the species *M. tuberculata* Bittner, 1875, *M. elegans* Beschin, Busulini, De Angeli & Tessier, 1985, *M. mainensis* Beschin, Busulini, De Angeli & Tessier, 1985, *M. margaritata* Fabiani, 1910 and *M. meneguzzoi* Beschin, Busulini, De Angeli & Tessier, 1985 is particularly interesting. Another taxon is present: *Periacanthus horridus* Bittner, 1875 that preserves the fragile spines ornamenting the lateral and posterior margins of the carapace.

**Dairidae:** in the Eocene of the “Main” quarry *Daira* De Haan, 1833 is represented by *D. salebrosa* Beschin, Busulini, De Angeli & Tessier, 2002. This genus is also known in the Vicenza area with *D. depressa* (A. Milne Edwards, 1865) in the Oligocene of Castalgomberto (Vicenza) (BESCHIN *et al.*, 2001). The numerous records of this genus make it possible to suppose that it originated in the western seas of the Tethys and it afterwards migrated so that now some species live in the seas of the Pacific coasts of Central America (*D. americana* Stimpson, 1870) and of the Indo-Pacific such as *D. perlata* (Herbst, 1790). This hypothesis seems to be confirmed by the discovery of this second species in the Miocene of Fiji Islands (RATHBUN, 1945), in the Miocene and Pliocene of Japan (KARASAWA, 1993, 2000) and in the Pleistocene-Olocene of Taiwan (HU & TAO, 1996).

**Parthenopidae:** one species is referred to this family: *Parthenope nummulitica* (Bittner, 1875), that was formerly described in the S. Giovanni Ilarione fauna (Verona).

**Retroplumidae:** only one specimen of *Retropluma eocenica* Via, 1959 has been discovered in the “Main” quarry: it is an interesting presence of a species that was previously found in the Eocene of Spain. The genus *Retropluma* was recorded in Italy only in the Pliocene of Brà (Piemonte) with the species *R. craverii* (Crema, 1895).

**Cheiragonidae:** this family has been recently enriched with a new species: *Montezumella pumicosa* Beschin, Busulini, De Angeli, Tessier, 2002: it is characterized by

the subpentagonal carapace, the large front with two denticulate laminar processes. This species is added to *M. cf. scabra* Quayle & Collins, 1981 (BUSULINI *et al.*, 1983).

**Portunidae:** the recently erected genus *Eocharybdis* (*E. cristata* Beschin, Busulini, De Angeli & Tessier, 2002) shows a relationship with both genera *Charybdis* de Haan, 1833 and *Thalamita* Latreille, 1829; its peculiarities are the wide and a little sinuous front, the anterolateral margins with five pointed teeth directed forward, the regions of the shield not well defined, the presence on the carapace of granulate ridges folded forward. This family is also represented by *Ceronnectes boeckhi* (Lörenthey, 1897) and by *Neptocarcinus millenaris*, Lörenthey, 1898, a species in common with the Eocene fauna of Hungary.

**Carpiliidae:** three forms are referred to this family: *Harpactoxanthopsis quadrilobata* (Desmarest, 1822), found in various outcrops in Veneto, *Palaeocarpilius simplex* Stoliczka, 1871 and an uncertain species belonging to the genus *Phlyctenodes* A. Milne-Edwards, 1862.

**Goneplacidae:** two crustaceans represent this family: *Branchioplax albertii* De Angeli & Beschin, 2002 belonging to a genus known with some fossil species of the Cainozoic in Great Britain, Hungary, America, Japan and Senegal and discovered here for the first time in Italy, and *Paracoralliocarcinus arcanus* Tessier, Beschin, Busulini & De Angeli, 1999, with a typical trapezoidal carapace with three spines on the short antero-lateral margins.

**Pilumnidae:** the recently described *Eopilumnus chechii* Beschin, Busulini, De Angeli & Tessier, 2002 even if attributed to the family Pilumnidae Samouelle, 1819 shows relationships with the family Xanthidae MacLeay, 1838: it is characterized by a subhexagonal carapace, front with four teeth, short anterolateral margins with four spines, long posterolateral margins, dorsal regions well defined by furrows, epibranchial regions divided in four lobes.

**Xanthidae:** the genera belonging to this family found in the “Main” quarry are three, while the species are four: *Eohalimede granosa* Beschin, Busulini, De Angeli & Tessier, 2002, *Lobonotus cf. orientalis* Collins & Morris, 1978, *Titanocarcinus aculeatus* Busulini, Tessier & Visentin, 1984 and *T. euglyphos* Bittner, 1875. The recent discovery of some specimens of *Eohalimede* Blow & Manning, 1996 is particularly relevant: this genus, in fact, has been previously recorded in North America only and namely in the Eocene of Carolinas. It has been already pointed out that the decapod fauna of North and South Carolina shows more analogies with contemporary European faunas than with American ones (BLOW & MANNING, 1996, 1997; FELDMANN *et al.*, 1998; DE ANGELI & BESCHIN, 1999): *Paguristes* Dana, 1851, *Cyrtorhina* Monod, 1956, *Lophoranina* Fabiani, 1910, *Calappilia* A. Milne Edwards, 1873, *Pseudohepaticiscus* Blow & Manning, 1996, *Glyphithyreus* Reuss, 1859, *Laeviocarcinus* Lörenthey & Beurlen, 1929, *Titanocarcinus* A. Milne Edwards, 1863 (for this taxon even a species is in common: *T. euglyphos* Bittner, 1875) and *Eohalimede* are the genera in common.

**Palicidae:** only one species belonging to this family is present in the “Main” quarry: *Eopalicus squamosus* Beschin, Busulini, De Angeli & Tessier, 1996 which is characterized by a polygonal, almost flat carapace with

five spines on the anterolateral margins and the dorsal regions ornamented by transverse and denticulate ridges of different extension.

**Grapsidae:** two species referred to this family have been found in the “Main” quarry *Pseudodaranyia carinata* Tessier, Beschin, Busulini & De Angeli, 1999 and *Maingrapsus quadratus* Tessier, Beschin, Busulini & De Angeli, 1999: the first one shows typical granulate keels on the shield and an ornamentation made of sparse and isolated granules or granules joined in little groups; the second is characterized by a subquadrate carapace and anterior margins forming a continuous arch. KARASAWA & KATO (2001) thought that this genus had to be attributed to the family Goneplacidae, but afterwards the same authors (KARASAWA & KATO, 2003) decided that this genus together with *Paracorallicarcinus* Tessier, Beschin, Busulini & De Angeli, 1999 had to be included in the family Pilumnidae; we have chosen, for the time being, to keep our original attributions.

Since the first issues (BUSULINI *et al.*, 1982, 1983) the idea of a very diversified and abundant thanatocoenosis, which can compete in importance with the Eocene classical ones of Spain (VIA, 1959, 1969), Hungary (LÖRENTHEY, 1898; LÖRENTHEY & BEURLIN, 1929; MÜLLER & COLLINS, 1991), England (BELL, 1857; QUAYLE & COLLINS, 1981) and Northern Africa (LÖRENTHEY, 1909) was delineated and comparisons with these coeval European faunas have been done (BESCHIN *et al.*, 2002).

Among the recorded genera only *Neocallichirus* Sakai, 1988, *Eucalliax* Manning & Felder, 1991, *Petrochirus* Stimpson, 1859, *Notopus* de Haan, 1841, *Cosmonotus* Adams & White, 1848, *Cyrtorhina* Monod, 1956, *Daira* de Haan, 1833 and *Retropluma* Gill, 1894 are still extant; they are absent from the Mediterranean.

The environment where the crustaceans of the “Main” quarry lived was a shallow sea with the predominance of sandy and muddy bottoms. The findings of crab genera living among corals such as *Kromtitis* and *Daira* correlated with the discovery of fossil corals, above all individual ones, testify the existence in the vicinity of a reef and can partially be explained with entrainment phenomena. These hypotheses agree with what one can observe in the similar sediments of the “Boschetto” quarry in Nogarole Vicentino (Vicenza), which is very close to the “Main” quarry (BESCHIN *et al.*, 1994).

In this area a platform with shallow, warm and agitated water existed. In the Chiampo Valley and in the whole Lessinean area, a general regression took place at the end of Middle Eocene caused by a uplifting which was linked to the intense volcanic and tectonic events acting in that period (DE ZANCHE, 1965).

### Acknowledgements

We are grateful to the director of the Museo Civico “G. Zannato” in Montecchio Maggiore (Vicenza) dott. R. Ghiotto and to the head of the paleontological collection of the Museo “P. Aurelio Menin” in Chiampo (Vicenza) padre Gb. Casonato who allowed the study of material deposited in their collections.

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