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Pleuronassa timerchidouensis n. gen., n. sp. (Axiidea, Callianassidae) from the Calcaires à slumps de Taghit Fm., Late Campanian of the Moyenne Moulouya, NE Morocco

Abstract - The new fossil decapod locality discovered recently in the NE extreme flank of the Chebka Timerchidou mountain, at the Moyenne Moulouya, NE of Morocco has yielded a rich decapod assemblage such as *Hasaracancer merijaensis* Ossó, Artal & Vega, 2011, *Costacopluma maroccana* Ossó, Artal & Vega, 2010, and *Ophthalmoplax minimus* Ossó, Artal & Vega, 2010. We report *Pleuronassa timerchidouensis* n. gen., n. sp. (Callianassidae Dana, 1852) from the same locality. It represents the second species of thalassinid from the Upper Cretaceous of Morocco following the recent discovery of *Neocallichirus agadirensis* Garassino, De Angeli & Pasini, 2011, from the Cenomanian of Agadir (W Morocco).

Key words: Crustacea, Decapoda, Callianassidae, Upper Cretaceous, Morocco.

Resum - *Pleuronassa timerchidouensis* n. gen., n. sp. (Axiidea, Callianassidae) de la Formació Calcaires à slumps de Taghit, Campanià superior de la Moyenne Moulouya, NE de Marroc.

El nou jaciment de decàpodes fòssils, recentment descobert al flanc de l'extrem NE del Chebka Timerchidou, a la Moyenne Moulouya, NE de Marroc, ha lliurat una interessant associació de decàpodes com *Hasaracancer merijaensis* Ossó, Artal & Vega, 2011, *Costacopluma maroccana* Ossó, Artal & Vega, 2010, i *Ophthalmoplax minimus* Ossó, Artal & Vega, 2010. D'aquest jaciment, es descriu *Pleuronassa timerchidouensis* n. gen., n. sp. (Callianassidae Dana, 1852) que representa la segona espècie de talassinideu del Cretaci superior de Marroc, després de la recent troballa de *Neocallichirus agadirensis* Garassino, De Angeli & Pasini, 2011, del Cenomanià d'Agadir (Oest de Marroc).

Paraules clau: Crustacea, Decapoda, Callianassidae, Cretaci superior, Marroc.

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Riassunto - *Pleuronassa timerchidouensis* n. gen., n. sp. (Axiidea, Callianassidae) dai Calacari à slumps della Formazione di Taghit, Campaniano superiore della Regione di Moulouya, NE Marocco.

Una nuova località fossilifera a crostacei decapodi, recentemente scoperta nella parte nordorientale delle montagne del Chebka Timerchidou, Regione di Moulouya, NE Marocco, ha permesso di descrivere una ricca associazione a crostacei decapodi rappresentata da *Hasaracancer merijaensis* Ossó, Artal & Vega, 2011, *Costacopluma maroccana* Ossó, Artal & Vega, 2010 e *Ophthalmoplax minimus* Ossó, Artal & Vega, 2010. Segnaliamo dalla stessa località *Pleuronassa timerchidouensis* n. gen., n. sp. (Callianassidae Dana, 1852) che rappresenta la seconda specie di talassinidi del Creatcico superiore del Marocco dopo la recente scoperta di *Neocallichirus agadirensis* Garassino, De Angeli & Pasini, 2011 del Cenomaniano di Agadir (Marocco occidentale).

Key words: Crustacea, Decapoda, Callianassidae, Cretacico superiore, Marocco.

Introduction

The new fossil decapod locality discovered recently in the NE extreme flank of the Chebka Timerchidou mountain, at the Moyenne Moulouya, NE of Morocco (Ossó *et al.*, 2010, 2011) has yielded a rich decapod assemblage including *Hasaracancer merijaensis* Ossó, Artal & Vega, 2011, *Costacopluma maroccana* Ossó, Artal & Vega, 2010, and *Ophthalmoplax minimus* Ossó, Artal & Vega, 2010 (Fig. 1).

Fossil thalassinids from Morocco are very rare, limited to the recent report by Garassino *et al.* (2011) of *Neocallichirus agadirensis* Garassino, De Angeli & Pasini, 2011, from the Cenomanian (Late Cretaceous) of Agadir (W Morocco), representing the first report of this genus in Africa and the oldest species known to date assigned to this genus.

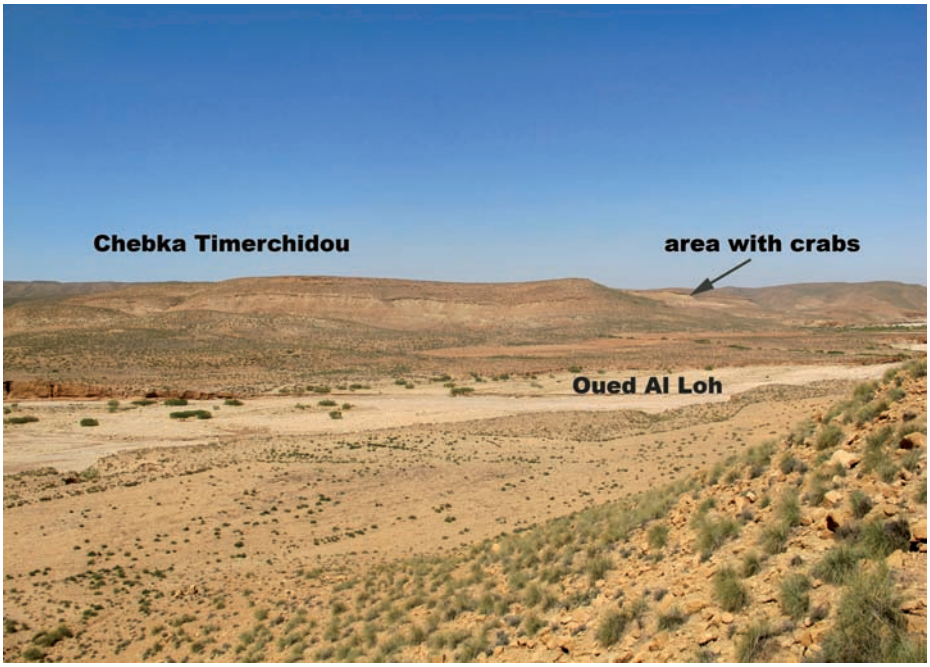

Fig. 1 - Landscape of the Chebka Timerchidou and beds bearing crabs / Paesaggio di Chebka Timerchidou con gli strati contenenti i granchi.

Geological setting

The outcrop area is located near the small village of Merija Tahtania, within the so-called Plis Marginaux of the High Oriental Atlas (Charroud, 2002; Ossó *et al.* 2010, 2011) and between the cities of Missour and Talsint. The beds containing the fossil decapods lie within the Coniacian-Campanian Calcaires à slumps de Taghit Formation, which defines the top of the Upper Cretaceous sequence in this area, and overlies the Calcaires de Tizi Zaoumit Formation, which comprises the Cenomanian-Turonian calcareous interval (Charroud, 2002). The lithology of the fossil beds in the Chebka Timerchidou, consists of fine grained yellowish marls, that suggest a muddy shallow marine bottom. The macrofauna of these beds, consists almost exclusively of decapod crustaceans. The Chebka Timerchidou outcrop is close of a previously reported locality near the Oued Al Loh (Ossó *et al.*, 2010). There, the beds containing crabs within the Calcaires à slumps de Taghit Formation correspond to an age of the lower Campanian (approximately 76 Ma). Thus, the association of the two previously described decapods, *Costacopluma maroccana* and *Ophthalmoplax minimus,* as well as the similar lithology and the position of the beds in the Chebka Timerchidou, permits us to place the new locality, within the Calcaires à slumps the Taghit Formation (Charroud, 2002) (Fig. 2).

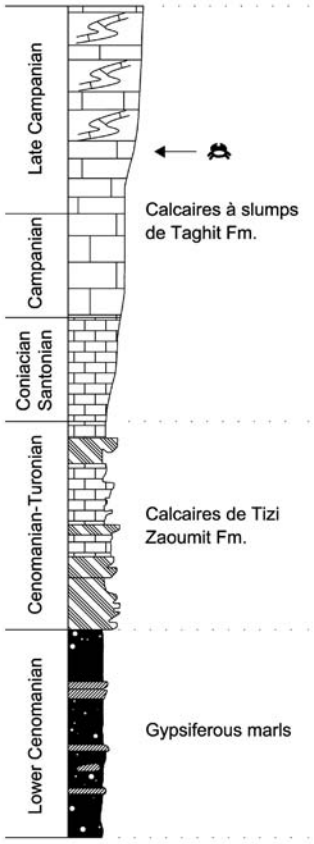

Fig. 2 - Stratigraphic column of Oued Al Loh outcrop (modified after Charroud, 2002) / Colonna stratigrafica del giacimento di Oued Al Loh (modificato da Charroud, 2002).

Materials

The studied specimens are preserved in fine-grained yellowish marls, flattened on a bedding plane. Their preparation was easy because of the softness of the surrounding matrix. The two specimens have been assigned to *Pleuronassa* n. gen., with *Pleuronassa timerchidouensis* n. gen., n. sp. (Callianassidae Dana, 1852).

The studied specimens are housed in the Palaeontological Collections of the Museu Geològic del Seminari Conciliar of Barcelona (MGSB).

For higher-level classification, we follow the recent arrangement proposed De Grave *et al.* (2009).

Abbreviations: lc: length of the carpus; hc: height of the carpus; lpr: length of the propdus; lpa: length of the palm; hpa: height of the palm.

Systematic Palaeontology

Infraorder Axiidea de Saint Laurent, 1979
Family Callianassidae Dana, 1852
Genus *Pleuronassa* nov.

Diagnosis: abdomen with subtriangular somites 3-5 with well-developed, pointed triangular pleura; subrectangular telson as long as the uropods; both uropods with a strong single median longitudinal ridge; major cheliped with propodus (excluding index) approximately as long as wide; index gently curved upwards, with median longitudinal ridge and smooth occlusal margin; dactylus strongly curved distally, longer than index, with a median longitudinal ridge, a row of small, strong tubercles aligned along the dorsal margin and smooth occlusal margin; subquadrate carpus, completely smooth, 1/3 of the length of the propodus; minor cheliped with propodus (excluding index) approximately as long as wide; index strongly curved upwards, strengthened by a median longitudinal ridge, with a row of small tubercles aligned along the ventral margin and with a single strong median tooth on occlusal margin; dactylus gently curved distally, slightly longer than index, with rounded distal extremity, a median longitudinal groove, with two rows of small tubercles aligned along the dorsal and ventral margins, and smooth occlusal margin; subquadrate carpus, higher than long, completely smooth, 1/3 the length of the propodus.

Etymology: from the well-developed pleura of abdominal somites.

Type species: *Pleuronassa timerchidouensis* n. gen., n. sp.

Description: as for the type species.

Discussion. The thalassinids are usually known in the fossil record by fragmentary specimens, generally only the major or minor chelipeds are preserved. Nearly complete specimens are very rare. Thus, the studied specimens in which it is possible to observe different morphological characters is important. As reported by De Grave *et al.* (2010) nineteen genera of thalassinids are known to date in the fossil record (excluding from the list the genera having only extant representatives). Usually the fossil specimens belonging to these genera are partially preserved and so it is difficult to make a comparison. However, most of them have also extant representatives from which it has been possible to take the most important diagnostic characters. Thus, we have taken the diagnostic characters of the studied specimens and we have compared them with the fossils of these genera, and also with their extant representatives, as follows: *Brecanclawu* Schweitzer & Feldmann,

2001, has the chela much longer and slender than the studied specimens; *Callianassa* Leach, 1814, and *Calliax* de Saint Laurent, 1973, have very dissimilar and subrectangular cheliped whilst the studied specimens have subquadrate cheliped; *Callianassa* Leach, 1814, has a carpus longer than the studied specimens, mainly in the minor cheliped; *Callichirus* Stimpson, 1866, and *Corallianassa* Manning, 1987, differ in having the carpus longer than the studied specimens; *Comoxianassa* Schweitzer, Feldmann, Ćosović, Ross & Waugh, 2009, differs in having subrectangular chelipeds and rounded somites; *Cowichianassa* Schweitzer, Feldmann, Ćosović, Ross & Waugh, 2009, has a proximal chela margin marking an oblique angle to the lower margin, whilst in the studied specimens this angle is to the upper margin, also, the somites don't have the well-developed triangular pleura as in the somites 3-5 of the studied specimens; *Eucalliax* Manning & Felder*,* 1991, differs in having a subrectangular propodus and uropods without strong median ridge; *Eoglypturus* Beschin, De Angeli, Checchi & Zarantonello, 2005, has five spines on the dorsal margin of the right propodus absent on the dorsal margin of the studied specimens which is smooth; *Glypturus* Stimpson, 1866, differs in having the dorsal margin armed with spines whereas in the studied specimens, this dorsal margin is smooth; *Lepidophthalmus* Holmes, 1904, has the palm of major and minor chelipeds as long as wide and the telson as long as the uropods, as in the studied specimens, but the occlusal margins of the dactylus and the index of minor cheliped are smooth (median tooth in occlusal margin of index in the studied specimens); *Melipal*, Schweitzer, Feldmann, Encinas & Suárez, 2006, has a subrectangular palm of major cheliped whilst it is subquadrate in the studied specimens, moreover the occlusal margins of the dactylus and the index of major cheliped have some proximal teeth (smooth in the studied specimens) and the occlusal margins of the dactylus and the index of minor cheliped are smooth (median tooth in occlusal margin of index in the studied specimens); *Neocallichirus* Sakai, 1988, has a minor cheliped with carpus longer than propodus and with the index with occlusal margin armed with numerous denticles or finely serrated, different of the studied specimens which have a single strong median tooth in occusal margin of minor cheliped; *Neotrypaea* Manning & Felder, 1991, differs in having occusal margins of the dactylus and the index of both chelipeds smooth; *Podocallichirus* Sakai, 1999, differs in having occlusal margins of major cheliped strongly serrate and occlusal margins of minor cheliped smooth; *Protocallianassa* Beurlen, 1930, differs in having major cheliped with occlusal margin of the dactylus with proximal tooth and occlusal margin of the index with median tooth while the occlusal margins of minor cheliped are smooth; *Sergio* Manning & Lemaitre, 1994, differs in having occlusal margins of major cheliped strongly serrate; *Trypaea* Dana, 1852, differs in having major cheliped with occlusal margin of the dactylus with one strong proximal tooth and occlusal margin of the index smooth; *Vegarthron*, Schweitzer & Feldmann, 2002, differs in having major cheliped with occlusal margin of the dactylus smooth.

Besides these differences, we consider two characters as very important to distinguish the studied specimens from the other genera in order to justify the erection of a new genus. The first is the presence of a minor cheliped with propodus approximately as long as wide, index strongly curved upwards, with median longitudinal ridge, with a row of small tubercles aligned along the ventral margin and with a single strong median tooth in occlusal margin, and dactylus gently curved distally, slightly longer than fixed finger, with rounded distal extremity, a median longitudinal groove, with two rows of small tubercles aligned along the dorsal and

ventral margins, and smooth occlusal margin. This kind of cheliped is not present in any of the above-mentioned genera. The second is the presence of abdominal subtriangular somites 3-5 with well-developed, pointed triangular pleura, usually strongly reduced in all above-mentioned genera. If the above-mentioned characters are not present in any fossil genera, we point out some resemblances with the extant *Paracalliax* de Saint Laurent, 1979, above all in the morphology of major and minor chelipeds.

Pleuronassa timerchidouensis n. gen., n. sp.
Figs. 3-8

Diagnosis: as for the genus.

Etymology: the trivial name alludes to Timerchidou locality where the studied specimens have been discovered.

Holotype: MGSB 77720.

Paratype: MGSB 77721.

Type Locality: Chebka Timerchidou, near Merija Tahtania, Moyenne Moulouya (Morocco).

Geological age: lower Campanian (Upper Cretaceous).

Occurrence and measurements: two specimens in lateral view, partially complete.

MGSB 77720 – total length: 34 mm
major cheliped: lpr: 13 mm; lpa: 7 mm; hpa 7 mm, lc: 5 mm, hc: 5 mm
minor cheliped: length, 10 mm; width, 5 mm

MGSB 77721 – total length: 26 mm
minor cheliped: lpr: 11 mm; lpa: 6 mm; hpa 5.5 mm, lc: 5 mm, hc: 3 mm

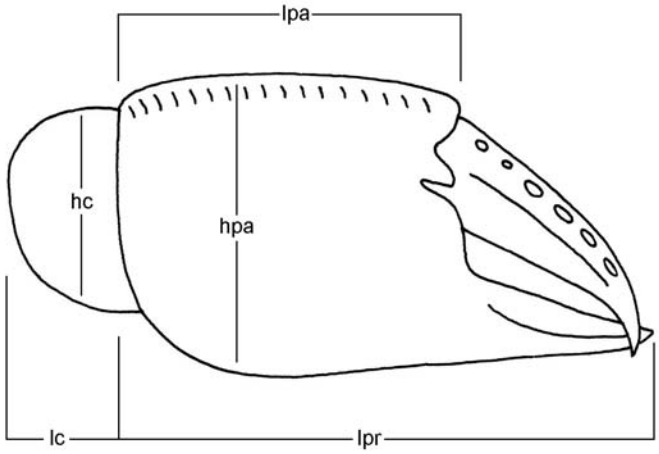

Fig. 3 - Major cheliped (chelipede maggiore); lc: length of carpus (lunghezza del carpus); hc: height of the carpus (altezza del carpus); lpr: length of the propodus (lunghezza del propodus); lpa: length of the palm (lunghezza del palmo); hpa: height of the palm (altezza del palmo).

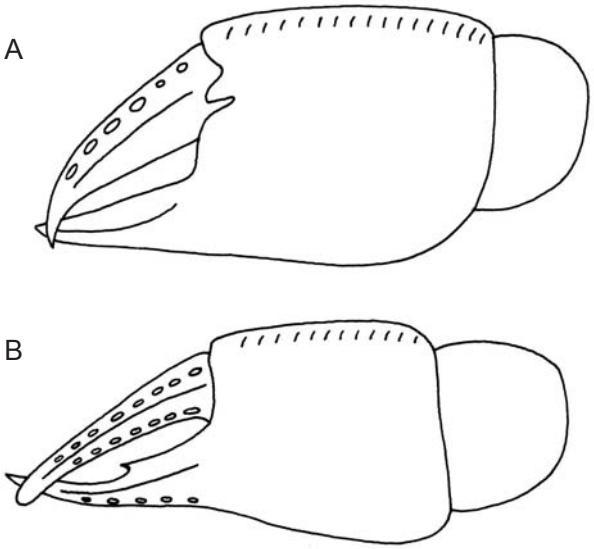

Fig. 4 - *Pleuronassa timerchidouensis* n. gen., n. sp., reconstruction of major (A) and minor (B) chelipeds / ricostruzione dei chelipedi maggiore e minore.

Fig. 5 - *Pleuronassa timerchidouensis* n. gen., n. sp., holotype (olotipo), MGSB 77720 (x 3.1).

Fig. 6 - *Pleuronassa timerchidouensis* n. gen., n. sp., paratype (paratipo), MGSB 77721 (x 4).

Description. Cephalothorax suboval (total length approximately 11 mm) poorly preserved; well-developed *linea thalassinica*. Abdomen with equal size somites; subrectangular somites 1 and 2; subtriangular somites 3-5 with well-developed, pointed triangular pleura; subsquare somite 6 longer than previous ones. Subrectangular telson with rounded distal extremity and smooth dorsal surface; telson as long as the uropods; rounded exopodite and endopodite, both with a well strong single median longitudinal ridge. Cheliped (P1) distinctly unequal. Major cheliped with distinct gap between dactylus and index; propodus (excluding index) approximately as long as wide, with a row of very small, parallel, vertical ridges, aligned along the dorsal margin; dorsal and ventral margins of propodus straight; index gently curved upwards, with median longitudinal ridge, with smooth occlusal margin; dactylus strongly curved distally, longer than index, with a median longitudinal ridge, a row of small and strong tubercles aligned along the dorsal margin and smooth occlusal margin; subquadrate carpus, higher than long, completely smooth, 1/3 of the length of the propodus. Minor cheliped with distinct gap between dactylus and index; propodus (excluding index) approximately as long as wide, with a row of very small parallel, vertical ridges, aligned along the dorsal margin; dorsal margin of propodus straight, ventral margin slightly sinuous; index strongly curved upwards, strengthened by a median longitudinal ridge, with a row of small tubercles aligned along the ventral margin and with a single strong median tooth on occlusal margin; dactylus gently curved distally, slightly longer than index, with rounded distal extremity, a median longitudinal groove, with two rows of small tubercles aligned along the dorsal and ventral margins, and smooth occlusal margin; subquadrate carpus, higher than long, completely smooth, 1/3 of the length of the propodus. Pereiopod 2 with gently elongate chela; propodus slightly longer than wide; dactylus and index equal in size, both with smooth occlusal margin; subtriangular smooth carpus, slightly restricted posteriorly. Pereiopod 3 with stout

Fig. 7 - *Pleuronassa timerchidouensis* n. gen., n. sp., MGSB 77720, detail of major and minor chelipeds / dettaglio dei chelipedi maggiore e minore (x 7.8).

chela; propodus as long as wide; dactylus and index equal in size, both with smooth occlusal margin; subtriangular smooth carpus, strongly restricted posteriorly.

Discussion. Fossil thalassinids from Morocco are very rare, limited to the recent report by Garassino *et al.* (2011) of *Neocallichirus agadirensis* Garassino, De Angeli and Pasini, 2011, from the Cenomanian (Late Cretaceous) of Agadir (W Morocco). *Pleuronassa timerchidouensis* n. gen., n. sp. differs from *N. agadirensis*, as follows: major cheliped with propodus approximately as long as wide (longer than wide in *N. agadirensis*); major cheliped with a row of very small parallel, ver-

Fig. 8 - *Pleuronassa timerchidouensis* n. gen., n. sp., MGSB 77720, details of abdominal somites 3-5 and tail fan/ dettagli dei somiti addominali 3-5 e del ventaglio caudale (x 7.5).

tical ridges, aligned along the dorsal margin (smooth dorsal margin in *N. agadirensis*); major cheliped with index gently curved upwards, with median longitudinal ridge, with smooth occlusal margin (index gently curved upwards without median longitudinal ridge and sinuous occlusal margin in *N. agadirensis*); major cheliped with dactylus strongly curved distally, longer than index, with a median longitudinal ridge, a row of small and strong tubercles aligned along the outer margin and smooth occlusal margin (dactylus slightly longer than index without median longitudinal ridge and a row of tubercles aligned along the outer margin in *N. agadirensis*).

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