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The family Erymidae Van Straelen, 1924 and the superfamily Glypheoidea Zittel, 1885 in the Sinemurian of Osteno in Lombardy (Crustacea, Decapoda)

Abstract – The aim of this work, which concludes the studies about macruran decapod crustaceans of the Sinemurian deposit of Osteno, is to analyze the family Erymidae Van Straelen, 1924 and the superfamily Glypheoidea Zittel, 1885. The two species *Eryma meyeri* n.sp. and *Phlyctisoma sinemuriana* n.sp. have been attributed to the family Erymidae Van Straelen, 1924 (infraorder Astacidea Latreille, 1803). The genus *Phlyctisoma* Bell, 1863 is reported for the first time in Lower Jurassic. The two species *Glyphea tricarinata* n.sp. and *Mecochirus germari* n.sp. have been attributed to the superfamily Glypheoidea Zittel, 1885 (infraorder Palinura Latreille, 1803). *Pseudoglyphea ancylochelis* (Woodward, 1863) belongs to the same superfamily. *M. germari* n.sp. is presently the best preserved species of Lower Jurassic deposits. The systematic position of the genus *Pseudoglyphea* Oppel, 1861 is discussed.

Riassunto – La famiglia Erymidae Van Straelen, 1924 e la superfamiglia Glypheoidea Zittel, 1885 nel Sinemuriano di Osteno in Lombardia (Crustacea, Decapoda).

In questo lavoro, che conclude gli studi sui crostacei decapodi macruri del giacimento sinemuriano di Osteno, vengono analizzate la famiglia Erymidae Van Straelen, 1924 e la superfamiglia Glypheoidea Zittel, 1885. Nell'ambito della famiglia Erymidae Van Straelen, 1924 (infraordine Astacidea Latreille, 1803) sono state istituite le due specie *Eryma meyeri* n.sp. e *Phlyctisoma sinemuriana* n.sp.. Il genere *Phlyctisoma* Bell, 1863 viene segnalato per la prima volta nel Giurassico inferiore. Nell'ambito della superfamiglia Glypheoidea Zittel, 1885 (infraordine Palinura Latreille, 1803) sono state istituite le due specie *Glyphea tricarinata* n.sp. e *Mecochirus germari* n.sp.. Alla stessa superfamiglia appartiene *Pseudoglyphea ancylochelis* (Woodward, 1863). Attualmente, *M. germari* n.sp. è la specie meglio conservata dei terreni del Giurassico inferiore. Viene discussa la posizione sistematica del genere Pseudoglyphea Oppel, 1861.

Key words: Crustacea, Decapoda, Lower Jurassic, Italy.

Introduction

The fossiliferous outcrop, located west of the village of Osteno (Como province) on the Italian shore of the Lugano Lake (Arduini, Pinna & Teruzzi, 1982), opens at the basis of Mount Cecci or Pinzerone and crops up

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in front of three now inactive quarries. The recovery of the cephalopod ammonoid *Coroniceras bisulcatum* (Brug.) (Pinna, 1967) allowed to ascribe the outcrop to the *«bucklandi zone»* of Lower Sinemurian.

After the discovery of the fossils of Osteno by Pinna (1967), the Museo di Storia Naturale di Milano carried out continuous researches on the fossiliferous outcrop for almost twenty years, gathering several hundreds of specimens. The collection consists of a wide variety of organisms (1).

This outcrop is particularly interesting for the perfect preservation of the specimens, which in most cases still preserve the most delicate structures, such as muscle bundles, gills and the body outline for the soft-bodied organisms. The preservation of these structures is extremely variable, to the point that the tissues or the muscle fibres can be entirely preserved, while the soft parts can be reduced to a thin film of organic matter. Thanks to this high preservation degree, the studies carried out so far have been to supply a detailed description and a perfect recontruction of the examined specimens (Pinna, 1985).

The study of decapod crustaceans of Osteno is part of a research programme on Mesozoic macruran decapod crustaceans that the Museo di Storia Naturale di Milano has been carrying out for many years, which brought to the description of important fauna associations of Lower Triassic of Ambilobè region (NW Madagascar; Garassino & Teruzzi, 1995) of Upper Triassic of Lombardy, such as Cene (Seriana Valley, Bergamo; Pinna, 1974) Prati di Rest (Valvestino, Brescia; Pinna, 1976), Ponte Giurino (Imagna Valley, Bergamo; Garassino & Teruzzi, 1993) and Carnia (Udine, NE Italy; Garassino, Teruzzi & Dalla Vecchia, in press) and the Cretaceous assemblages of Trebiciano (Trieste, NE Italy; Garassino & Ferrari, 1992), of Lebanese outcrops (Garassino, 1994) and of Vernasso (Udine N. Italy; Garassino & Teruzzi, in press).

Modes of preservation

The faunistic assemblages of Osteno can be found inside the selciferous limestone of Lower Sinemurian, known in the geological literature as «Kiese Kalk» of Swiss authors or «Moltrasio Limestone» of Italian authors. The spongolitic micrite typical of the Moltrasio Limestone Formation of Lombardy, that contains the Osteno fossiliferous lens, is very rich of sponge spicules, produced by the disintegration of sponges themselves (sponge spicules represent up to 25% of the rock). The macruran decapod crustaceans

(1) The main fauna fraction consists of macruran decapod crustaceans, of which the genera *Aeger* Münster, 1839 (infraorder Penaeidea de Haan, 1849) (Garassino & Teruzzi, 1990) and *Coleia* Broderip, 1835 (infraorder Palinura Latreille, 1803) (Pinna, 1968, 1969 and Teruzzi, 1990) have been studied. Several works have been given up to many thylacocephalan crustaceans (for specific bibliographic reference, see Arduini & Pinna, 1989). The fauna also includes several fishes, subject of studies carried out by Cristopher Duffin (Duffin, 1987, 1992). The perfect preservation of the soft-bodied organisms allowed a detailed description of annelid worms (polychaetes) (Arduini, Pinna & Teruzzi, 1982), of nematodes (Arduini, Pinna & Teruzzi, 1983), of one single specimen of enteropneust (Arduini, Pinna & Teruzzi, 1981) and of a cephalopod coleoid of uncertain ascription (Pinna, 1972). Finally some continental vegetables have been recovered (Bonci & Vannucci, 1986).

are compressed and flattened and their preparation is made difficult by the strong consistency of the rock.

The sample includes 276 specimens of macruran decapod crustaceans belonging to the collection of the Museo di Storia Naturale di Milano. The abundant material and the perfect preservation of the specimens allowed a detailed anatomic reconstruction of the five examined species.

Acronym. MSNM: Museo di Storia Naturale di Milano.

Abbreviations

R	- rostrum	C	- carina
E	- eye	A1	- antennula
eel	- cervical groove	A2	- antenna
b	- antennal groove	An	- antennal spine
bl	- hepatic groove	is	- ischiocerite
i	- ventral groove	me	- merocerite
c	- postcervical groove	ca	- carpocerite
a	- branchiocardiac groove	S	- scaphocerite
d	- gastro-orbital groove		

Systematics

Infraorder Astacidea Latreille, 1803
Family Erymidae Van Straelen, 1924
Genus *Eryma* von Meyer, 1840

Eryma meyeri n.sp.
Figs. 1, 2, 3, 15, 16, 17

Derivatio nominis: dedicated to Herbert von Meyer who established this genus in 1840.

Holotype: MSNM i7606.

Paratypes: MSNM i9871, i9893, i9895.

Type locality: Osteno (Como, Italy).

Geological age: Lower Sinemurian, «*bucklandi zone*».

Diagnosis. Subcylindrical carapace; long rostrum, with one suprarostral

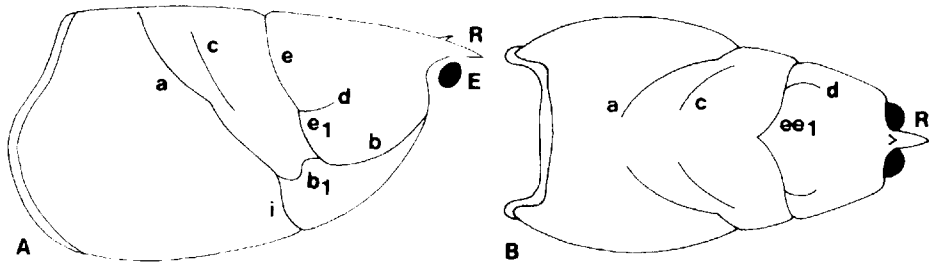

Fig. 1 – *Eryma meyeri* n.sp., carapace reconstruction in lateral view (A) and in dorsal view (B), line drawing.

tooth; deep cervical groove; weak branchiocardiac, postcervical, antennal, gastro-orbital, hepatic and ventral grooves; chela of pereiopod I with index longer than the dactylus; subrectangular telson; exopodite with diaeresis.

Material. 41 specimens, fairly preserved. Most of the specimens are preserved in lateral view (35) and a small part in dorsal view (6).

The description of the species is essentially based on the specimens: MSNM: i7606, i7607, i9871, i9875, i9884, i9886, i9893, i9895, i9896, i9902, i9915, i9916, il0265, il0635, il0656.

Description. A small-size erymid, with thin and strongly tuberculate exoskeleton, 2 to 3 cm in length.

Carapace. In lateral view, the carapace (Fig.1) is subcylindric in outline, with the ventral margin raising slightly in the anterior third. The dorsal margin is straight and it bends near the cervical groove. The dorsal margin extends into a long rostrum, pointed at the distal extremity and with a suprarostral tooth in the proximal third. The posterior margin is sinuous, with a concavity in the middle and strengthened by a thin marginal ridge.

In dorsal view, the carapace (Fig. 1) is subcylindrical in outline and it narrows slightly near the shallow ocular incisions. The lateral margins are rounded, while the posterior margin is slightly forward arcuate. The deep cervical groove and the weak branchiocardiac, postcervical, antennal, hepatic and ventral grooves can be observed on the carapace (Fig. 1). The weak gastro-orbital groove originates from the median portion of the cervical groove.

Abdomen. It is well preserved in all specimens. The somites are subrectangular in outline and are of even length. The telson is subrectangular and it does not show a characteristic ornamentation. The uropods are not longer than the telson. The exopodite, crossed by a thin longitudinal median carina, has a rounded diaeresis and a spine on the external lateral margin, while the endopodite, crossed by a thin longitudinal median carina, does not show a characteristic ornamentation. The distal margins of the exopodite and of the endopodite are finely fringed.

Cephalic appendages. They are preserved in few specimens. It is possible to observe the 3rd segment of the peduncle of the antennulae, to which a flagellum—which total length cannot be assessed—is articulated. The flagella of the antenna are preserved only in fragments.

Thoracic appendages. They are preserved in almost all specimens. One single specimen (MSNM i7607) still preserves the 3rd maxilliped with spineless dactylus and propodus. Pereiopod I is well developed with chelae of equal length. The propodus of the chelae is strong and stocky, with index longer than the dactylus. The distal extremety of the index is slightly bent, while that of the dactylus is straight. The internal margins of the index and the dactylus are supplied with small teeth in the proximal and median parts. The surface of the chelae is ornate by small spine-shaped tubercles. The carpus is short and stocky, while the merus is strong and elongate. The external lateral margins of the merus and the propodus bear a row of strong spines. Pereiopods II-III are of the same length, they consist of thin and elongate articula, and are supplied with small chelae with internal dactylus. Pereiopods IV-V, thin and elongate, have a terminal dactylus.

Abdominal appendages. Only two specimens (MNSM: i7606, il0656)

still preserve the pleopods, consisting of a subrectangular sympodite to which two long multiarticulate flagella are articulated.

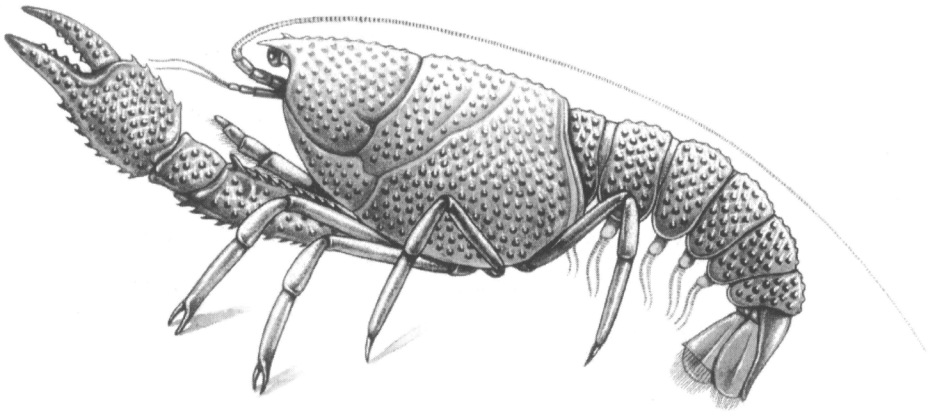

Fig. 2 – *Eryma meyeri* n.sp., reconstruction

Observations

The genus *Eryma* was established by von Meyer (1840) on the basis of specimens of the lithographic limestone of Solnhofen that Münster (1839) ascribed to the genus *Glyphea.*

Förster (1966), stressing the fact that it is an extremely conservative and constant genus as for its shape starting from Upper Lias to Lower Cretaceous, highlights its main features: cylindrical carapace with moderately toothed long rostrum, very deep cervical groove, weak gastro-orbital groove, branchiocardiac and postcervical grooves almost parallel, weak ornamental of the carapace, flat abdomen with triangular-shaped somites, and pereiopod I with a short and stocky chela.

The main features of the genus *Eryma* von Meyer, 1840 can be found in the examined specimens.

It is interesting to observe that the genus *Eryma* von Meyer, 1840 is known by species which generally preserve only the carapace or the first pair of pereiopods. *E. meyeri* n.sp. is one of the few species, together with *E. modestiformis* (Schlotheim, 1822) of Tithonian of Solnhofen, which perfect preservation of every anatomic element allowed a detailed reconstruction.

We presently known 45 species (cfr. Rathbun, 1926, Van Straelen, 1936, Stenzel, 1945, Roger, 1946, Secretan, 1964, Förster, 1966, Feldmann, 1979 and Feldmann & McPherson, 1980) ascribed to this genus, distributed from Sinemurian (Lower Jurassic) to Senonian (Upper Cretaceous).

The only species belonging to the Sinemurian known to date is *E. bordenensis* (Copeland, 1960) of the Borden Island Formation in Canada (Copeland, 1960 and Feldmann & McPherson, 1980). Also Van Straelen (1925) reports the presence of the genus *Eryma* von Meyer, 1840 in the Sinemurian of Mohon, near Mésières (Ardennes) in the *Asteroceras obtusum zone*, without supplying a precise diagnosis because of the poor preservation of the material recovered.

The comparison between *E. meyeri* n.sp. and *E. bordenensis* (Copeland, 1960) is made very difficult by the bad preservation of Copeland's species, limited to the anterior and median portions of the carapace and to part of pereiopod I. The two species differ essentially for these features: in the new species the rostrum is short, with a suprarostral tooth, while in Copeland's species the rostrum is long, with four or five suprarostral teeth; in *E. meyeri* n.sp. the dorsal margin is smooth, while in *E. bordenensis* (Copeland, 1960) it is strongly toothed; finally between the two species is different the path of the postcervical, branchiocardiac and hepatic grooves (Fig. 3).

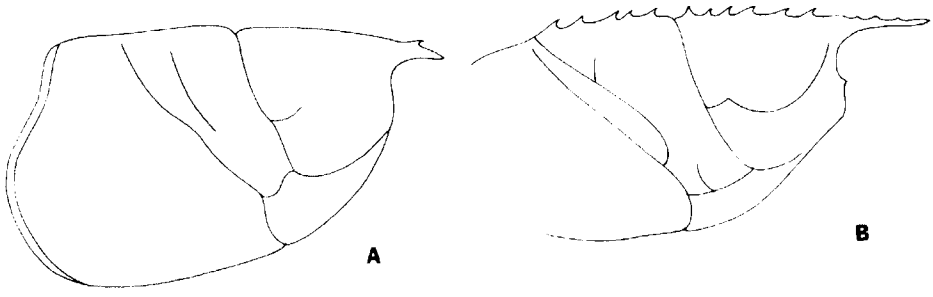

Fig. 3 – Comparison between the carapaces of *Eryma meyeri* n.sp. (A) and *Eryma bordenensis* (Copeland, 1960) (B).

Genus *Phlyctisoma* Bell, 1863

Phlyctisoma sinemuriana n.sp.
Figs. 4, 5, 18, 19, 20, 21

Derivatio nominis: referring to the geological range of Osteno.
Holotype: MSNM il3517.
Paratypes: MSNM i9887, il0357, il0450.
Type locality: Osteno (Como, Italy).
Geological age: Lower Sinemurian, «*bucklandi zone*».

Diagnosis. Subcylindrical carapace; long rostrum, lacking both supra- and subrostral teeth; long and deep cervical groove; chela of pereiopod I with the index longer than the dactylus; subrectangular telson; exopodite with diaeresis.

Material. 10 specimens, in a fairly good state of preservation, and all in dorsal view.

The description of the species is essentially based on the specimens: MSNM: i7608-i9911, i9907-i9887, i9909-i9873, il0450-il3517.

Description. A small-sized erymid, with thin and finely tuberculate exoskeleton, 2 to 2.5 cm in length.

Carapace. In dorsal view, the carapace (Fig. 4) is subcylindrical in outline and it narrows strongly near the very deep ocular incisions. The lateral margins introflex at the level of the cervical and postcervical grooves and end with a well developed antennal spine. The posterior margin is anteriorly

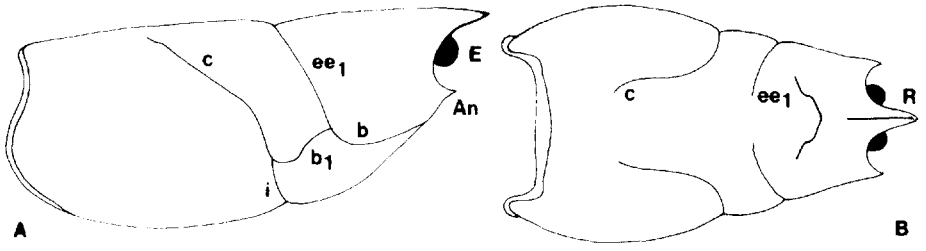

Fig. 4 – *Phlyctisoma sinemuriana* n.sp., carapace reconstruction in lateral view (A) and in dorsal view (B), line drawing.

very arcuate and strengthened by a thin marginal ridge. The dorsal margin extends into a long rostrum, lacking both supra- and subrostral teeth and strengthened by a strong toothless ridge. The large and deep cervical groove and the weak postcervical groove can be observed on the carapace.

Abdomen. It is well preserved in only a few specimens. The somites are subrectangular in outline and are of even length. The subrectangular telson does not show a characteristic ornamentation. The uropods, visible in three specimens (MSNM: i9887-i9907, il0450, il3517), are not longer than the telson. The exopodite, crossed by a thin longitudinal median carina, has a rounded diaeresis, while the endopodite does not show a characteristic ornamentation. The distal margins of the exopodite and the endopodite are finely fringed.

Cephalic appendages. They are preserved in a few specimens. The eye is carried by a short and slender eye-stalk. The peduncle of the antennulae consists of three segments of even length. The antennal peduncle consists of ischiocerite, merocerite and carpocerite, all of same length. It is not possible to assess the total length of the antennal flagella.

Thoracic appendages. They are preserved in all specimens. The 3rd maxilliped, which can be observed in two specimens (MSNM: i7608, il0450), consists of four spineless articula, narrowing slightly toward the distal extremity. Pereiopod I is very developed with chelae of equal length. The propodus of the chelae is strong and elongate, with the index longer than the dactylus and both slightly bent at the distal extremity; the internal margins of both the articula are finely toothed. The carpus is short and stocky, while the merus is thin and elongate. Pereiopods II-III are of equal length, they consist of thin and elongate articula and are supplied with small chelae with internal dactylus. Pereiopods IV-V, thin and elongate, have a terminal dactylus.

Abdominal appendages. The preservation in dorsal view of all the specimens did not allow to observe these appendages.

Observations

The genus *Phlyctisoma* was established by Bell (1863) for two macruran decapod crustaceans of Cambridge Greensand (Lower Cretaceous, England), ascribed to two different species, *P. tuberculatum* and *P. granulatum*, in order to distinguish these forms from the other Jurassic erymids. Such distinction was essentially based on the different path of the grooves and on the kind of ornamentation of the carapace.

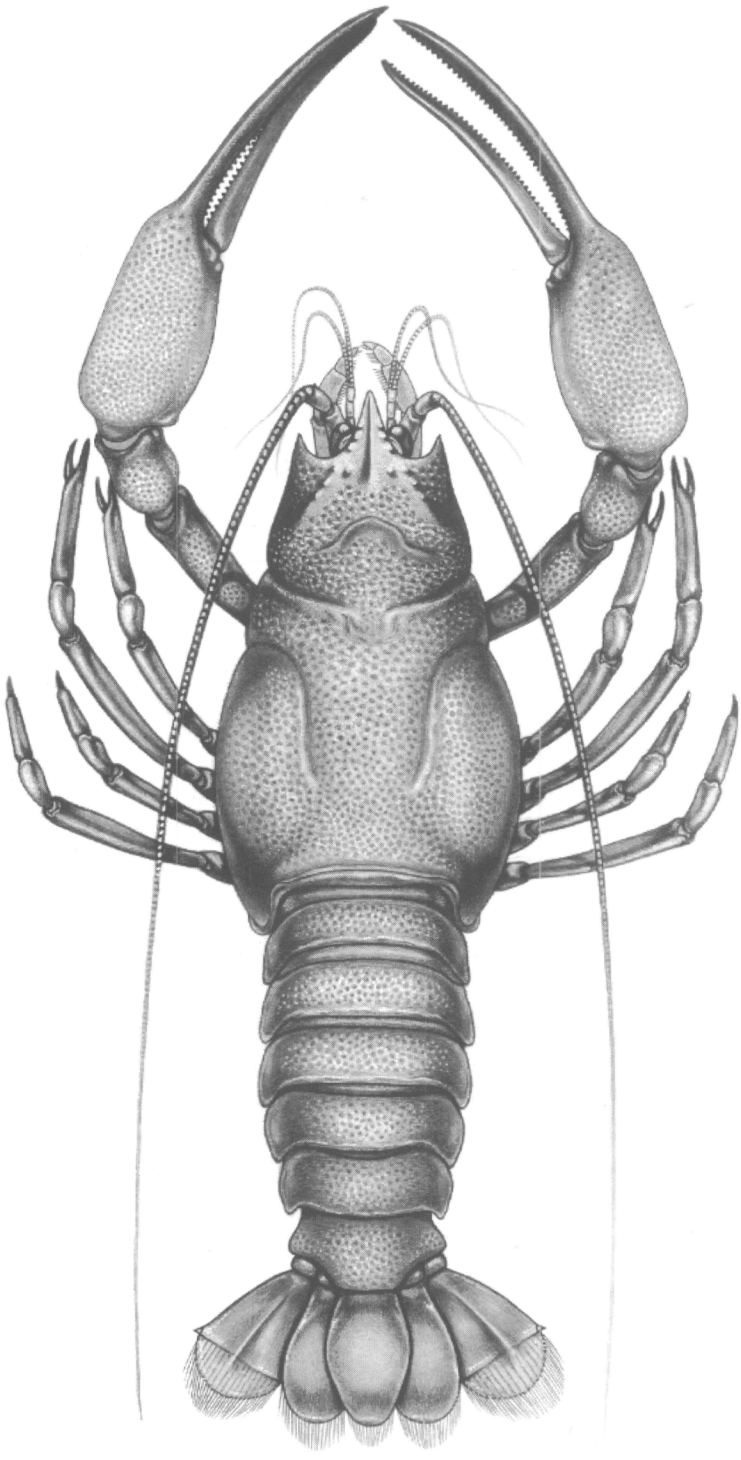

Fig. 5 – *Phlyctisoma sinemuriana* n.sp., reconstruction.

Förster (1966) highlights the main features of the genus *Phlyctisoma* Bell, 1863: strongly arcuate subcylindrical carapace, deep gastro-orbital and cervical grooves, strongly developed postcervical groove reaching the hepatic groove, extremely small branchiocardic groove, rough and slightly differentiated ornamentation of the carapace, abdomen with triangular somites and pereiopod I with strongly elongate dactylus and index.

The main features of the genus *Phlyctisoma* Bell, 1863 can be found in the examined specimens.

9 species were previously known (cfr. Secretan, 1964, Förster, 1966 and Feldmann & McPherson, 1980) and ascribed to this genus, distributed from the Bajocian (Middle Jurassic) to the Upper Campanian-Lower Maastrichtian (Upper Cretaceous): *P. elegans* (Mechin, 1901) of Bajocian of Marbach (Germany), *P. calloviensis* Förster, 1966 of Callovian of Kornberg near Herznach (Germany), *P. perroni* (Etallon, 1861) of Oxfordian of Frasnes (France), *P. pseudobabeaui* (Dollfus, 1863) of Kimmeridgian of La Hève and Boulogne-sur-Mer (France), *P. minuta* (Schlotheim,1822) of Tithonian of Solnhofen and Eichstätt (Germany), *P. strambergensis* (Bachmayer, 1959) of Tithonian of Stramberg (Germany), *P. spinulatum* Secretan, 1964 of Valanginian-Hauterivian of Madagascar, *P. tuberculata* Bell, 1863 of Albian of Cambridge (England) and *P. dawsoni* (Woodward, 1900) of Upper Campanian-Lower Maastrichtian of British Columbia (Canada).

Therefore, on the basis of present knownledge, *P. sinemuriana* n.sp. represents the most ancient species of the genus *Phlyctisoma* Bell, 1863 known to date.

The comparison of P. *sinemuriana* n.sp. with the other species is made particularly difficult by the state of preservation of the specimens known in the literature, generally limited to the carapace and pereiopod I. The only possible comparison is with *P. minuta* (Schlotheim, 1822) of Tithonian of Solnhofen, preserved in all its parts. There are two features distinguishing *P. sinemuriana* n.sp. from *P. minuta* (Schlotheim, 1822): the rostrum of the new species has no subrostral teeth and the chelae of pereiopod I are long and thin if compared to the short and stocky chelae that can be observed in the Solnhofen species.

Infraorder Palinura Latreille, 1803
Superfamily Glyphaeoidea Zittel, 1885
Family Glypheidae Zittel, 1885
Genus *Glyphea* von Meyer, 1835

Glyphea tricarinata n.sp.
Figs. 6, 7, 8, 22, 23, 24, 25

Derivatio nominis: for the presence of three longitudinal carinae in the gastric region.

Holotype: MSNM i7609.

Paratypes: MSNM i9967, i9970, il0451.

Type locality: Osteno (Como, Italy).

Geological age: Lower Sinemurian, «*bucklandi zone*».

Diagnosis. Subcylindrical carapace; short rostrum, lacking both supra- and subrostral teeth; presence of three strong longitudinal carinae in the gastric region; wide and very deep cervical groove joining to the antennal groove; deep branchiocardiac and postcervical grooves; weak hepatic, antennal and ventral grooves; subchelate pereiopod I; subrectangular telson; exopodite with diaeresis.

Material. 137 complete and fragmentary specimens, in a fairly good state of preservation. Most of the specimens are preserved in lateral view and only four preserved in dorsal view.

The description of the species is essentially based on the specimens: MSNM: i7609, i9938, i9942, i9944, i9946, i9963, i9967, i9970, i9980, i9997, il0007, il0451, il0455.

Description. A small-sized glypheid with strong and very tuberculate exoskeleton, 3 to 7 cm in length.

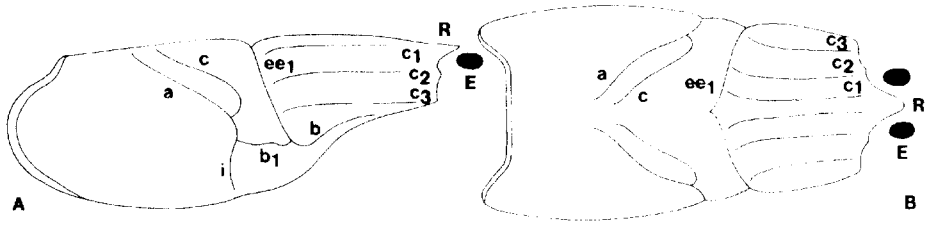

Fig. 6 – *Glyphea tricarinata* n.sp., carapace reconstruction in lateral view (A) and in dorsal view (B), line drawing.

Carapace. In lateral view, the carapace (Fig. 6) is subcylindrical in outline, with the ventral margin rising considerably in the anterior third. The dorsal margin is straight and bends slightly near the cervical groove. The dorsal margin extends into a short rostrum, lacking both supra-and subrostral teeth. The posterior margin is sinuous with a strong convexity in the median and lower parts and is strengthened by a strong marginal ridge. The ocular incision is narrow and shallow and the antennal and pterigostomial angles are weakly developed. The cervical groove, originating in the median part of the dorsal margin, is wide and very deep and it joins to the weak antennal groove. The branchiocardiac groove is sinuous, and it starts from the posterior third of the dorsal margin. Also the postcervical groove originates in the posterior third of the dorsal margin and it creates an acute angle with the branchiocardiac groove; it anteriorly bends downward and joins to the anterior extremity of the branchiocardiac groove, thus delimiting an elongate triangular lobe. The dorsal part of the postcervical groove is less deep than the ventral part. The more or less sinuous weak hepatic groove and the weakly developed ventral groove start from the anterior extremity of the branchiocardiac groove. In the gastric region there are three very tuberculate strong longitudinal carinae, running along the whole region. The carinae are at the same distance and the space separating them is concave. In the lower carina the tubercles are more developed than the other carinae.

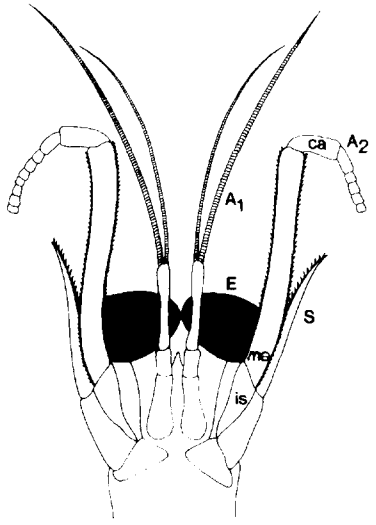

Fig. 7 – *Glyphea tricarinata* n.sp., cephalic appendages in ventral view, line drawing.

Abdomen. It is well preserved in almost all specimens. The somites are subrectangular in outline and are of even length from the first to the fifth, while somite VI is slightly longer than those anterior to it. The lower margin of somites I-V, ending with a point in the median part, is slightly toothed. A thin transversal groove runs in the median part of the pleurae of somites I-V. The telson is subrectangular in outline and it does not show a characteristic ornamentation. The length of the uropods does not exceed that of the telson. The exopodite has a spine on the external lateral margin near the straight diaeresis, while the endopodite does not show a characteristic ornamentation. The distal margin of the telson and of the uropods is finely fringed.

Cephalic appendages. They are well preserved in a few specimens (Fig. 7). The eye is carried by a slender and elongate eye-stalk. The antennulae consist of three segments; the 1st and the 3rd are long and slender, while the 2nd is short and stocky. Two short flagella are articulated to the 3rd segment. The antennae consist of three articula: short and stocky ischiocerite, thin and elongate merocerite, with slightly toothed lateral margins, and short and stocky carpocerite to which a flagellum with a not assessable length is articulated. The scaphocerite is triangular in outline, with a pointed distal extremity and an internal lateral margin bearing a row of thin spines.

Thoracic appendages. The well developed 3rd maxilliped consists of four spineless articula narrowing slightly toward the distal extremity. The subchelate pereiopod I is particularly strong. The merus and the propodus are of equal length, while the carpus is half as long as the other articula. The dorsal margin of the merus bears a row of small spines, while the ventral margin shows sparse and strong spines. The dorsal margin of the carpus is smooth, while the ventral margin shows three strong spines. The dorsal margin of the propodus is smooth, while the ventral margin bears a row of strong spines , the last of which is particularly developed , almost forming

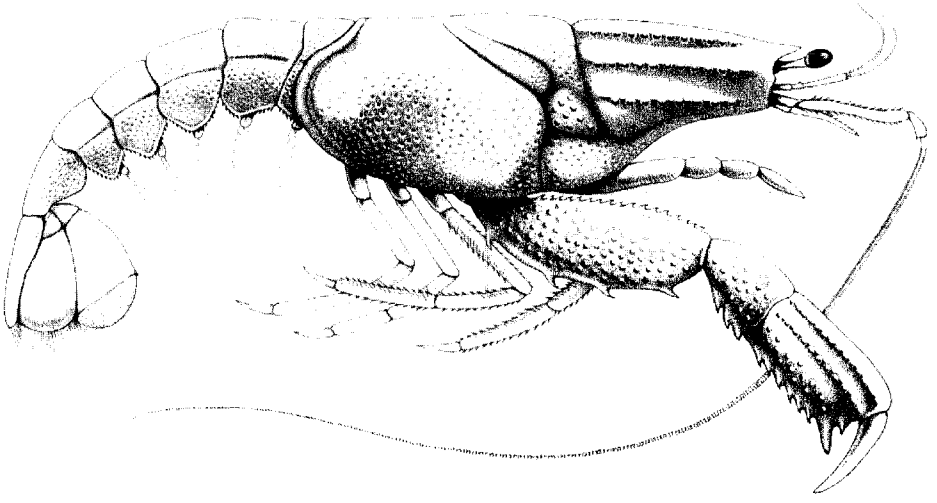

Fig. 8 – *Glyphea tricarinata* n.sp., reconstruction.

the index of chela. The propodus is crossed by two strong tuberculate longitudinal carinae along its whole length: on the internal carina the tubercles are sparse and strong, while on the external one the tubercles are thick and slender. The dactylus having the same length as the carpus does not show a characteristic ornamentation. Pereiopods II-V have a terminal dactylus. The dorsal and ventral margins of pereiopods II-III are characterized by a row of small spines.

Abdominal appendages. The pleopods consist of a subrectangular sympodite to which two long multiarticulate flagella are articulated.

Observations

Four genera belong to the family Glypheidae Zittel, 1885: *Glyphea* von Meyer, 1835, *Litogaster* von Meyer, 1847, *Paralitogaster* Glaessner, 1969 (substitution name for *Aspidogaster* Assmann, 1927; cfr. Förster, 1967), and *Trachysoma* Bell, 1858. I believe that the genus *Trachysoma* Bell, 1858, known by one single and extremely incomplete specimen, needs a careful revision, since the poor material available is insufficient for a certain ascription to this family.

Woods (1925) highlights the main features of the genus *Glyphea* von Meyer, 1835: strongly tuberculate subcylindrical carapace, short rostrum lacking both supra- and subrostral teeth, two or three tuberculate longitudinal carinae in the gastric region, deep and sinuous cervical groove, joining to the hepatic and antennal grooves in the pterigostomial region, branchiocardiac groove, postcervical groove creating an acute angle before joining to the branchiocardiac groove, hepatic groove, more or less developed ventral groove, pereiopod I subchelate, pereiopods II-V with terminal dactylus and exopodite with diaeresis.

The main features of the genus *Glyphea* von Meyer, 1835 can be found in the examined specimens.

Thanks to several work (cfr. Wöhrmann, 1892, Van Straelen, 1925, Woods, 1925, Beurlen, 1933, Kuhn, 1952, Woods, 1957, Feldmann & McPherson, 1980, Feldmann, 1981, Damborenea & Mancenido, 1987 and Feldmann, Tsudy & Thomson, 1993) we presently know 46 species ascribed to this genus, distributed from the Carnian (Upper Triassic) to the Campanian (Upper Cretaceous). This genus has never been subject to a careful revision: it is therefore possible that many species are synonymous on the basis of certain features, such as the path of the grooves, the number of carinae on the carapace and the first pair of pereiopods.

The examined specimens have been compared with the other Sinemurian species known to date: *G. tomesi* Woodward, 1868 of Peartree and Wilford Hill near Stratford-on-Avon (England), *G. lyrica* Blake, 1876 of Robin Hood's Bay (England), *G. prestwichi* Woods, 1925 of Blea Wyke and Peak (England), *G. terquemi* Oppel, 1861 of Weiler (Alsace-France) and *G. robusta* Feldmann & McPherson, 1980 of the Borden Island Formation (Canada). The comparison is made difficult both by the bad preservation of the species already known—mostly limited to the carapace and the abdomen, and rarely to the first pair of pereiopods—and by the fossilization modalities of the specimens, which not always facilitated the descriptions and the iconographic reconstructions. It is for these reasons that the only features that will be used as distinctive elements will be the path of the grooves and the number of carinae.

The species *G. tomesi* Woodward, 1868 is known by means of one single incomplete specimen, fossilized in dorsal view (Woods, 1925, Tab. XIII, Fig. la-b). There are two features allowing to distinguish *G. tricarinata* n.sp. from this species. In Woodward's species the rostrum is long, while in the new species the rostrum is short. Moreover the path of the branchiocardiac and postcervical grooves is different: in *G. tomesi*, Woodward, 1868 these grooves are weak and they join before reaching the median line, while in *G. tricarinata* n.sp. they are deep and they join at the level of the median line. The number of carinae in the gastric region (a total of three) is common to both species.

The species *G. lyrica* Blake, 1876 has been established on a few badly preserved specimens, fossilized in lateral and dorsal view (Woods, 1925, Tab. XIII, Figs. 4-6). *G. tricarinata* n.sp. is different from Blake's species because of two features. The two species share the number of carinae in the gastric region, but their arrangement is different: in *G. lyrica* Blake, 1876, the median and lower carinae are separated by a wider distance if compared to the median and upper carinae, while in *G. tricarinata* n.sp. the three carinae are at the same distance. Moreover the hepatic groove is different: in *G. lyrica* Blake, 1876 it is straight and it joins to the antennal groove in the pterigostomial region, while in *G. tricarinata* n.sp. the hepatic groove is sinuous and it joins to the lower extremity of the cervical groove.

The species *G. prestwichi* Woods, 1925 is known by means of some incomplete specimens, preserved in lateral and dorsal view (Wood, 1925, Tab. XIII, Fig. 7a-b; Tab. XIV, Figs. 1, 2). Also in this case the carinae and the grooves distinguish the two species. In Woods' species the median and lower carinae are separated by a wider distance if compared to the median and upper carinae, while in the new species the three carinae are at the sa-

me distance. Moreover in *G. prestwichi* Woods, 1925 the hepatic groove is straight, while in *G. tricarinata* n.sp. it is sinuous.

The species *G. terquemi* Oppel, 1861 is known by means of one single incomplete specimen, preserved in lateral view (Oppel, 1862, tab. XV, Figs. 6, 7a-b; Van Straelen, 1925, p. 162, Fig. 72). The number and arrangement of the carinae in the anterior region of the carapace distinguish the two species. In *G. terquemi* Oppel, 1861 the carinae are four, separated by a more or less equal distance, and the third, starting from the dorsal margin of the carapace, is bifurcate at the proximal extremity, while in *G. tricarinata* n.sp. the carinae are three and are located at the same distance.

The species *G. robusta* Feldmann & McPherson, 1980 is known by means of six complete and fragmentary specimens, preserved in lateral view (Feldmann & McPherson, 1980, Tab. 2, figs. 8, 9; Tab. 3, Fig. 2-7; Figs. 3-5). *G. tricarinata* n.sp. differs from *G. robusta* Feldmann & McPherson, 1980 for the different location of the cervical groove: in the new species the cervical groove originates in the median portion of the carapace, while in Feldmann & McPherson's species the cervical groove originates in the anteri or third of the carapace. Also the path of the hepatic groove is different: in *G. tricarinata* n.sp. it is sinuous, while in *G. robusta* Feldmann & McPherson, 1980 it is curvilinear. Finally the two species differ also in the different structure of pereiopod I: in the new species pereiopod I is short and stocky, while in *G. robusta* pereiopod I is slender and strongly elongate.

Finally, it is interesting to notice that *G. tricarinata* n.sp., together with the species *G. udressieri* von Meyer, 1836, *G. regleyana* Desmarest, 1822, *G. munsteri* Voltz, 1835, *G. pseudoscyllarus* Schlotheim, 1822 and *G. robusta* Feldmann & McPherson, 1980, represents one of the few presently known species complete of glypheid of which it has been possible to supply not only an accurate description of the different anatomic parts, but also a detailed iconographic reconstruction.

Family Mecochiridae Van Straelen, 1925
Genus *Mecochirus* Germar, 1827

Mecochirus germari n.sp.
Figs. 9, 10, 26, 27, 28, 29

Derivatio nominis: dedicated to E.F. Germar who established this genus in 1827.

Holotype: MSNM il3521a-b.

Paratypes: MSNM il0121, il0124, il0920.

Type locality: Osteno (Como, Italy).

Geological age: Lower Sinemurian, «*bucklandi zone*».

Diagnosis. Subrectangular carapace; short rostrum lacking both supra- and subrostral teeth; deep cervical groove joining to the antennal groove; parallel branchiocardiac and postcervical grooves; the hepatic groove is present; pereiopod I subchelate and extremely elongate; subrectangular telson; exopodite with diaeresis.

Material. 81 complete and fragmentary specimens, in a fairly good sta-

te of preservation. Most of the specimens are preserved in lateral view and three specimens only are in dorsal view.

The description of the species is essentially based on the specimens: MSNM: il0119, il0121, il0124, il2132a-b, il0136, il0139, il0141, il0172, il0294, il0920, il3520, il3521a-b.

Description. A small-sized mecochirid, with thin and strongly tuberculate exoskeleton, 2 to 4 cm in length.

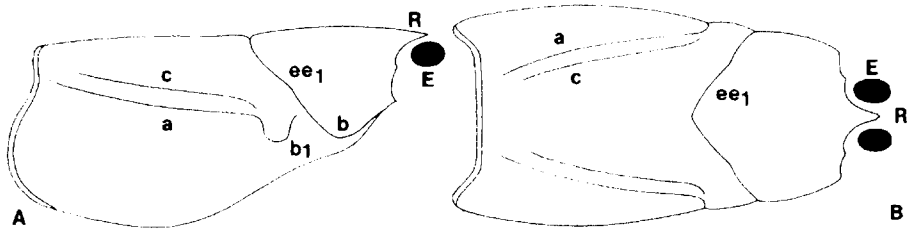

Fig. 9 – *Mecochirus germari* n.sp., carapace reconstruction in lateral view (A) and in dorsal view (B), line drawing.

Carapace. In lateral view, the carapace (Fig. 9) is subrectangular in outline, with the ventral margin rising considerably in the anterior third. The dorsal margin is straight and it bends slightly near the cervical groove. The dorsal margin extends into a short rostrum, lacking both supra- and subrostral teeth. The posterior margin is sinuous, with a weak convexity in the anterior third and strengthened by a thin marginal ridge. The ocular incision is narrow and shallow and the antennal and pterigostomial angles are weakly developed. The cervical groove, originating in the anterior third of the dorsal margin, is straight and joins to the weak antennal groove. The postcervical and branchiocardiac grooves run parallel: the first ends distally against the branchiocardiac groove, while the latter joins to the curvilinear hepatic groove. The tubercle ornamentation is particularly developed along the margins of the branchiocardiac and postcervical grooves. No carinae can be observed in the gastric region.

Abdomen. It is well preserved in almost all the specimens. The somites are subrectangular in outline and are of even length. A thin transversal groove runs in the median part of the pleurae of somites I-V. The lower margins of the somites, slightly pointed at the median part, are toothed. The telson is subrectangular with a rounded distal extremity. The exopodite has a straight diaeresis, while the endopodite does not show a characteristic ornamentation.

Cephalic appendages. They are badly preserved in all specimens. Only in two specimens (MSNM: il0126, il0294) it is possible to observe the 3rd segment of the antennulae peduncle to which a fragment of flagellum is articulated and the carpocerite of the antennae to which a flagellum with a not assessable total length articulates.

Thoracic appendages. The 3rd maxilliped and pereiopods II-V are not preserved in any specimens. It is possible to observe only the strongly developed pereiopod I, which carpus and dactylus are half as long as the merus

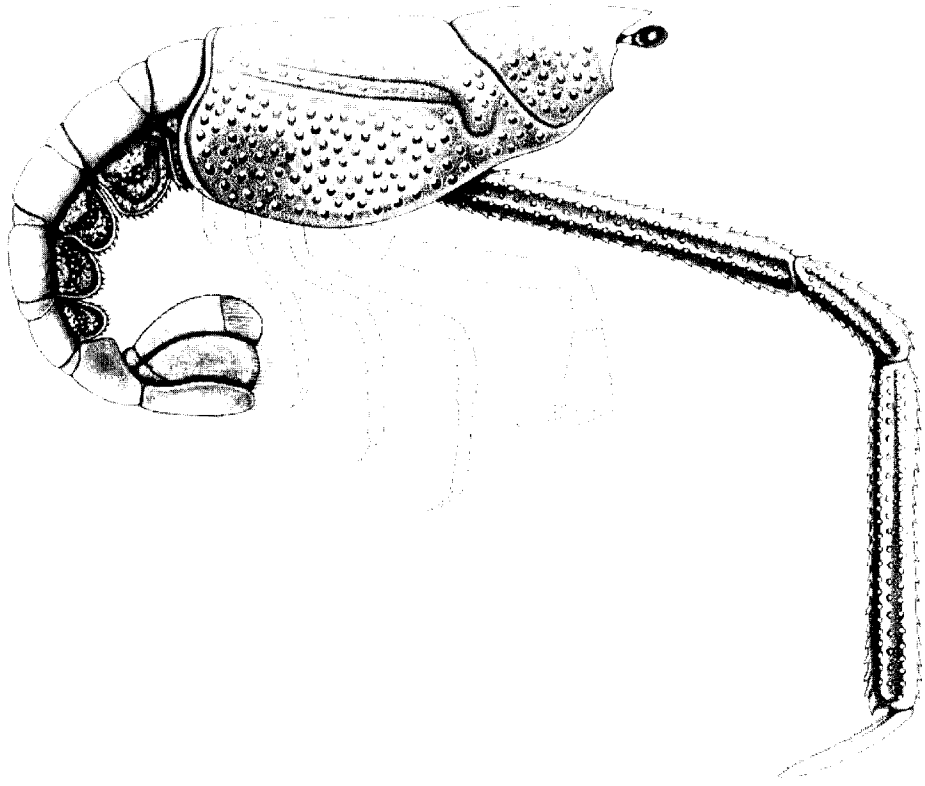

Fig. 10 – *Mecochirus germari* n. sp., reconstruction.

and the propodus. The dactylus articulates to the upper third of the articular surface of the propodus and its ventral margin is finely toothed. All the articula are crossed by two strong tuberculate longitudinal carinae. The dorsal and ventral margins of the first three articula are finely toothed.

Abdominal appendages. Not preserved.

Observations

According to Simpson & Middleton (1985), five genera belong to the family Mecochiridae Van Straelen, 1925: *Mecochirus* Germar, 1827, *Pseudoglyphea* Oppel, 1861, *Meyeria* M'Coy, 1849, *Meyerella* Simpson, in press and *Huhatanka* Feldmann & West, 1978. Glaessner (1969) doubtfully ascribed the two genera *Selenisca* von Meyer, 1847 and *Praeatya* Woodward, 1868 to the same family. Presently the genus *Selenisca* with the species *S. gratiosa* von Meyer, 1847 is considered as a synonym of the genus *Glyphea* von Meyer, 1835, while the genus *Praeatya* with the species *P. scabrosa* Woodward, 1868 has been ascribed to the genus *Pseudoglyphea* Oppel, 1861 (Förster, 1971).

Förster (1971) highlights the main features of the genus *Mecochirus* Germar, 1827: subrectangular carapace with short rostrum lacking both supra- and subrostral teeth, deep cervical groove extending into the antennal groove, strongly backward and parallel postcervical and branchio-

cardiac grooves, weakly developed hepatic groove, carinae in the gastric region, pereiopod I elongate and almost subchelate, pereiopod II subchelate, pereiopods III-V with terminal dactylus and exopodite with diaeresis.

The main features of the genus *Mecochirus* Germar, 1827 can be found in the examined specimens.

We presently know 21 species distributed from the Sinemurian (Lower Jurassic) to the Campanian (Upper Cretaceous) (cfr. Förster, 1971). The extremely thin carapace limited the preservation of these organisms, with the exception of those found in the Tithonian of Solnhofen. It is the reason why the species are different when comparing pereiopod I and particularly the propodus (Förster, 1971 and Förster & Hillebrandt, 1984).

The only Sinemurian species known to date is *M. olifex* Questedt, 1856 (Questedt, 1856 and Oppel, 1862, Tab. 22, Fig. 1) of Dusslingen (Württemberg, Germany), ascribed to this genus on the basis of pereiopod I. The lack of grooves and carinae on the carapace of *M. olifex* Questedt, 1856 makes the comparison with *M. germari* n.sp. difficult, therefore limited to pereiopod I. The length of the articula is different: in *M. olifex* the carpus is more or less as long as the propodus, while in *M. germari* n.sp. the carpus is half as long as the propodus. The pereiopods of both species have a tuberculate ornamentation, but *M. germari* n.sp. is different from *M. olifex* Questedt, 1856 because of the presence of two strong longitudinal carinae running along the articula.

Genus *Pseudoglyphea* Oppel, 1861
Pseudoglyphea ancylochelis (Woodward, 1863)
Figs. 11, 12, 13, 14, 30, 31

1863 - *Scapheus ancylochelis* - Woodward, p. 318, pl. 11
1924 - *Scapheus ancylochelis* - Van Straelen, p. 224, fig. 3
1925 - *Scapheus ancylochelis* - Van Straelen, p. 210, fig. 104, pl. VII, fig. 2
1925 - *Pseudoglyphea ancylochelis* (Woodward) - Woods, p. 46, pl. XII, figs. 2, 3

Diagnosis. Subcylindrical carapace; strongly toothed dorsal margin of the carapace; short rostrum lacking subrostral teeth; rostral carina consisting of two or three forward teeth; deep cervical groove joining to the antennal groove; weak and parallel branchiocardiac and postcervical grooves; weakly developed hepatic groove; pereiopod I subchelate; subrectangular telson; exopodite with diaeresis.

Material. 7 complete specimens, in a fairly good state of preservation and all in lateral view. The state of preservation of the examined specimens allowed a new description of this species, adding new data to the species previously supplied by Woodward (1863), based on one single specimen of Lyme Regis (Dorset, England).

MSNM: il0149, il0169, il0254, il0256-il0293, il0258, il0264, il0295.

Description. A middle-sized mecochirid, with strong and very tuberculate exoskeleton, 4 to 7 cm in length.

Carapace. In lateral view, the carapace (Fig. 11) is subcylindrical in outline, with the ventral margin rising slightly in the anterior third. The

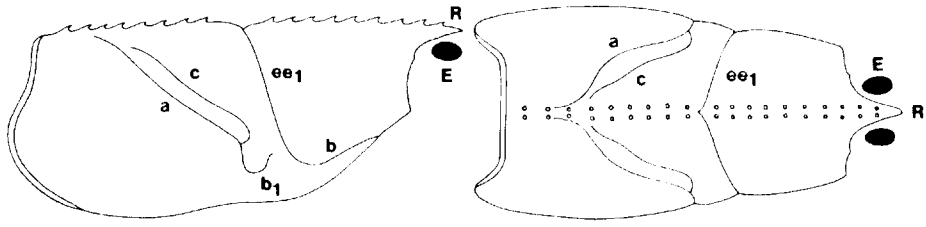

Fig. 11 – *Pseudoglyphea ancylochelis* (Woodward, 1863), carapace reconstruction in lateral view (A) and in dorsal view (B), line drawing.

dorsal margin is straight and bears a double row of strong teeth running along its whole length. The dorsal margin extends into a short rostrum lacking the subrostral teeth. The rostral carina consists of two or three forward teeth. The posterior margin is sinuous with a slight convexity in the lower third and strengthened by a thin marginal ridge. The ocular incision is narrow and shallow and the antennal and pterigostomial angles are weakly developed. No carinae can be observed in the gastric region. The cervical groove is very deep and it joins to the antennal groove in the antennal region. The branchiocardiac and postcervical grooves are weak and run parallel. The hepatic groove, originating in the joint between the branchiocardiac and the postcervical grooves, is weakly developed and follows a curvilinear path. The tubercle ornamentation is particularly developed near the branchiocardiac and postcervical grooves.

Abdomen. It is well preserved in all specimens. Somites I-V are subtrapezoidal in outline and are of even length, while somite VI is subrectangular. The lower margins of all the somites, ending with a point in the median part, are finely toothed. A thin transversal carina runs in the median part of the pleurae of somites I-V. The telson is subrectangular in outline and it has two small spines on the ventral margin, respectively in the upper third and in the lower third. The uropods are not longer than the telson. The endopodite, crossed by a strong longitudinal median carina, does not show a characteristic ornamentation, while the exopodite, crossed by a thin longitudinal median carina, has a spine on the external lateral margin, near the straight diaeresis. The distal margin of both the uropods is finely fringed.

Cephalic appendages. They are badly preserved in all specimens. Only the eye and the flagella of the antennulae and of the antennae can be observed.

Thoracic appendages. They are well preserved only in three specimens (MSNM: il0149, il0254, il0293-il0256). The 3rd maxilliped is partly preserved. Only the propodus and the dactylus can be observed, both spineless. Pereiopod I subchelate is strongly developed. The merus and the propodus, about the same length, are strong and elongate, while the carpus is short and stocky. The dorsal and ventral margins of these articula are supplied with small spines. The ventral margin of the propodus end, at the distal extremity, with a strong spine, almost forming the index of a chela. The dactylus is thin and elongate and it does not show any characteristic ornamentation. The bad preservation does not allow to establish if pereiopods

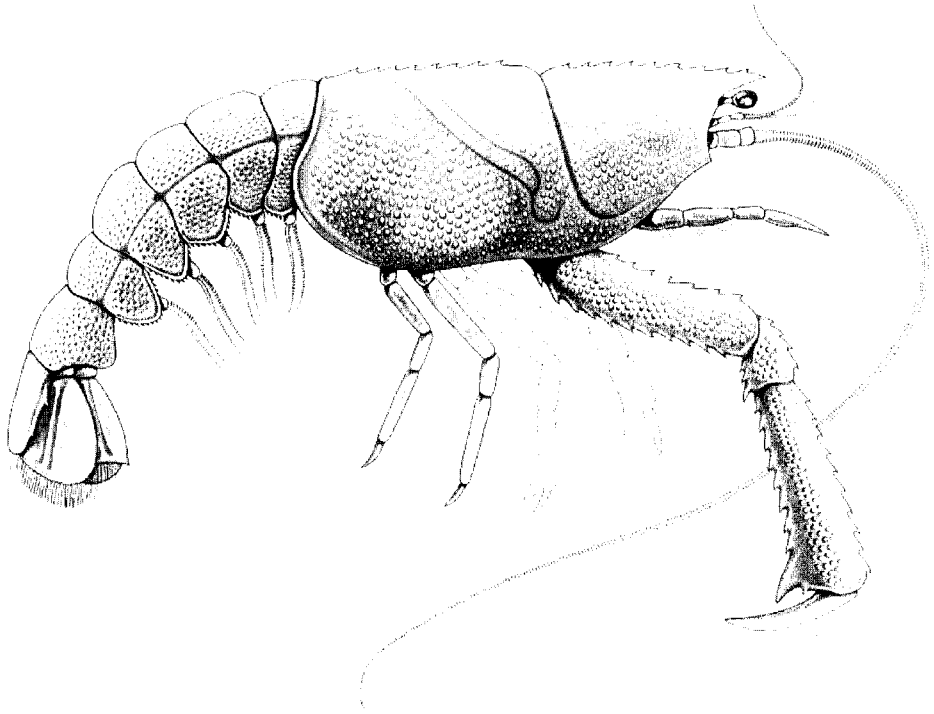

Fig. 12 – *Pseudoglyphea ancylochelis* (Woodward, 1863), reconstruction.

II-III are subchelate; there are nevertheless good reasons to believe it, since this feature can be found in *P. gigantea* Garassino & Teruzzi, 1993, belonging to the same genus.

Abdominal appendages. Only in three specimens (MSNM: il0149, il0254, il0293-il0256) it is possible to observe the pleopods consisting of a subrectangular sympodite to which two long multiarticulate flagella are articulated.

Observations

The systematic position of the genus *Pseudoglyphea* Oppel, 1861 has been long controversial and it has not been established as yet.

Van Straelen (1925) established the new family Mecochiridae in order to gather all glypheids lacking the scaphocerite. On the basis of this morphological difference, the superfamily Glypheoidea Zittel, 1885 included two families: Glypheidae Zittel, 1885 with the genera *Glyphea* von Meyer, 1835, *Pseudoglyphea* Oppel, 1861 and *Scapheus* Woodward, 1863; Mecochiridae Van Straelen, 1925 with the single genus *Mecochirus* Germar, 1827.

Woods (1926), describing the decapod crustaceans found in England, ascribed the genera *Pseudoglyphea* Oppel, 1861, *Glyphea* von Meyer, 1835, *Mecochirus* Germar, 1827, and *Meyeria* M'Coy, 1849 to the single family Glypheidae Zittel, 1885.

Beurlen (1928) distinguished two subfamilies within the family Glypheidae Zittel, 1885: Glypheinae with the genera *Litogaster* von Meyer,

1847, *Seebachia* Wüst, 1903, *Glypheopsis* Beurlen, 1928, *Glyphea* von Meyer, 1835 and *Paraglyphea* Beurlen, 1928; Mecochirinae with the genera *Mecochirus* Germar, 1827, *Pseudoglyphea* Oppel, 1861, *Scapheus* Woodward, 1863 and *Selenisca* von Meyer, 1847.

Beurlen (1930) identified two families within the superfamily Glypheoidea Zittel, 1885: Glypheidae Zittel, 1885 with the genera *Litogaster* von Meyer, 1847, *Aspidogaster* Assmann, 1927, *Glyphea* von Meyer, 1835, *Glypheopsis* Beurlen, 1928, *Trachysoma* Bell, 1858, *Paraglyphea* Beurlen, 1928 and *Pseudoglyphea* Oppel, 1861; Mecochiridae Van Straelen, 1925 with the genera *Scapheus* Woodward, 1863, *Eumorphia* von Meyer, 1847, *Selenisca* von Meyer, 1847, *Mecochirus* Germar, 1827, *Meyeria* M'Coy, 1849 and *Praeatya* Woodward, 1868.

Beurlen & Glaessner (1930) further confirmed the subdivision of the superfamily Glypheoidea Zittel, 1885 into the two families Glypheidae Zittel, 1885 and Mecochiridae Van Straelen, 1925, without nevertheless ascribing the genus *Pseudoglyphea* Oppel, 1861 to one of the two families.

Glaessner (1969) maintained the distinction between the families Glypheidae Zittel, 1885 and Mecochiridae Van Straelen, 1925, but he ascribed—without any apparent reason—the genus *Pseudoglyphea* Oppel, 1861 to the family Mecochiridae Van Straelen, 1925. Such ascription was confirmed also by Simpson & Middleton (1985).

We presently know that *Glypheopsis*, *Paraglyphea* and *Selenisca* are synonyms of the genus *Glyphea*, von Meyer, 1835 that *Praeatya* and *Scapheus* are synonyms of the genus *Pseudoglyphea*, Germar, 1827 and that *Eumorphia* and *Seebachia* are synonyms respectively of the genus *Mecochirus* Oppel, 1861 and the genus *Pseudopemphix* Wüst, 1903 (cfr. Woods, 1926, Glaessner, 1929, 1969 and Förster, 1967). Moreover, in accordance with Förster (1967), the genus *Triasiglyphea* Van Straelen, 1936, ascribed to the family Glypheidae Zittel, 1885 must be considered as a synonyms of *Pseudoglyphea* Oppel, 1861.

According to the present knowledge and to what stated, we can say that the family Glypheidae Zittel, 1885 includes the four genera *Glyphea* von Meyer, 1835, *Paralitogaster* Glaessner, 1969 (substitution name for *Aspidogaster* Assmann, 1927—cfr. Förster, 1967), *Litogaster* von Meyer, 1847 and *Trachysoma* Bell, 1858, while the family Mecochiridae Van Straelen, 1925, according to Simpson & Middleton (1985), includes the five genera *Mecochirus* Germar, 1827, *Meyeria* M'Coy, 1849, *Meyerella* Simpson, in press, *Pseudoglyphea* Oppel, 1861 and *Huhatanka* Feldmann & West, 1978.

Oppel (1861) establyshed the genus *Pseudoglyphea* on a specimen that von Meyer (1840) ascribed to the species *Glyphea grandis* of the Sinemurian of Fritlingen near Rottweil (Württemberg, Germany).

Förster (1971) highlights the main features of the genus *Pseudoglyphea* Oppel, 1861: cylindrical carapace, toothed rostrum, deep cervical groove joining to the curvilinear and weak antennal groove, branchiocardiac and postcervical grooves parallel from the posterior third of the carapace, well developed hepatic groove, presence of carinae in the gastric region, pereiopod I subchelate and exopodite with diaeresis.

The main features of the genus *Pseudoglyphea* Oppel,1861 can be found in the examined specimens.

We presently know 16 species belonging to the genus *Pseudoglyphea* Oppel, 1861 (cfr. Feldmann, 1981, Förster, 1971 and Garassino & Teruzzi, 1993), distributed from the Carnian (Upper Triassic) to the Oxfordian (Upper Jurassic). Two of them are ascribed to the Sinemurian: *P. ancylochelis* (Woodward, 1863) of Lyme Regis (England) and *P. jourdani* (Dumortier, 1867) of Saint-Fortunat (France). It is almost impossible to compare the examined specimens with *P. jourdani* (Dumortier, 1867), due to the bad preservation of Dumortier's species, known only by means of the median portion of the carapace. The only datum we can draw from the description of the author concerns the path of the grooves, which is similar in both species.

On the contrary it is quite easy to carry out a comparison with the species *P. ancylochelis* (Woodward, 1863), known by one single complete specimen. It has been possible to ascribe the examined specimens to this species, thanks to the description and the reconstruction carried out by Woodward (Woodward, 1863, p. 318, Pl. XI).

The new species *P. gigantea* Garassino & Teruzzi, 1993 of Norian-Rhaetian of Ponte Giurino (Imagna Valley, Bergamo; Garassino & Teruzzi, 1993, p. 14, Fig. 27) has recently been described. The state of preservation of the examined specimens (a total of 183) allowed a detailed and accurate reconstruction of the species. It was therefore possible to highlight the most important feature of this species, that is pereiopod III subchelate and not with a terminal dactylus, as it can be observed in the other genera belonging to the family Mecochiridae Van Straelen, 1925.

With the exception of this species, only *P. ancylochelis* (Woodward, 1863) still preserves the first three pairs of pereiopods. The type described by Woodward (1863, Pl. XI) preserves just fragments of pereiopods II-III, while a specimen belonging to the collection of the Geological Institute of Strasbourg University, lost during a fire, preserved them more or less completely. Van Straelen (1924, p. 224, Fig. 3; 1925, p. 210, Pl. VII, Fig. 2) described them as supplied with small chelae, even though the drawing of pereiopod II does not allow to ascertain whether they are true chelae or subchelae.

The existence of pereiopod II chelate or subchelate would also be confirmed by the specimen that Colosi (1921, Figs. 1, 2) ascribed to the new genus *Heteroglyphea*, which is nowadays considered as a synonym of *Pseudoglyphea* Oppel, 1861 (Van Straelen, 1924, p. 226, Fig. 4; Glaessner, 1969), despite the different opinion of Secretan (1968). Colosi, describing the new species *H. paronae*, stated that pereiopod II was supplied with a small chela.

Even though the presence of pereiopod II-III chelate is a common feature in the genera *Paralitogaster* Glaessner, 1969 (family Glypheidae Zittel, 1885) and *Pemphix* von Meyer, 1840 (family Pemphicidae Van Straelen, 1928), it not enough to consider the genus *Pseudoglyphea* Oppel, 1861 as a synonym of one of the two above-mentioned genera, also because the shape of the carapace, the path of the grooves and pereiopod I are different.

The presence of pereiopod III subchelate clearly differentiates the genus *Pseudoglyphea* Oppel, 1861 from the other genera belonging to the family Mecochiridae Van Straelen, 1925, where pereiopod III has a terminal

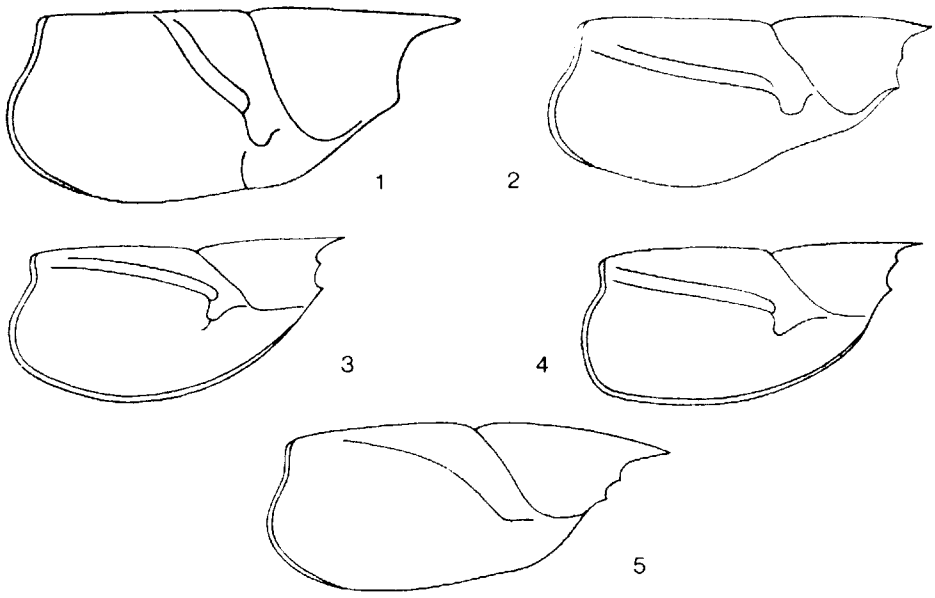

Fig. 13 - Comparison between the carapaces of the genera which belong to the family Mecochiridae. 1) *Pseudoglyphea* Oppel, 1861; 2) *Mecochirus* Germar, 1827; 3) *Meyerella* Simpson, in press; 4) *Meyeria* M'Coy, 1849; 5) *Huhatanka* Feldmann & West, 1978.

dactylus. That is not the only different feature: also the general shape of the carapace, the position and the path of the grooves and the relative length of the articula of pereiopod I distinguish the genus *Pseudoglyphea* Oppel, 1861 from the other genera (Fig. 13).

I therefore believe that these features are enough to exclude that this genus belongs to the family Mecochiridae Van Straelen, 1925.

On the one hand the general shape of the carapace, the path of the grooves and pereiopod I exclude that this genus belongs to the family Pemphicidae Van Straelen, 1928, but on the other hand such features are in my opinion enough to ascribe *Pseudoglyphea* Oppel, 1861 again to the family Glypheidae Zittel, 1885.

But also within this family it is possible to highlight a few inconsistencies. Only the genera *Pseudoglyphea* Oppel, 1861 and *Paralitogaster* Glaessner, 1969 have in fact pereiopods I-III subchelate, since the genera *Glyphea* von Meyer, 1835 and *Litogaster* von Meyer,1847 have pereiopods II-V with a terminal dactylus, a feature shared also by *Neoglyphea inopinata* Forest & de Saint Laurent, 1975, the only living species belonging to this family (Forest & de Saint Laurent, 1975, 1976). Moreover the path of the grooves in *Pseudoglyphea* Oppel, 1861 and *Paralitogaster* Glaessner, 1969 is similar and it differs from that of *Glyphea* von Meyer, 1835 and *Litogaster* von Meyer, 1847 (Fig. 14).

In a previous work (Garassino & Teruzzi, 1993) I already mentioned the need of a revision of the superfamily Glypheoidea Zittel, 1885; on the basis of the recent discoveries and of a better knowledge of fossil decapod crustaceans I believe that a careful revision is a highly necessary work.

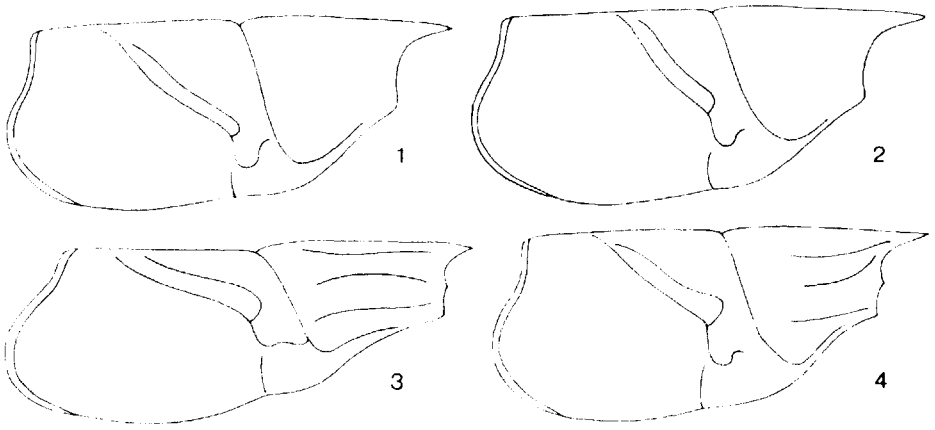

Fig. 14 – Comparison between the carapaces of the genera which belong to the family Glypheidae and the carapace of the genus *Pseudoglyphea*. 1) *Paralitogaster* Glaessner, 1969; 2) *Pseudoglyphea* Oppel, 1861, 3) *Litogaster* von Meyer, 1847; 4) *Glyphea* von Meyer, 1835.

Conclusions

The Osteno fauna association can be compared to the coeval association of Lyme Regis of Dorset (England), even though the latter is less abundant and varied. On the basis of the data known to date, the most evident analogies have been found especially in the macruran decapod crustaceans and the fishes. The studies carried out in macruran decapod crustaceans of the English outcrop (Broderip, 1835, 1837, Withers, 1933, Woods, 1925 and Woodward, 1863, 1866, 1888) brought to the description of three genera *Aeger* Münster, 1839 (two species), *Coleia* Broderip, 1835 (four species) and *Pseudoglyphea* Oppel, 1861 (one species). When comparing these data with those gathered at Osteno, it is possible to observe first of all that at Lyme Regis a high specific difference can also be found for the genera *Aeger* Münster, 1839 and *Coleia* Broderip, 1835, and that the species *Pseudoglyphea ancylochelis* (Woodward, 1863) is proof of the faunistic analogy between the two outcrops. Unlike Osteno the genera *Eryma* von Meyer, 1840, *Phlyctisoma* Bell, 1863, *Glyphea* von Meyer, 1835 and *Mecochirus* Germar, 1827 have not been found at Lyme Regis yet. As far as the ichthyofauna is concerned, the presence of certain genera, such as *Squaloraja, Pholidolepis, Pholidophorus, Cosmolepis* and *Palaeospinax* further confirms the faunistic analogy between the two outcrops (Duffin & Patterson, 1993).

The abundance, the variety and the preservation of the specimens examined during the years of research (Pinna, 1968, 1969, Garassino & Teruzzi, 1990 and Teruzzi, 1990) made the Osteno outcrop one of the richest of Jurassic, comparable only to that of Tithonian of Solnhofen. Like the German fauna, the Osteno fauna is characterized by a high taxonomic difference. The 379 specimens examined during the different works are in fact subdivided into the genera *Aeger* Münster, 1839 (33 specimens), *Coleia* Broderip,1835 (70 specimens), *Eryma* von Meyer, 1840 (41 specimens), *Phlyctisoma* Bell, 1863 (10 specimens), *Glyphea* von Meyer, 1835 (137 specimens),

Mecochirus Germar,1827 (81 specimens) and *Pseudoglyphea* Oppel, 1861 (7 specimens). The studies of Osteno macruran decapod crustaceans shed light on at least three interesting aspects: first of all we witness a true radiation of reptant crustaceans, highly diversified at a generic level (a diversification that can be found also in other Jurassic outcrops), unlike natantian crustaceans; second of all it is possible to notice a strong specific difference only in the genera *Aeger* Münster, 1839 and *Coleia* Broderip, 1835 (six species for the genus *Aeger* and four for the genus *Coleia*); such diversity could be ascribed both to physic and environmental factors and to the ability of macruran decapod crustaceans to occupy different trophic niches. Finally the examined fauna did not show any typical genera of alpine Upper Triassic, such as *Archaeopalinurus* Pinna, 1974 and of Upper Jurassic, such as *Palinurina* Münster, 1839 and *Dusa* Münster, 1839, while the latter are well represented in the Tithonian of Solnhofen.

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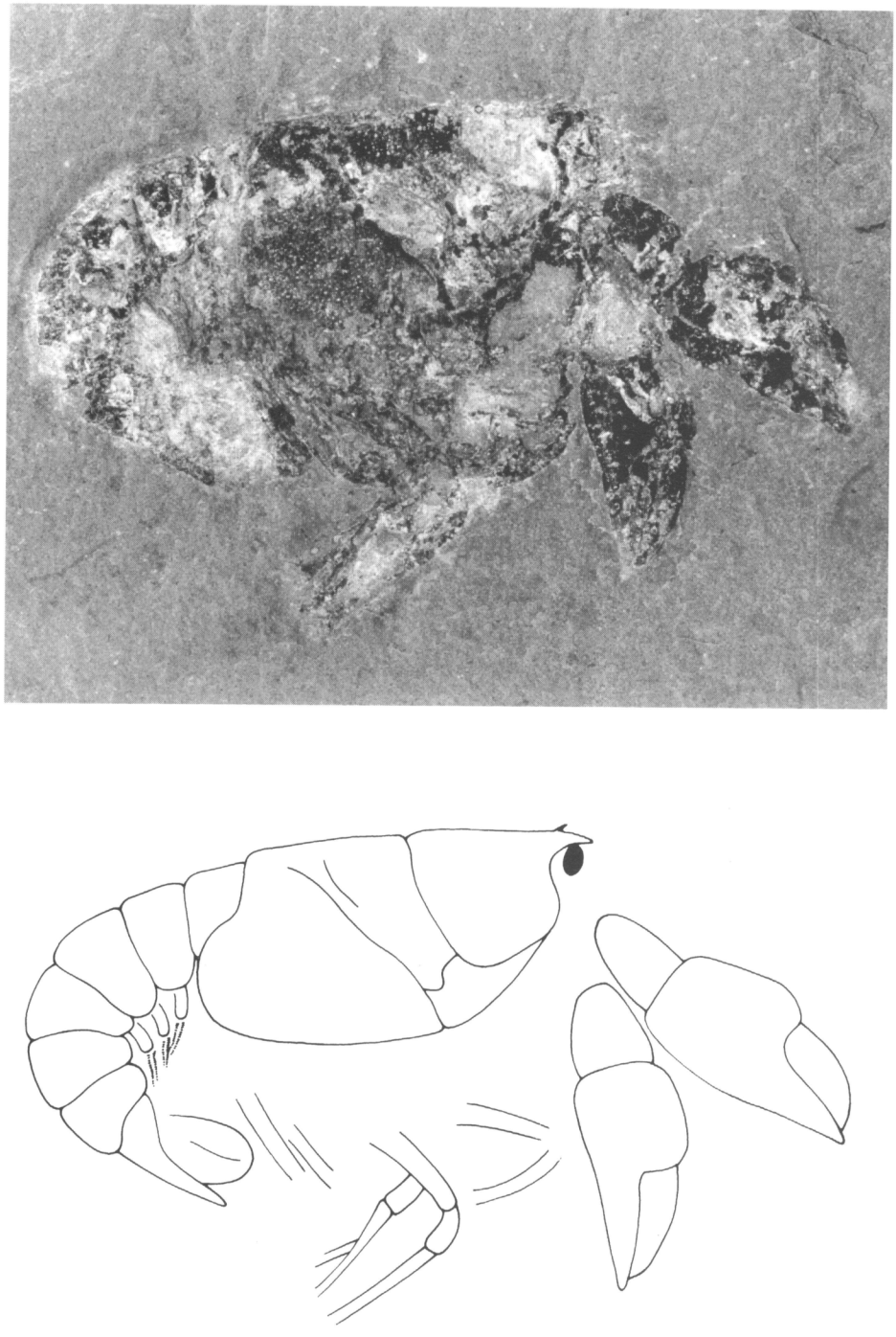


Fig. 15 – *Eryma meyeri* n.sp., holotype, n. cat. MSNM i7606, photo and reconstruction ($\times$ 4)

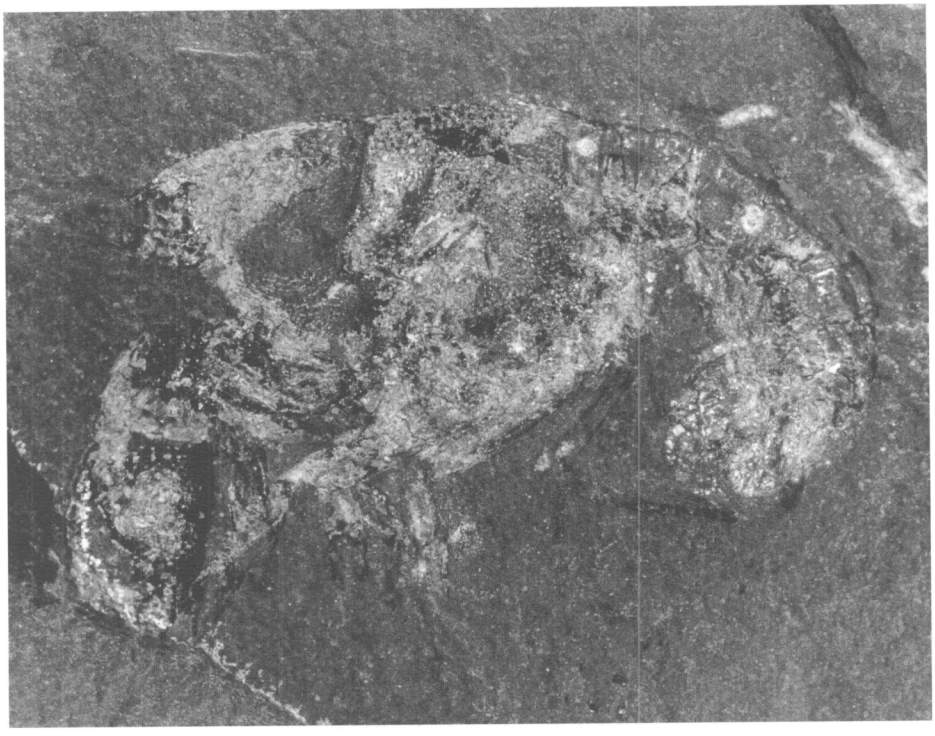


Fig. 16 – *Eryma meyeri* n.sp., n. cat. MSNM i9895, photo and reconstruction (× 4.9)

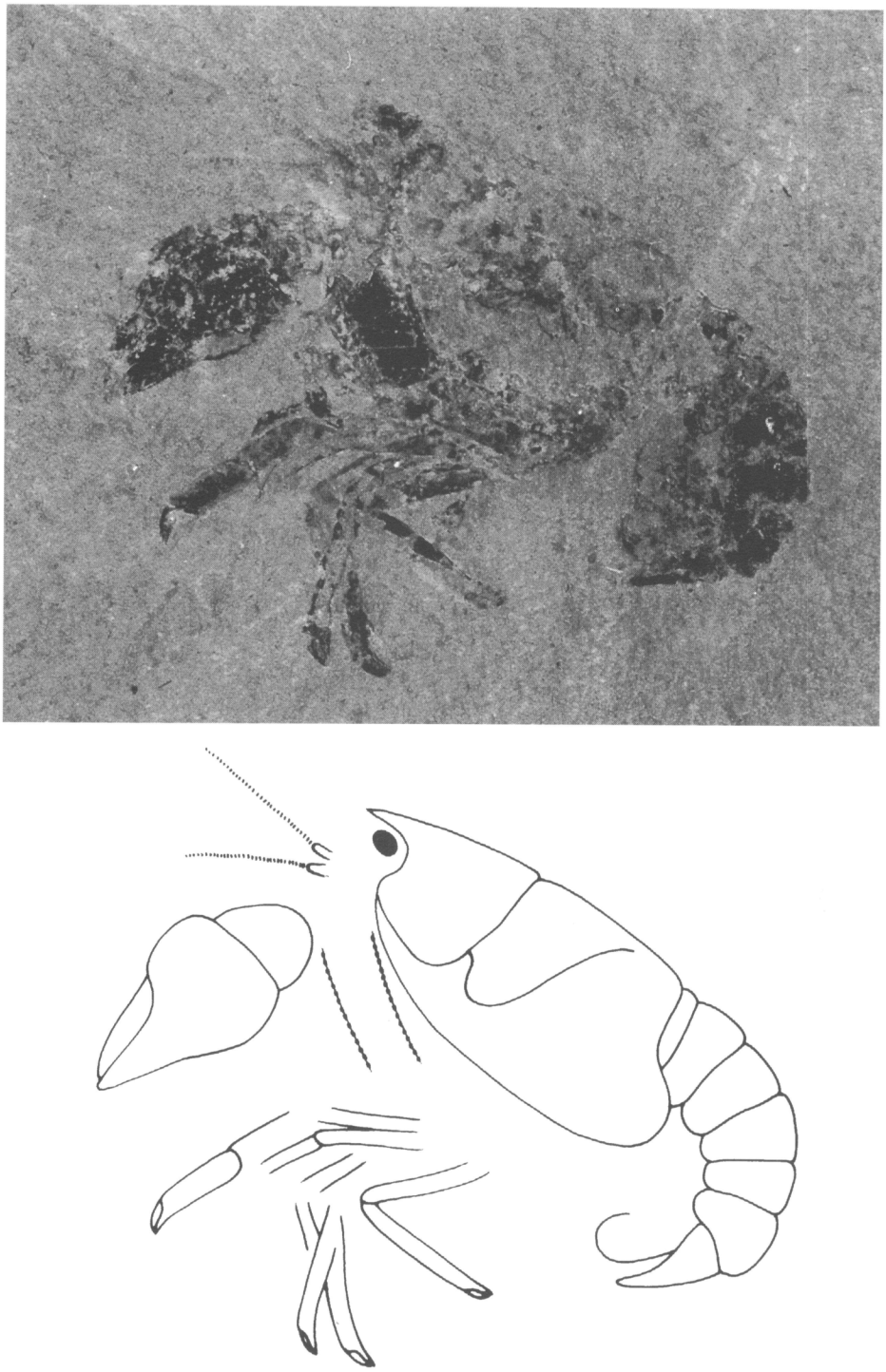


Fig. 17 – *Eryma meyeri* n.sp., n. cat. MSNM i9893, photo and reconstruction (× 4.8)

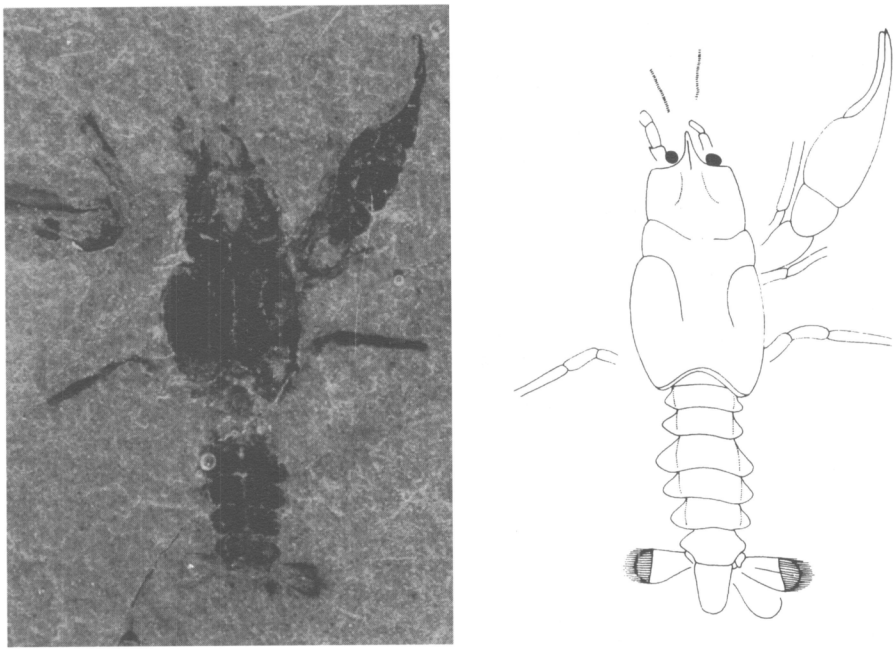


Fig. 18 – *Phlyctisoma sinemuriana* n.sp., holotype, n. cat. MSNM il3517, photo and reconstruction (× 2.6)

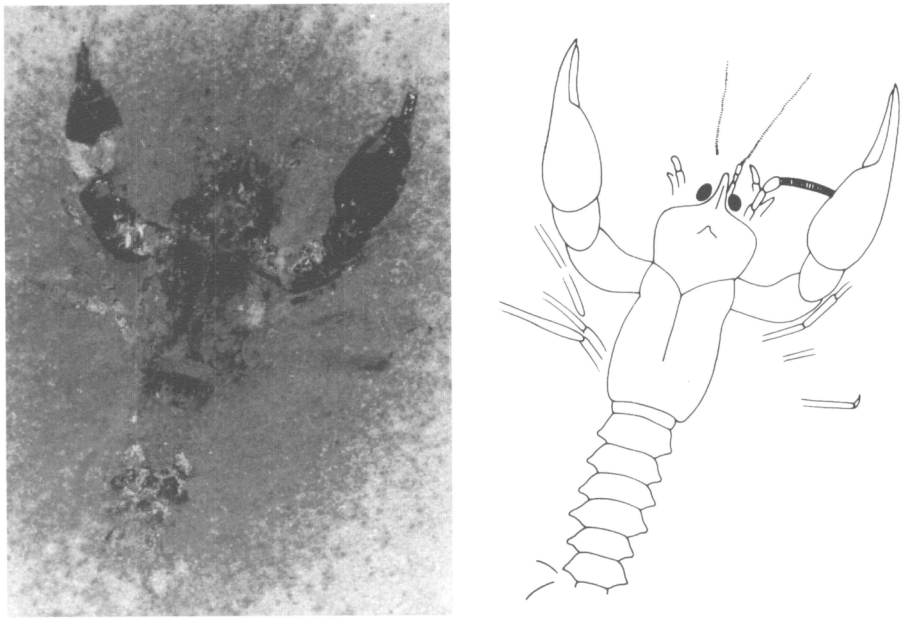


Fig. 19 – *Phlyctisoma sinemuriana* n.sp., n. cat. MSNM i9887, photo and reconstruction (× 2.8)

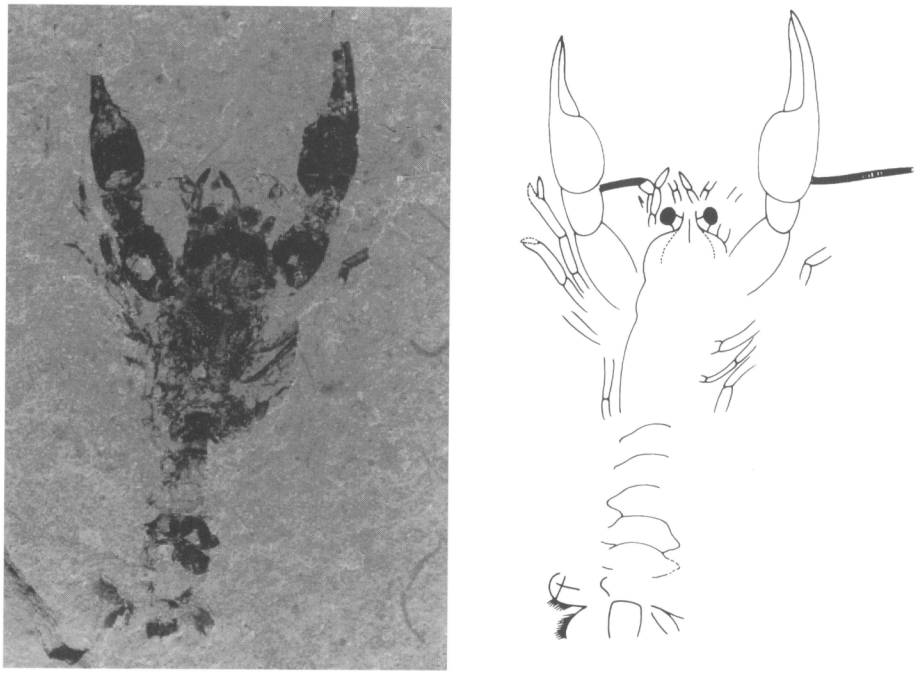


Fig. 20 – *Phlyctisoma sinemuriana* n.sp., n. cat. MSNM il0450, photo and reconstruction (× 2.7)

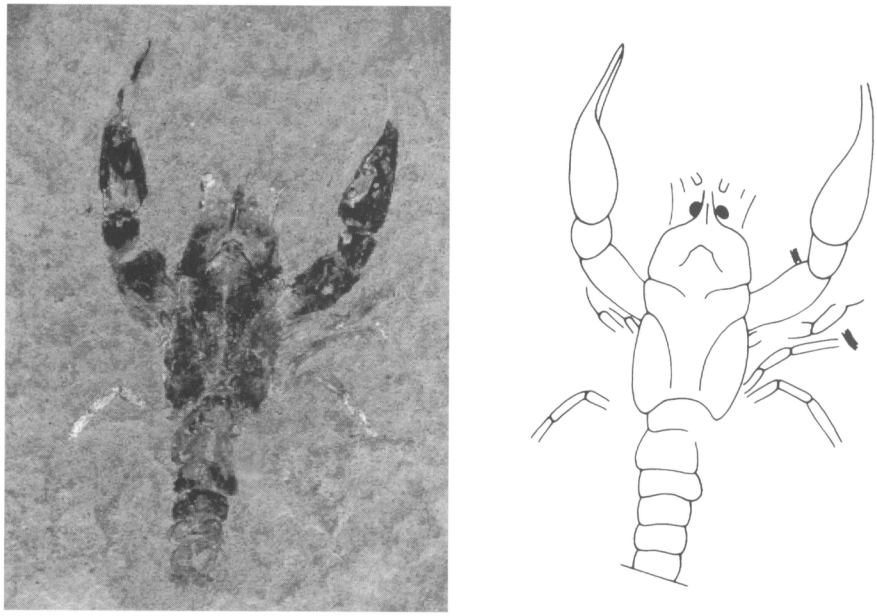
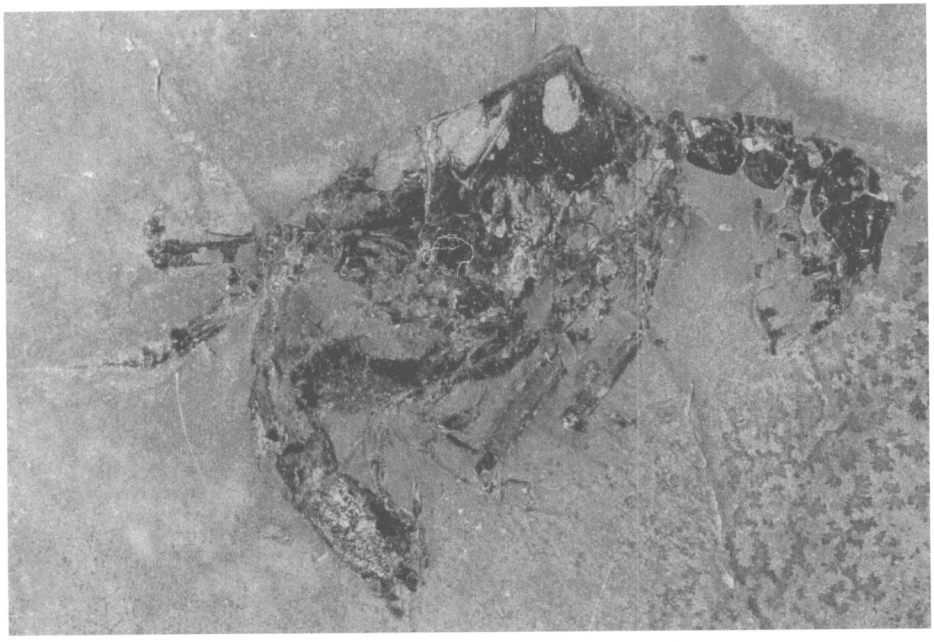


Fig. 21 – *Phlyctisoma sinemuriana* n.sp., n. cat. MSNM i7608, photo and reconstruction (× 2.7)



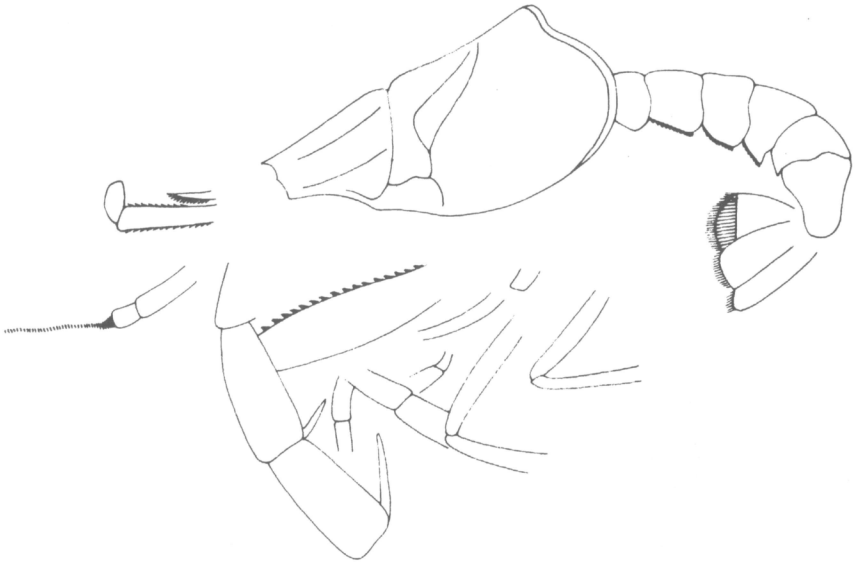


Fig. 22 – *Glyphea tricarinata* n.sp., holotype, n. cat. MSNM i7609, photo and reconstruction (× 1.7)

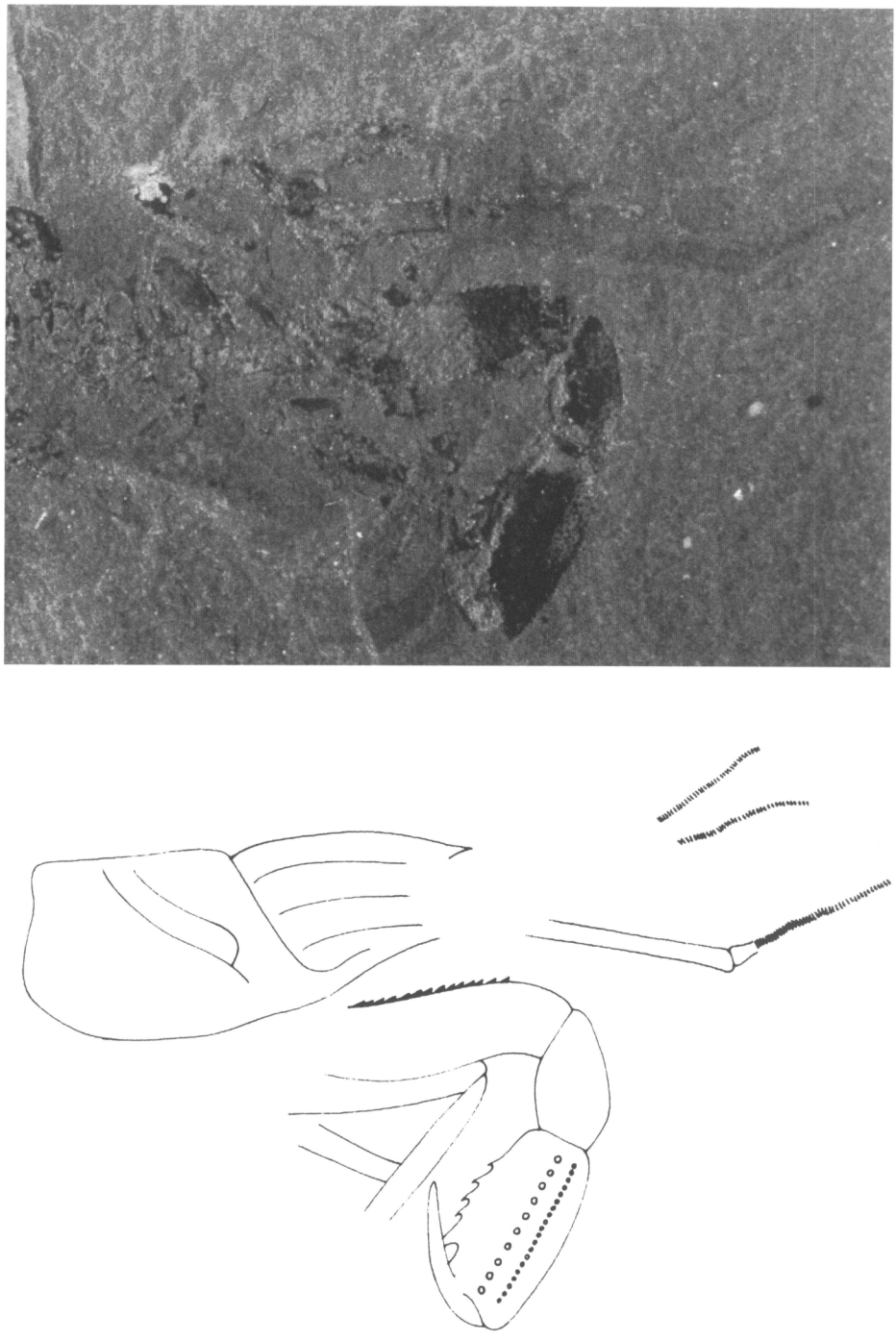


Fig. 23 – *Glyphea tricarinata* n.sp., n. cat. MSNM i0451, photo and reconstruction ($\times$ 5.6)

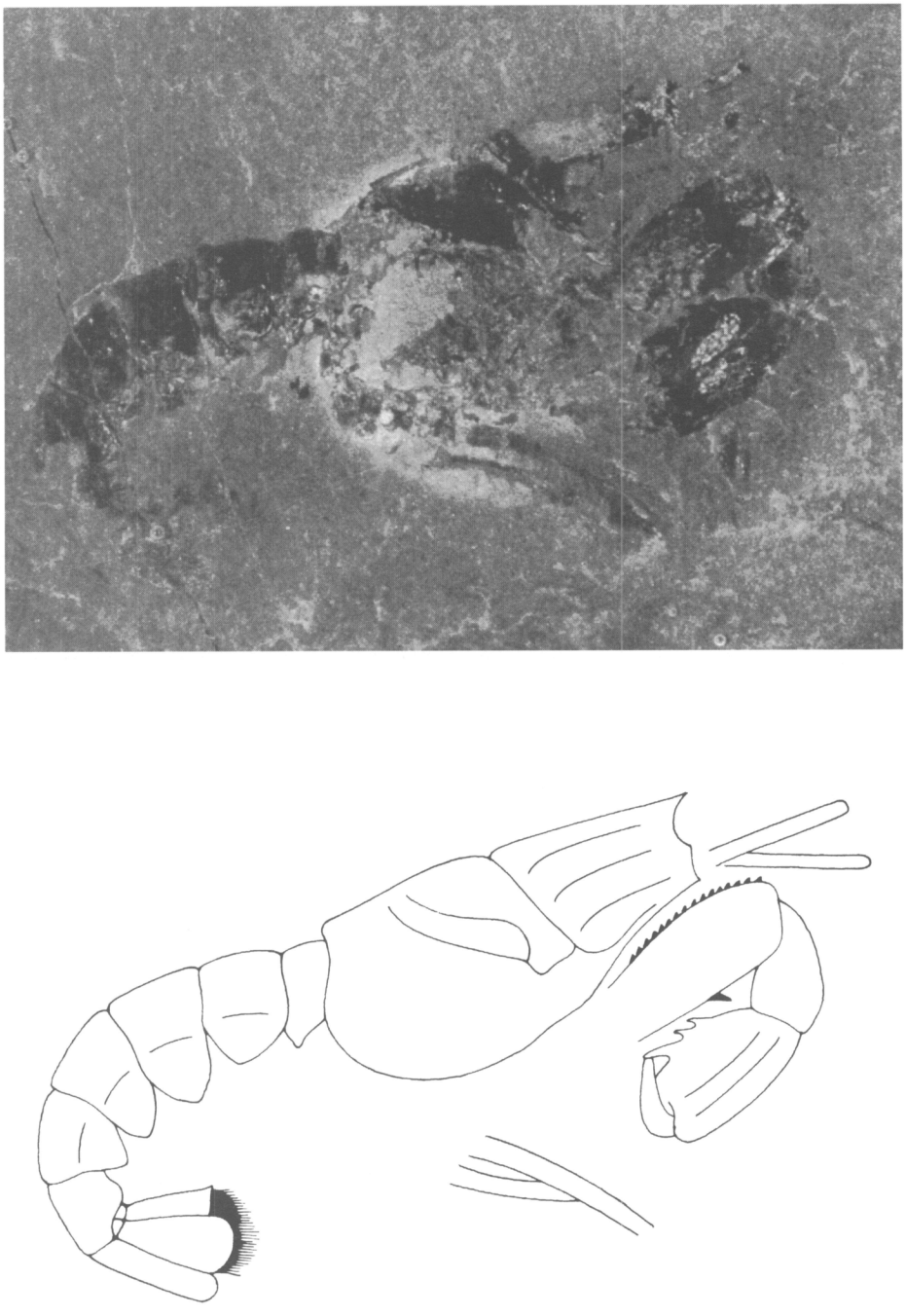


Fig. 24 – *Glyphea tricarinata* n.sp., n. cat. MSNM i9967, photo and reconstruction (× 5.3)

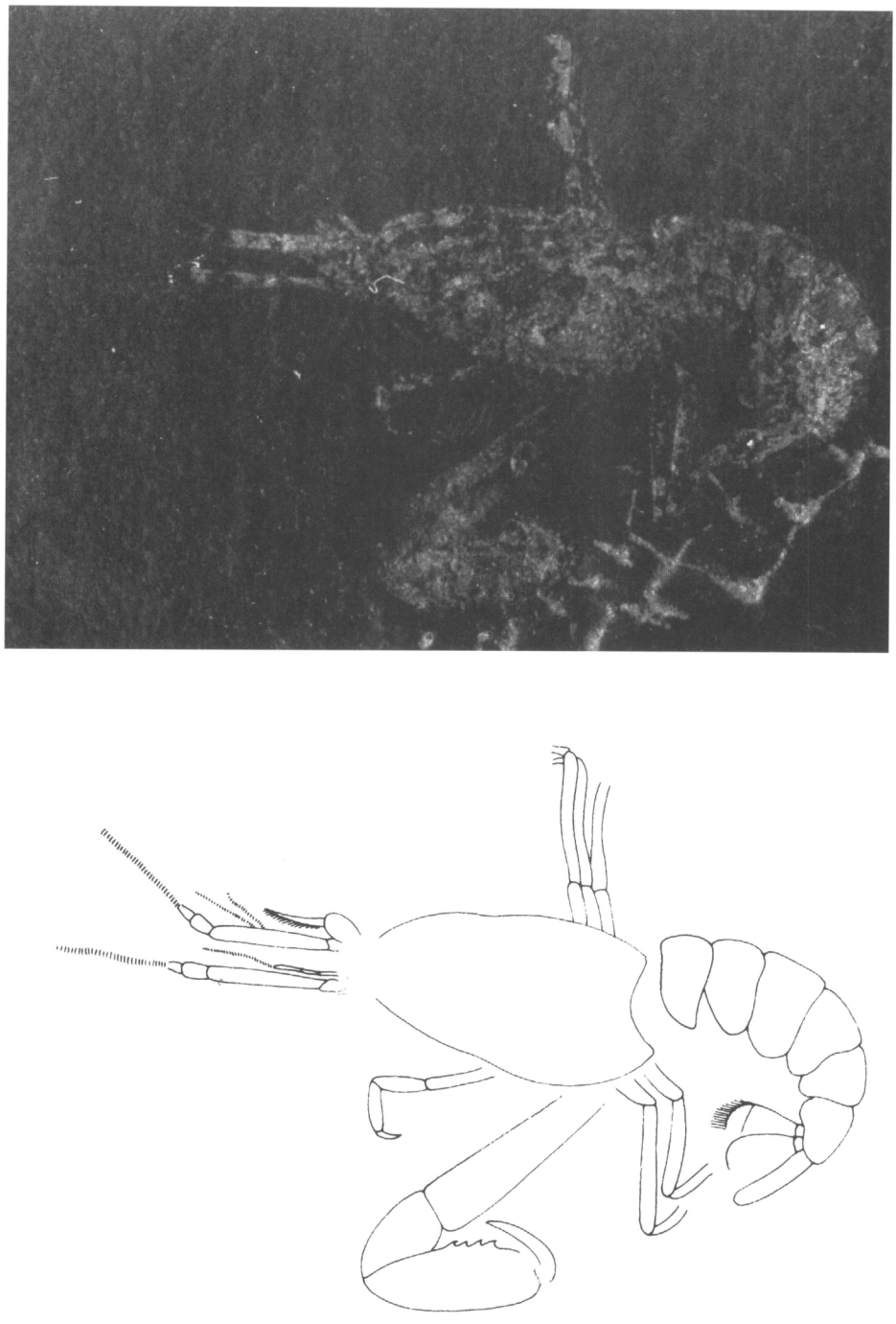


Fig. 25 – *Glyphea tricarinata* n.sp., n. cat. MSNM i9970, photo and reconstruction ($\times$ 3.1)

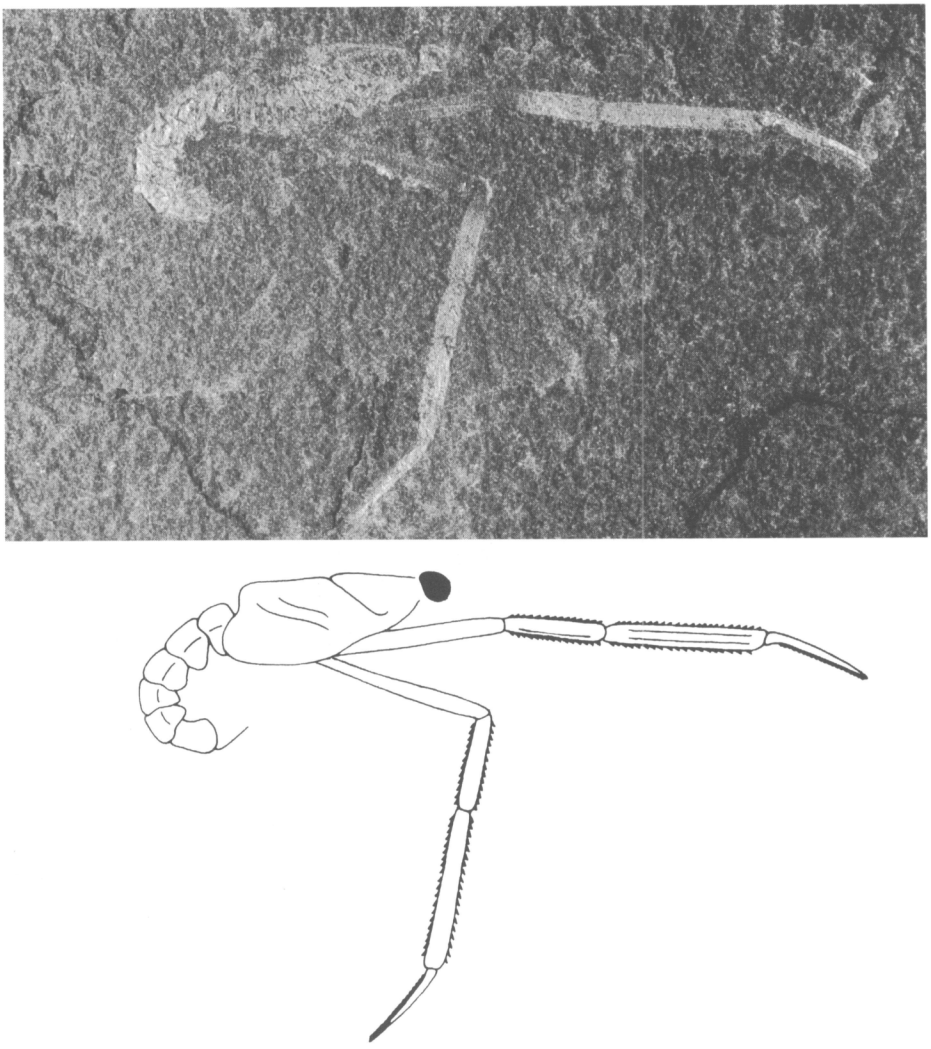


Fig. 26 – *Mecochirus germari* n.sp., holotype, n. cat. MSNM il3521, photo and reconstruction (× 1.8)

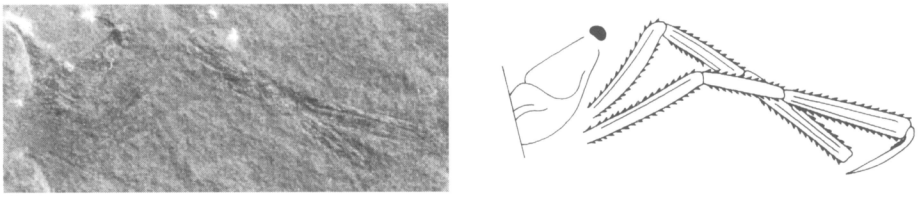


Fig. 27 – *Mecochirus germari* n.sp., n. cat. MSNM il0124, photo and reconstruction (× 1.7)

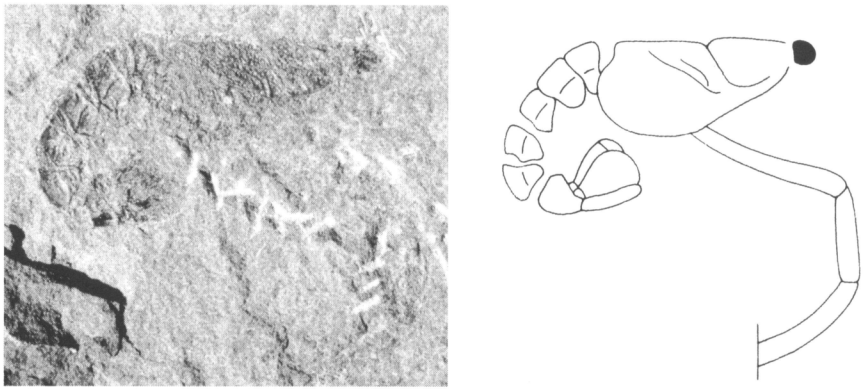


Fig. 28 – *Mecochirus germari* n.sp., n. cat. MSNM il0121, photo and reconstruction (× 1.9)

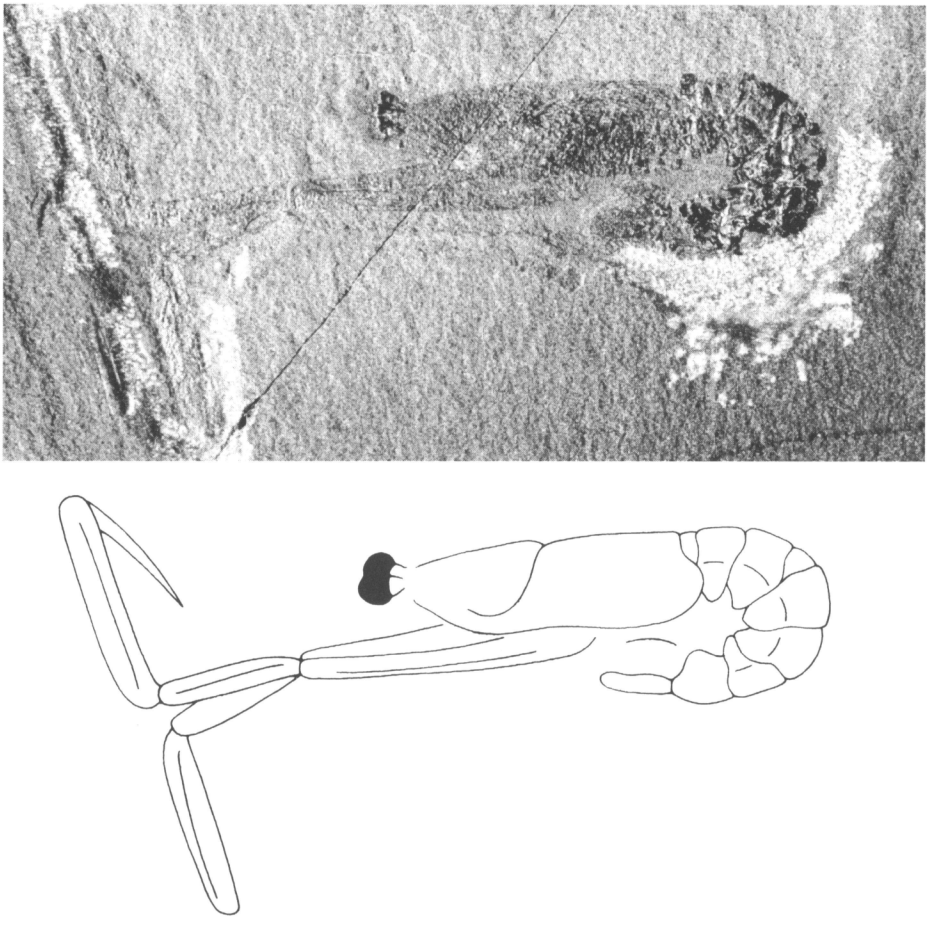
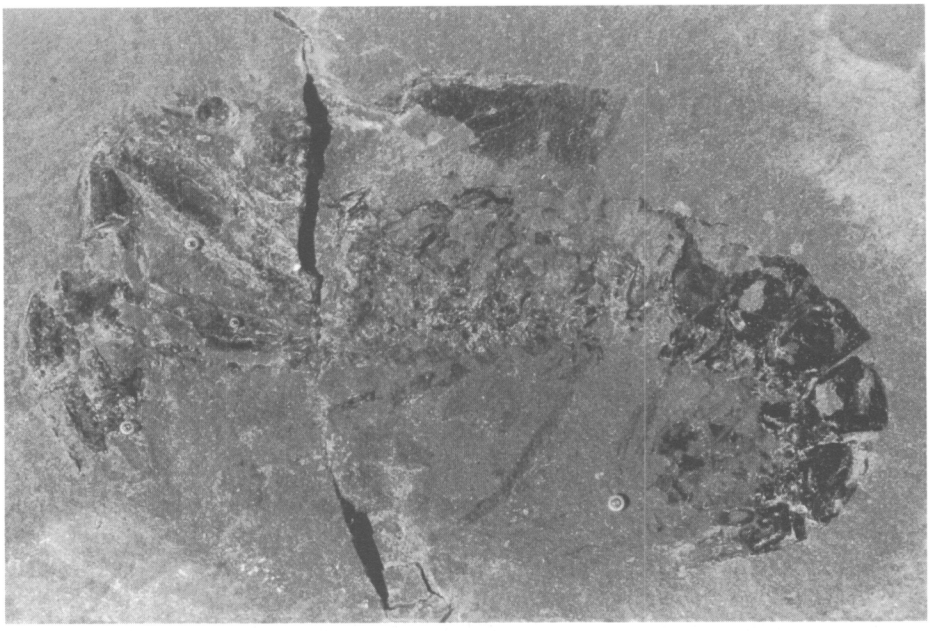


Fig. 29 – *Mecochirus germari* n.sp., n. cat. MSNM il0920, photo and reconstruction (× 2.5)



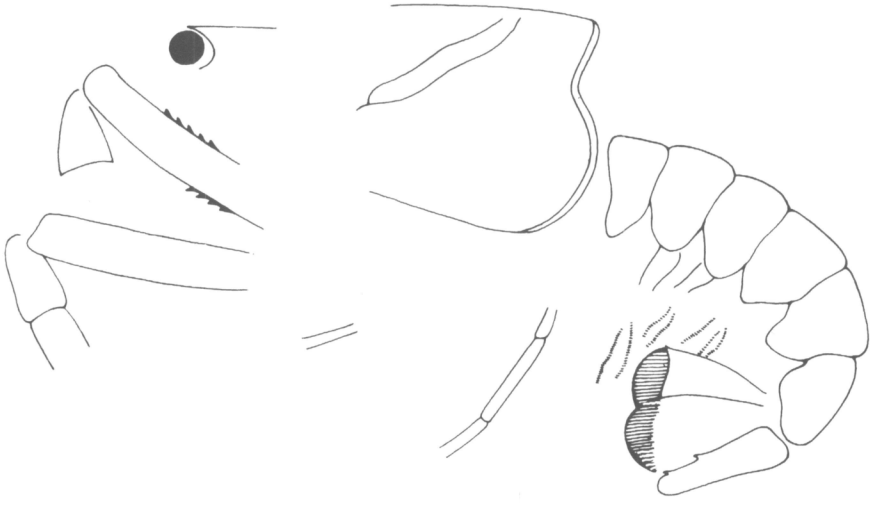


Fig. 30 – *Pseudoglyphea ancylochelis* (Woodward, 1863), n. cat. MSNM il0293, photo and reconstruction (× 2.5)

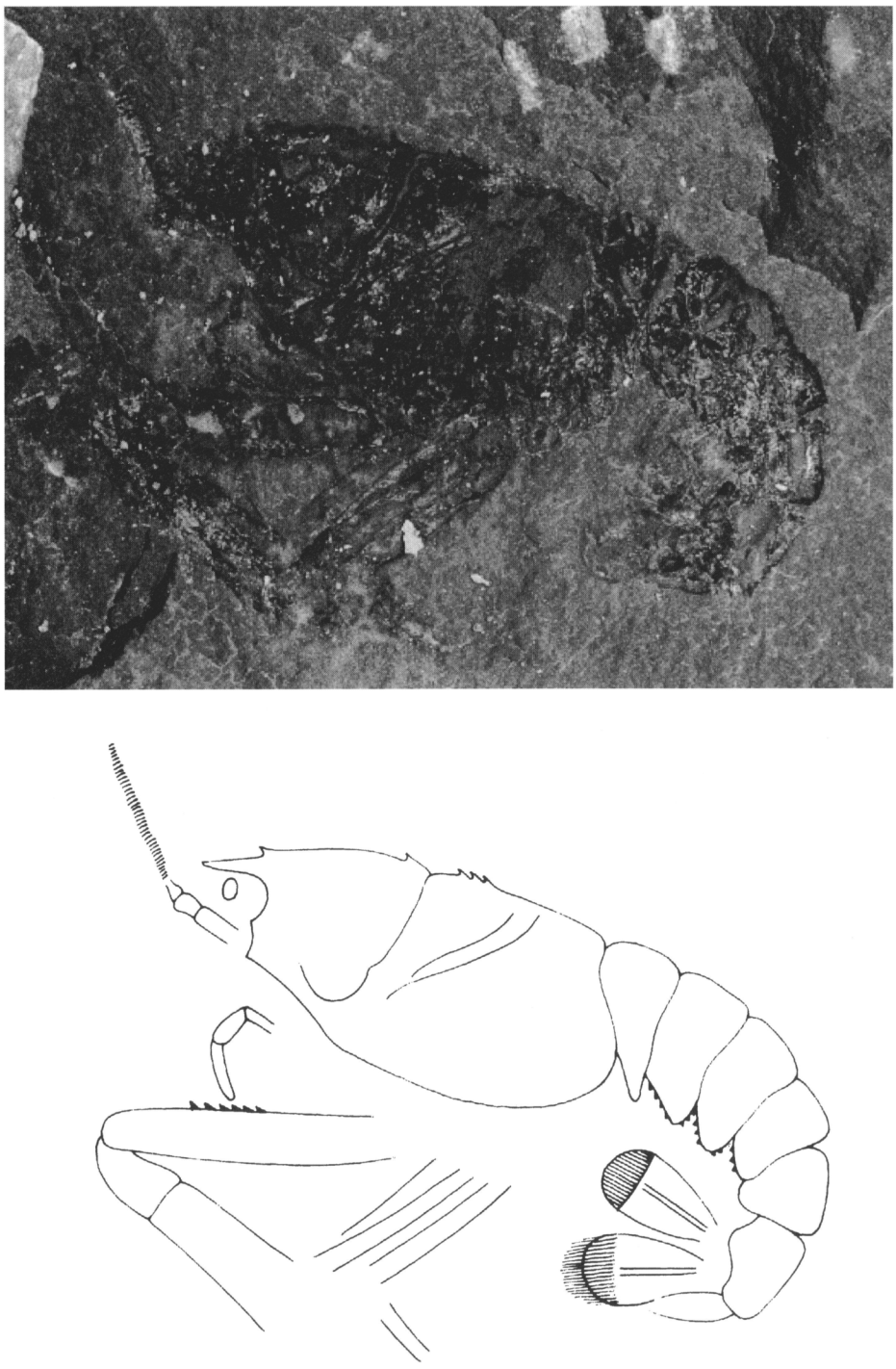


Fig. 31 – *Pseudoglyphea ancylochelis* (Woodward, 1863), n. cat. MSNM il0254, photo and reconstruction (× 2.2)