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The genera *Longitergite* nov. and *Bannikovia* nov. in the Lower Miocene of N Caucasus (Russia) (Crustacea, Decapoda)

Abstract - A few specimens of macruran decapod crustaceans from the Apsheronsk Region (N Caucasus, Russia) are described. The specimens were found in the layers of the Maikop Formation, dated back to Lower Miocene. The study of this material brought to the description of the two new genera *Longitergite* nov. (Infraorder Penaeidea de Haan, 1849, family Penaeidae Rafinesque, 1815) and *Bannikovia* nov. (Infraorder Caridea Dana, 1852, indeterminate family). Even though the sample is represented only by a few specimens, it plays a particularly important role, since it enriches the previous knowledge about the macruran decapod crustaceans of Miocene of N Caucasus. Moreover, the genus *Bannikovia* nov. enriches the knowledge about the Miocene carideans, adding to the two forms already known always discovered in N Caucasus.

Riassunto - I generi *Longitergite* nov. e *Bannikovia* nov. nel Miocene inferiore del N. Caucaso (Russia) (Crustacea, Decapoda).

Vengono descritti alcuni esemplari di crostacei decapodi macruri provenienti dalla Regione di Apsheronsk (N. Caucaso, Russia). Gli esemplari sono stati rinvenuti negli strati della Formazione di Maikop, datati al Miocene inferiore. Lo studio di questo materiale ha portato alla descrizione dei due nuovi generi *Longitergite* nov. (Infraordine Penaeidea de Haan, 1849, famiglia Penaeidae Rafinesque, 1815) e *Bannikovia* nov. (Infraordine Caridea Dana, 1852, famiglia indeterminata). Anche se il campione è limitato a pochi esemplari, riveste una particolare importanza in quanto arricchisce le precedenti conoscenze sui crostacei decapodi macruri del Miocene del N. Caucaso. Inoltre, il genere *Bannikovia* nov. arricchisce le conoscenze sui caridei marini del Miocene, sommandosi alle due forme già note, rinvenute sempre nel N. Caucaso.

Key words: Crustacea, Decapoda, Lower Miocene, Russia

Introduction

This work describes five specimens of macruran decapod crustaceans found during an excavation carried out by Dr A. Bannikov of the Palaeontological Museum of the Academy of Sciences of the USSR in the Apsheronsk Region (N Caucasus, Russia), 1.5 km West of Shirvas-Kaya, near the Pshekha river. The specimens are preserved in the upper layers of the

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Maikop Series dated back to Middle-Upper Oligocene and to Lower Miocene (Nalivkin, 1973, p. 621). The origin of this deposition assemblage is still debated. According to Nalivkin (1973), some consider the Maikop Series to be of a deep-water origin, while others think that it consists of terrestrial deposits of near-shore alluvional plains situated between rising mountain chains and sea.

The Maikop Series, with a thickness between 100 and 1400-1700 m, is generally subdivided into three parts. The lower part, located in the Maikop Region, is made of light grey clays containing ostracods, while the middle-upper part of the Series, dated to Lower Miocene, consists of dark grey clays occasionally preserving fishes and macruran and brachyuran decapod crustaceans.

Tertiary macruran decapod crustaceans

Compared to the numerous Mesozoic outcrops that gave particularly abundant decapod crustacean faunistic assemblages - both in the number of taxa found and in the number of specimens - the knowledge about macruran decapod crustaceans of the Tertiary are limited to occasional reports from different European and non-European localities.

Palaeocene

Prasad (1961) described the first species of Palaeocenic penaeid, *Penaeus kapurdii*, on two specimens from Rjasthan (India).

Tiwari (1963) not only questioned the ascription of *P. kapurdii* Prasad, 1961 to the family Penaeidae Rafinesque, 1815, but described two new species of penaeids from the same locality: *Penaeus barmerensis* and *P. glaessneri*. In the same work the author ascribed the layers containing the fossiliferous levels near the site of Kapurdi to Upper Palaeocene-Lower Eocene.

Scorziello & Sgrosso (1965) reported at Mount Vesole, in north-western Cilento, south of the Alburno massif (Salerno, S Italy), the presence of some penaeid decapod crustaceans in a fair state of preservation, without supplying a more precise description.

Eocene

Secretan (1975) described three new species of penaeids found in the Mount Bolca outcrop (Verona, N Italy). It is the most abundant sample (38 specimens) of Tertiary macruran decapod crustaceans known to date. The specimens were ascribed to the species *Penaeus bolcensis*, *P. obtusus* and *Pseudobombur nummuliticus*.

Packard (1881) and Feldmann et al. (1981) studied a sample of 23 macruran decapod crustaceans found in the Green River outcrop (Wyoming, USA). The specimens were ascribed to the species *Bechleja rostrata* Feldmann, Grande & McCoy, 1981 (Infraorder Caridea Dana, 1852, family Palaemonidae Rafinesque, 1815) and *Procambarus (Austrocambarus) primaevus* (Packard, 1880) (Infraorder Astacidea Latreille, 1803, family Cambaridae Erichson, 1846). It is one of the few reports on freshwater crustaceans known to date.

Van Straelen (1940) ascribed a badly preserved specimen from Anatolia (Turkey) to the species *Penaeus smyrnacus*.

Oligocene

Hoŭsa (1956) erected the genus *Bechleja* (Infraorder Caridea Dana, 1852, family Palaemonidae Rafinesque, 1815) on some specimens found in Upper Oligocene-Lower Miocene strata of Czechoslovakia, and ascribed the species *B. inopinata* to such genus.

Martins-Neto & Mezzalira (1991b) studied some caridean specimens from Brazil, revising the species *Bechleja bahiaensis* (Beurlen, 1950) and describing the new species *B. robusta*.

Aguirre-Urreta (1992) ascribed a sample of 12 specimens from the Nirihuau Formation (NW Patagonia, Argentina), to the new genus and the new species *Lammuastacus longirostris* (Infraorder Astacidea Latreille, 1803, family Parastacidae Huxley, 1879). It is the first certain report on a parastacid in the Tertiary. In the past Beurlen (1950) ascribed in dubitative form an incomplete specimen, found in the Paraiba Basin (Brazil) deposits, to the family Parastacidae. The sediment and palaeontological data indicate that the faunistic association of the Nirihuau Formation is typical of a freshwater environment (Aguirre-Urreta, 1992).

In the Chiavon and Salcedo localities (Vicenza, N Italy) a brachyuran decapod crustacean faunistic assemblage is known since long, occasionally preserving macruran crustaceans, presently studied by the authors. From a preliminary analysis it seems that representatives of the infraorders Penaeidea de Haan, 1849 and Caridea Dana, 1852 are present.

Miocene

Cope (1871) and Rathbun (1929) ascribed some specimens to the species *Pacifastacus (H.) chenoderma* (Cope, 1871) (Infraorder Astacidea Latreille, 1803, family Cambaridae Erichson, 1846), preserved in the strata of the Payette Formation from the Idaho and Oregon States (USA).

Smirnov (1929) described some macruran and brachyuran decapod crustaceans from N Caucasus. He ascribed some specimens to the new species *Palaemon mortuus* (Infraorder Caridea Dana, 1852, family Palaemonidae Rafinesque, 1815) and *Pasiphaea mortua* (Infraorder Caridea Dana, 1852, family Pasiphaeidae Dana, 1852). These two species were the only marine caridean crustaceans known to date in the Tertiary.

Cisternas & Díaz (1986) found in the Louquimay Basin (S Chile) some isolated chelae, that they ascribed to the family Parastacidae Huxley, 1879.

Feldmann & Pole (1994) described the first freshwater astacuran, found in New Zealand, in the Dunstan Formation of the Manuherikia Group. The specimen was ascribed to the species *Paranephrops fordycei* (Infraorder Astacidea Latreille, 1803, family Parastacidae Huxley, 1879).

Preservation modalities and materials

The macruran decapod crustaceans, preserved in thin dark grey clayey levels, are flattened on the layer surface and their preparation is made easy by the softness of the surrounding rock.

The examined sample, housed in the collections of the Palaeontological Museum of the Academy of Sciences of the USSR, is limited to five specimens, two of which are preserved as part and counter-part.

A specimen is ascribed to the genus *Longitergite* nov., belonging to the

infraorder Penaeidea de Haan, 1849, family Penaeidae Rafinesque, 1815, while the other four specimens are ascribed to the genus *Bannikovia* nov., belonging to the infraorder Caridea Dana, 1852, indeterminate family.

SYSTEMATICS

Infraorder Penaeidea de Hann, 1849
Family Penaeidae Rafinesque, 1815

Genus *Longitergite* nov.

Diagnosis: subrectangular carapace; short rostrum lacking any supra- and subrostral teeth; somite VI strongly elongate.

Derivatio nominis: for the strong elongation of somite VI

Type species: *Longitergite miocenicus* n. sp.

Description: as for the type species

Longitergite miocenicus n. sp.
Fig. 1

Derivatio nominis: it refers to the geological age of the examined specimen

Holotype: PIN 4505-5a

Type locality: Apsheronsk Region (N Caucasus)

Geological age: Upper Maikop beds (Lower Miocene)

Diagnosis: as for the genus

Material: one specimen in fair state of preservation.

PIN 4505-5a

Description. Elongate penaeid, with thin and completely smooth exoskeleton, 4 cm in length.

Carapace. The carapace, in lateral view, has a subrectangular shape and gets slightly narrow toward the anterior margin for the small curvature of the ventral margin. The dorsal margin is straight, while the posterior margin is slightly sinuous with a small convexity in the lower third. The dorsal margin extends into a short rostrum, slightly bent toward the bottom, with pointed distal extremity and without supra- and subrostral teeth. No grooves, carinae and spines can be observed on the surface of the carapace. The carapace is about half as long as the abdomen.

Abdomen. The rectangular somites have an increasing length from I to VI. The posterior margin of somites I-III is straight, while in somites IV-V it is slightly posteriorly projecting. There is a remarkably strong elongation of somite VI, almost twice as long as the other somites. The triangular telson, with pointed distal extremity, is as long as somite VI. The uropods are badly preserved and it is not possible to ascertain if they are longer than the telson. The rectangular protopodite and part of the exopodite and endopodite can be observed.

Cephalic appendages. Badly preserved. The extremely elongate structures that can be observed on the holotype can probably be interpreted as

the scaphocerites of the antennae. Also the carpocerite of the antennae can be observed.

Thoracic appendages. Only a few elements of pereiopod I and maybe of pereiopod IV can be observed. It is not possible to ascertain the presence of chelate elements in pereiopods I-III.

Abdominal appendages. Only fragments of the sympodites can be observed on somites I-V.

Observations. We know that the knowledge about Tertiary penaeids are extremely limited. The total number of species described before this work is seven, three of which from Palaeocene and four from Eocene.

Six species were ascribed by different authors to the same genus *Penaeus* Fabricius, 1798. On the contrary we believe that the examined specimen has to be ascribed to *Longitergite* n.gen., because it is not possible to observe any typical features of the genus *Penaeus* Fabricius, 1798, such as the rostrum with many suprarostral teeth, the cervical and orbital-antennal grooves, the hepatic and antennal spines and the telson with a deep median groove.

Infraorder Caridea Dana, 1852
Indet. family

Genus *Bannikovia* nov.

Diagnosis: subrectangular carapace; short rostrum lacking any supra- and subrostral teeth; row of denticulate carinae on the carapace; somite II with subround pleura partly covering the pleurae of somites I and III; somite VI strongly elongate.

Derivatio nominis: dedicated to Dr. A. Bannikov, who found the specimens subject of this study

Type species: *Bannikovia maikopensis* n. sp.

Description: as for the type species

Bannikovia maikopensis n. sp.
Figs. 2, 3, 4 ,5, 6

Derivatio nominis: from the city of Maikop, from which the Series is named

Holotype: PIN 4504-1

Paratypes: PIN 4504-3, PIN 4505-4a

Type locality: Apsheronsk Region (N Caucasus)

Geological age: Upper Maikop beds (Lower Miocene)

Diagnosis: as for the genus

Material: four specimens in fair state of preservation.

PIN 4504-1, PIN 4504-2, 4504-3, 4505-4

Description. Elongate caridean, with thin and smooth exoskeleton, 2 to 4 cm in length.

Carapace. The carapace, in lateral view in all specimens, has a subrectangular shape and gets slightly narrow toward the anterior margin for the

small curvature of the ventral margin. The dorsal margin is slightly bent, while the posterior margin has a sinuous trend with a small convexity in the lower third. The dorsal margin extends into a short rostrum, with pointed distal extremity and without supra- and subrostral teeth (PIN 4504-1, PIN 4504-2). Two thin denticulate carinae running parallel can be observed in the upper third of the carapace, near the dorsal margin (PIN 4504-1, PIN 4504-2, PIN 4505-4a).

Abdomen. Well preserved in all specimens. Somite II shows a subround pleura partly covering the pleurae of somites I and III. The posterior margin of somite III is straight, while that of somites IV-V is posteriorly projecting, thus forming a slight convexity in the lower third. Somite VI has a rectangular shape and it is strongly elongate. The telson, as long as somite VI, has a triangular shape and a pointed distal extremity. The tail fan is badly preserved. The rectangular protopodite and part of the exopodite can be observed only in three specimens (PIN 4504-1, PIN 4504-3, PIN 4504-4).

Cephalic appendages. Badly preserved. An elongate structure, that could be the scaphocerite of the antennae, can be observed only in two specimens (PIN 4504-1, PIN 4504-3).

Thoracic appendages. Badly preserved in all specimens. Only fragments of the pereiopods can be observed and it is not possible to ascertain the presence of chelate elements.

Abdominal appendages. The pleopods are not preserved in any specimen.

Observations. Carideans are extremely rare at the fossil state and their anatomical details are not very much known because of the not always excellent state of preservation.

The most ancient genera known to date, *Acanthinopus* Pinna, 1974 and *Leiothorax* Pinna, 1974, were found in the Calcare di Zorzino (Norian, Upper Triassic) of Bergamo Prealps (Cene, Seriana Valley - Bergamo, N Italy) (Pinna, 1974). A new form, *Pinnacaris* Garassino & Teruzzi, 1993, has been recently described in the Argillite di Riva di Solto (Upper Norian-Lower Rhaetian, Upper Triassic) of Ponte Giurino (Imagna Valley - Bergamo, N Italy) (Garassino & Teruzzi, 1993).

Glaessner (1969) reported about nine Jurassic genera that could be ascribed to the families Atyidae de Haan, 1849 (living), Oplophoridae Dana, 1852 (living), Palaemonidae Rafinesque, 1815 (living), and Udorellidae Van Straelen, 1924 (extinct). The same author ascribed four *incertae sedis* genera to carideans: *Blaculla* Münster, 1839, *Hefriga* Münster, 1839, *Gampsurus* von Der Marck, 1865, and *Udora* Münster, 1839.

We presently know only two species of Cretaceous carideans.

Martins-Neto & Mezzalira (1991a) found a few specimens in the Crato Member of the Santana Formation (Lower Cretaceous) of Brazil. The fair state of preservation allowed the authors to erected the new genus *Beurlenia* (family Palaemonidae Rafinesque, 1815) to which the species *B. araripensis* belongs.

On a sample of five specimens, found in the Santonian (Upper Cretaceous) of Sahel Alma (Lebanon), Roger (1946) described the new species

Notostomus cretaceus. This species has recently been the subject of revision by Garassino (1994).

Garassino & Ferrari (1992) have reported the presence of only one specimen from the Senonian (Upper Cretaceous) of Trebiciano (Trieste, NE Italy) attributed to the Infraorder Caridea Dana, 1852, family, genus and species indeterminate. Garassino & Teruzzi (in press) recently reported a new form of caridean in the Upper Hauterivian-Lower Barremian (Lower Cretaceous) of Vernasso (Udine, NE Italy).

We know three caridean genera in the Tertiary boudaries.

The genus *Bechleja* Hoŭsa, 1956, typical of freshwater deposits, with four species: *B. rostrata* Feldmann et al., 1981 of the Eocene of Green River (Wyoming, USA); *B. inopinata* Hoŭsa, 1956 of the Oligocene of Czechoslovakia; *B. bahiaensis* (Beurlen, 1950) and *B. robusta* Martins-Neto & Mezzalira, 1991 of the Oligocene of Brazil.

The genus *Palaemon* Weber, 1795 with the species *P. mortuus* Smirnov, 1929 and *Pasiphaea* Savigny, 1816 with the species *P. mortua* Smirnov, 1929, both discovered in the Miocene of N Caucasus (Smirnov, 1929).

B. maikopensis n. gen. n. sp. differs from *P. mortuus* Smirnov, 1929 for the rostrum without supra- and subrostral teeth and for the presence of two thin denticulate carinae near the dorsal margin of carapace.

The comparison between *B. maikopensis* n. gen. n. sp. and *P. mortua* Smirnov, 1929 is very difficult for the bad preservation of the specimens belonging to Smirnov's species. Nevertheless, *B. maikopensis* n. gen. n. sp. differs from *P. mortua* Smirnov, 1929 for the presence of two thin denticulate carinae near the dorsal margin of carapace.

On the grounds of this comparison *Palaemon mortuus* Smirnov, 1929, *Pasiphaea mortua* Smirnov, 1929 and *Bannikovia maikopensis* n. sp. are the only three species of marine caridean crustaceans known to date in the Tertiary and all discovered in N Caucasus. Only in the Upper Triassic of Cene (Seriana Valley, Bergamo - N Italy) (Pinna, 1974) there is a so high percentage of marine caridean crustaceans as Maikop Formation of N Caucasus.

Even though the morphological features observed in the examined specimens are not enough to precisely ascribe the genus *Bannikovia* n.gen. to one of the known fossil or living families, the presence of two denticulate carinae on the carapace could get this genus closer to the families Oplophoridae Dana, 1852 and Crangonidae Rathbun, 1904.

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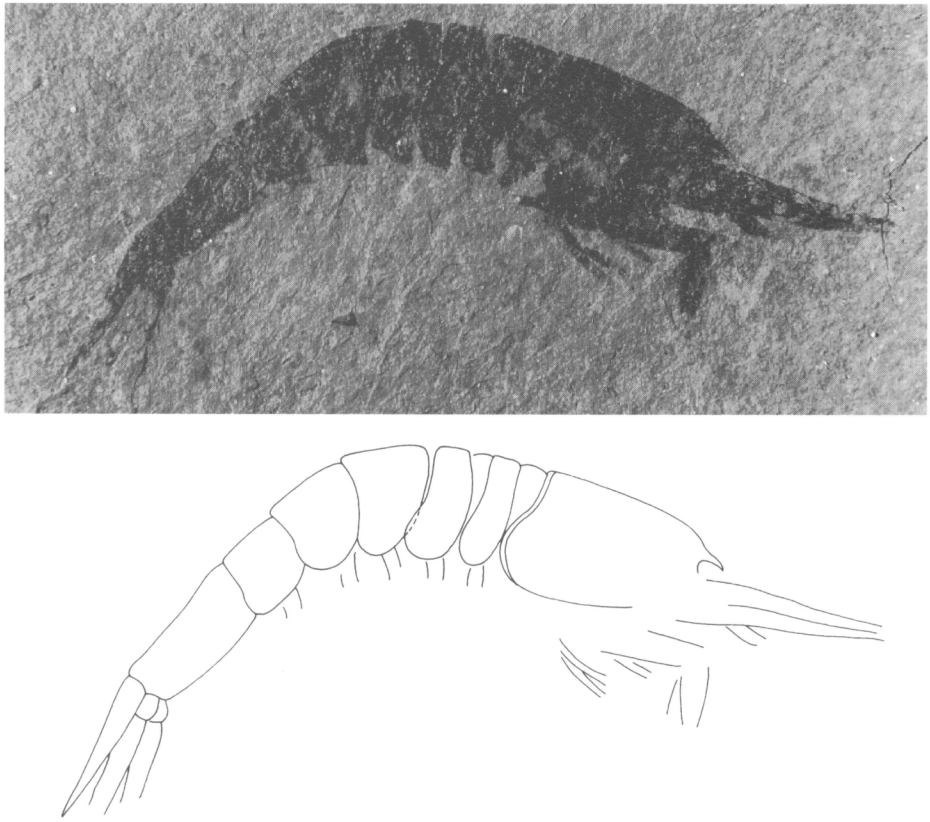

Fig. 1 – *Longitergite miocenicus* n. gen. n. sp., holotype, n.cat. PIN 4505-5a, photo and reconstruction (× 2.8)

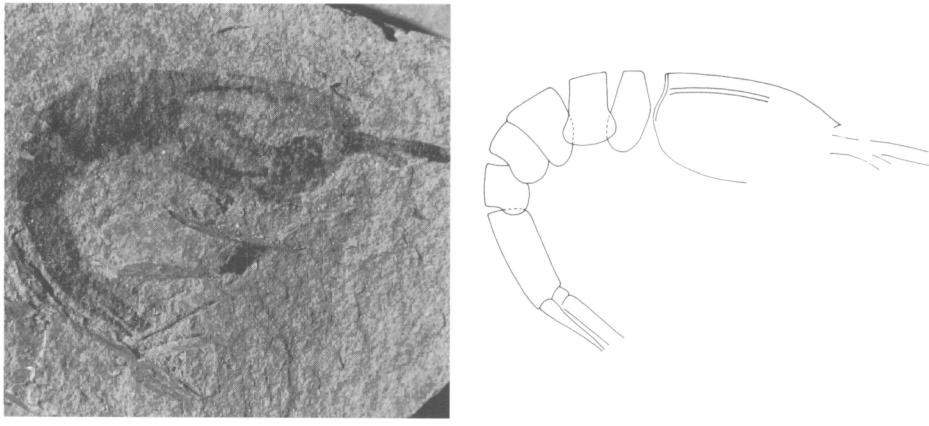

Fig. 2 – *Bannikovia maikopensis* n. gen. n. sp., holotype, n.cat. PIN 4504-1, photo and reconstruction (× 2)

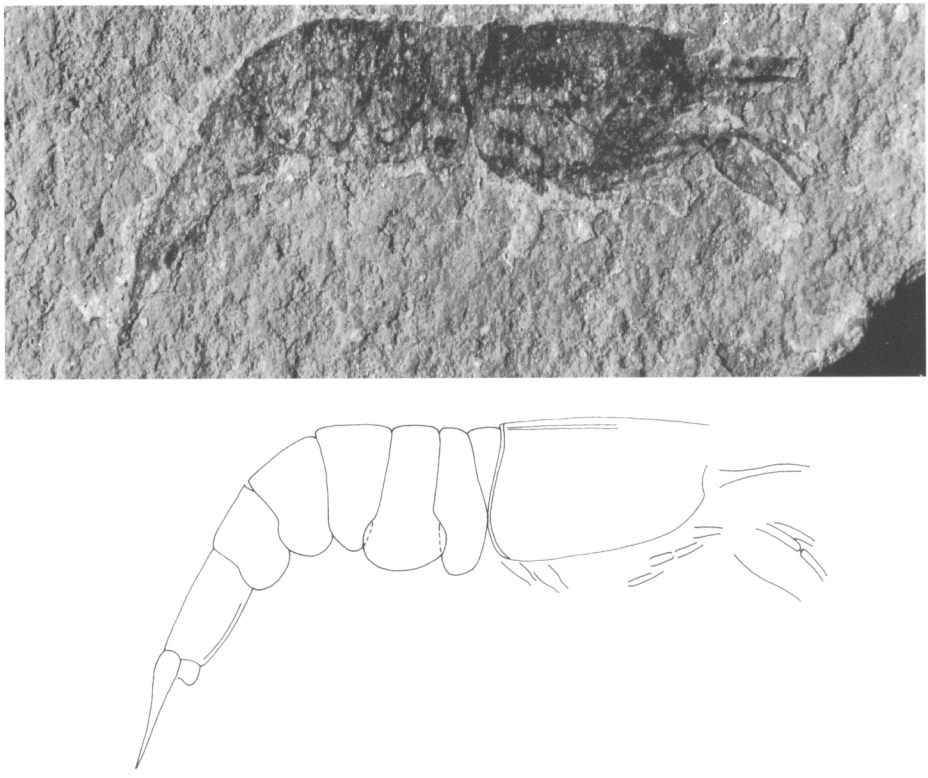

Fig. 3 – *Bannikovia maikopensis* n. gen. n. sp., n.cat. PIN 4504-3, photo and reconstruction (× 5.6)

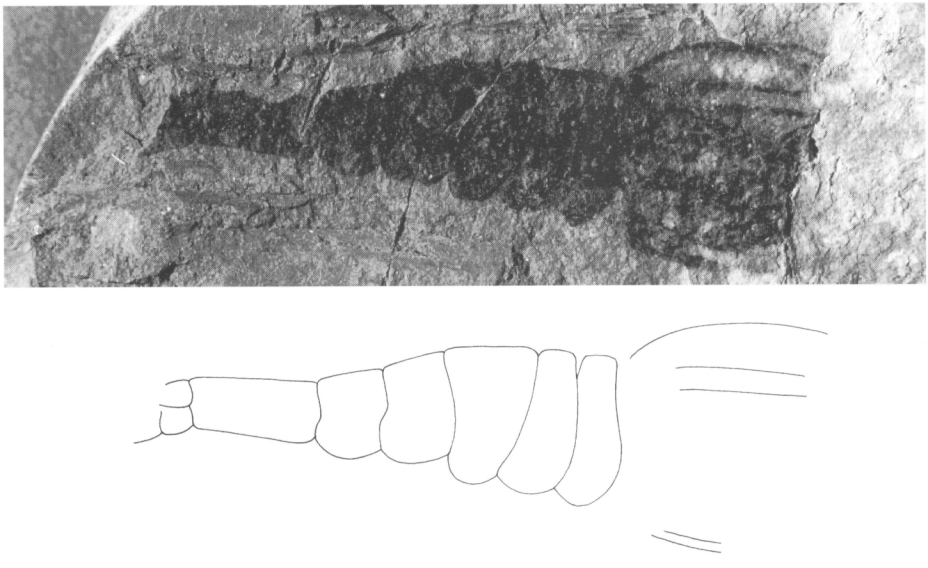

Fig. 4 – *Bannikovia maikopensis* n. gen. n. sp., n.cat. PIN 4505-4, photo and reconstruction (× 4)

Fig. 5 – *Bannikovia maikopensis* n. gen. n. sp., n.cat. PIN 4505-4a, photo and reconstruction (× 3.5)

Fig. 6 – *Bannikovia maikopensis* n. gen. n. sp., n.cat. PIN 4504-2, photo and reconstruction (× 2.5)

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