

Review of brachyuran crabs from the late Miocene (Messinian) of Oran, Algeria

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Review of brachyuran crabs from the late Miocene (Messinian) of Oran, Algeria

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ABSTRACT

A revision of the type material and historical specimens of brachyuran crabs collected from the late Miocene (Messinian) of Oran, Algeria, is proposed. These specimens were first described by Van Straelen (1937) as *Maja arambourgi*, *Hyas oranensis*, *Calappa sahelensis*, and *Geryon latifrons*. The reappraisal of the spider crab *M. arambourgi* allows us to assign it to the new genus *Wahrانيا* n. gen. Besides some peculiar morphological characters of *Wahrانيا* n. gen. lead us to propose the new subfamily Wahraniinae n. subfam. within the Epialtidae MacLeay, 1838, representing the second report of this family from the Miocene of the Mediterranean Basin. The new genus *Parahyas* n. gen. is erected to accommodate the spider crab *H. oranensis*. It is the sole Mediterranean fossil genus within the Oregoniidae Garth, 1958. The reappraisal of *C. sahelensis* allowed us to confirm its assignment to *Calappa* Weber, 1795, known in the Miocene fossil record with three species. *Geryon latifrons* is considered as a junior synonym of *Chlinocephalus demissifrons* Ristori, 1886. This synonymy results the first report from Africa of this species known to date from the Miocene and Plio-Pleistocene of Italy and the Miocene of Spain and Hungary. We also revise one very large isolated chela assigned to *Cancer* sp. by Van Straelen (1937), and we report some specimens of *Cancer sismondai* Meyer, 1843 collected by Camille Arambourg. Two new specimens collected by Léopold Geslin are assigned to *Goneplax gulderi* Bachmayer, 1953, representing the first record of the species in the southern Proto-Mediterranean Basin.

KEY WORDS

Crustacea,
Epialtidae,
Oregoniidae
Calappidae,
Euryplacidae,
Goneplacidae,
North Africa,
Messinian,
new subfamily,
new genera,
new combinations,
new synonym.

RÉSUMÉ

Révision des crabes brachyures du Miocène supérieur (Messinien) d'Oran, Algérie.

Une révision du matériel type et des spécimens historiques de crabes brachyures récoltés dans le Miocène supérieur (Messinien) d'Oran en Algérie, est proposée. Ces spécimens ont été décrits pour la première fois par Van Straelen (1937) comme *Maja arambourgi*, *Hyas oranensis*, *Calappa saheliensis*, et *Geryon latifrons*. La réévaluation de l'araignée de mer *M. arambourgi* nous conduit à la placer dans le genre *Wahrnia* n. gen. De plus, certains caractères morphologiques particuliers de *Wahrnia* n. gen. permettent de proposer la sous-famille Wahrniinae n. subfam. au sein des Epialtidae MacLeay, 1838, ce qui représente la seconde mention de cette famille dans le Miocène du Bassin proto-méditerranéen. Le genre *Parahyas* n. gen. est érigé pour l'araignée de mer *H. oranensis*. C'est le seul genre méditerranéen fossile parmi les Oregoniidae Garth, 1958. La révision de *C. saheliensis* permet de confirmer son placement dans *Calappa* Weber, 1795, connu dans le registre fossile miocène par trois espèces. *Geryon latifrons* est considéré comme un synonyme plus récent de *Chlinocephalus demissifrons* Ristori, 1886. Cette synonymie conduit à la première mention en Afrique de cette espèce, connue jusqu'à présent dans le Miocène et le Plio-Pléistocène d'Italie et le Miocène d'Espagne et de Hongrie. Nous révisons aussi une très grosse pince isolée, identifiée comme *Cancer* sp. par Van Straelen (1937), et nous listons aussi quelques spécimens de *Cancer sismondai* Meyer, 1843 récoltés par Camille Arambourg. Deux spécimens récoltés par Léopold Geslin sont identifiés comme *Goneplax gulderi* Bachmayer, 1953, et représentent la première mention de l'espèce au sud du Bassin proto-méditerranéen.

MOTS CLÉS

Crustacea,
Epialtidae,
Oregoniidae,
Calappidae,
Euryplacidae,
Goneplacidae,
Afrique du Nord,
Messinien,
sous-famille nouvelle,
genres nouveaux,
combinaisons nouvelles,
synonyme nouveau.

INTRODUCTION

The decapod crustacean fauna from the Miocene of Oran, northwestern Algeria (North Africa) was studied since A. Milne-Edwards (1861, 1864a, 1864b) who first described *Cancer deshayesii* A. Milne-Edwards, 1864 from the Pliocene of Alger and Miocene of Oran. Later Camille Arambourg collected specimens from the Messinian marls of Les Planteurs and Ravin Blanc quarries, which allowed Van Straelen (1934, 1937) to describe the decapod crustacean fauna with six species including four new ones. The Messinian reef-facies of Oran yielded six species of anomurans and brachyurans including the new xanthid crab *Lachnopodus murdjadjensis* described by Saint Martin & Müller (1988: 253, 254). The most recent study by Moissette & Müller (1990) reported several decapod remains from interbedded marls within diatomites outcropping in the Messinian of Arbal, Tafaraoui, and Sig localities around Oran. They identified 16 taxa of eight families (Callianassidae Dana, 1852, Galatheididae Samouelle, 1819, Parthenopidae MacLeay, 1838, Majidae Samouelle, 1819, Cancridae Latreille, 1802, Portunidae Rafinesque, 1815, Xanthidae MacLeay, 1838, *incertae sedis* family).

The first purpose of this study is a revision of the taxonomy and systematics of the material collected by Arambourg before and after the First World War. All the type and figured specimens are housed in the palaeontological collections of the MNHN, Paris and were never revised since Van Straelen (1937). The second purpose is to describe specimens collected at Oran by Dr Léopold Geslin after the Algerian Independence: these specimens are completely new and were collected at Ravin Blanc quarry.

GEOLOGICAL SETTING

The distinguished French paleontologist Camille Arambourg collected in the 1920s a rich fauna of teleostean fishes during the geological exploration of the Chelif Basin in the northwest margin of Algeria (Gaudant 2008). He assembled an amazing collection of fossils from several late Miocene localities of that basin (Gambetta, Les Planteurs, Raz-el-Aïn, Saint-Denis du Sig, Sidi-Brahim), and described most of the teleostean fishes in an extensive monograph (Arambourg 1927). The fishes were mainly collected in three quarries nearby Oran: Les Planteurs, Raz-el-Aïn, and Ravin Blanc (Fig. 1). Decapod crustaceans were collected only in Les Planteurs and Ravin Blanc quarries, both characterized by marno-diatomitic series having a stratigraphic age between the Miocene and the Pliocene. To determine the age of the deposits, the old publications use the term Sahelian, a regional stratigraphic division now obsolete, covering part of the late Miocene and early Pliocene. Actually, the studied specimens belong to the carbonate facies cropping out at Oran and referred now to the late Messinian (Neogene, Cenozoic; Moissette 1984). For more details about stratigraphy and palaeoenvironmental data, see Saint Martin & Müller (1988), Moissette & Müller (1990) and Mansour & Saint Martin (1999).

LES PLANTEURS QUARRY

This quarry was located on the eastern escarpment of Djebel Murdjadjo, eastern of Oran. It is today included in the Sanaouer district of Sidi El Houari. The stratigraphic origin of the crabs is not well known. Indeed, neither Arambourg (1927) nor Van Straelen (1937) provided data about the pre-



FIG. 1. — **A**, simplified geological map of Oran region with the location of the fossiliferous quarries: Les Planteurs, Ravin Blanc, and Raz-el-Aïn; **B**, current general view of Ravin Blanc quarry with diatomitic beds (1) and chalky beds (2), which probably yielded decapod crustaceans. Maps: Cédric Chény. Photograph: Salim Allam.

cise levels yielding crabs that could be confused with the fish levels (J.-P. Saint Martin, pers. comm. 2023). Les Planteurs quarry yielded a rich fauna of pelagic fishes and big-sized selachii (Arambourg 1927). Van Straelen (1937) reported some species of crabs, as follows: *Calappa sahariensis* Van Straelen, 1937, *Geryon latifrons* Van Straelen, 1937, *Maia* [sic] *arambourgi* Van Straelen, 1937, and *Hyas oranensis* Van Straelen, 1937. Nobody has never revised the stratigraphic origin and the systematics of the crabs from Oran, whereas the fish fauna was carefully revised by Gaudant (2008).

RAVIN BLANC QUARRY

This quarry was located 5 km eastern of Les Planteurs and Raz-el-Aïn quarries (Fig. 1B). This quarry was located between Es Seddikia and El Makkari districts (*ex* Gambetta and Saint-Eugène districts) and was exploited by a lime and cement factory, south of the district of Gambetta. Dr Léopold Geslin lived in this area and collected fossils in this quarry characterized by 4 to 5 m of tripoli superimposed to silex marl rich in foraminifers, lamellibranchs, ostracods, and echinoderms, typical of pre-reef deposits (Saint Martin & Müller 1988).

TABLE 1. — List of the studied samples: type material and specimens from the Messinian of Oran, Algeria (MNHN: coll. Arambourg and Geslin; University of Lyon: coll. Saint Martin).

Taxa	Quarries	Number of specimens	Collections
Majoidea			
Epiplatidae			
Wahraniinae n. subfam.			
<i>Wahrania arambourgi</i> (Van Straelen, 1937), n. comb.	Les Planteurs	1	Arambourg
Oregoniidae			
<i>Parahyas oranensis</i> (Van Straelen, 1937), n. comb.	Les Planteurs	2	Arambourg
Calappoidea			
Calappidae			
<i>Calappa saheliensis</i> Van Straelen, 1937	Les Planteurs	6	Arambourg
Goneplacoidea			
Euryplacidae			
<i>Chlinocephalus demissifrons</i> Ristori, 1886	Les Planteurs	14	Arambourg
	Ravin Blanc	3	Geslin
Goneplacidae			
<i>Goneplax gulderi</i> Bachmayer, 1953	Ravin Blanc	2	Geslin
Cancroidea			
Cancridae			
<i>Cancer sismondai</i> Meyer, 1843	Les Planteurs	23	Arambourg
<i>Cancer</i> sp.	Les Planteurs	1	Arambourg
Xanthoidea			
Xanthidae			
<i>Lachnopodus murdjadjensis</i> Saint Martin & Müller, 1988	Djebel Murdjadjo	3	Saint Martin

Until now more of 300 fossils, above all pelagic bone fishes, are reported (Gaudant 2008). The rich collection donated between 1962 and 1977 by Dr Léopold Geslin to the MNHN includes just five specimens of crabs herein described. We precise that Léopold Geslin was an active member of the Oran Geography and Archaeology Society and ensured the transition and reactivation of this learned society after the Algerian Independence (Benkada 1999).

MATERIAL AND METHODS

Fifty-two specimens of crabs from the Messinian of Oran are available in the MNHN palaeontological collections (Table 1). They are preserved as inner and outer three-dimensional molds in dorsal and ventral views. They were collected from Les Planteurs quarry by Camille Arambourg in the 1920s, and from Ravin Blanc quarry by Léopold Geslin in the 1960s. About half part of Arambourg’s specimens was studied by Van Straelen (1937), the remaining one being unreported, and also subject of the present paper. Five additional specimens from Dr Geslin’s collection were recovered during the recent moving of the palaeontological collections (Charbonnier 2021).

ABBREVIATIONS

Institutional abbreviations

IGF	Museo di Geologia e Paleontologia dell’Università di Firenze, Firenze, Italy;
MNHN.F	Muséum national d’Histoire naturelle, collection de Paléontologie, Paris, France;
MSNM	Museo di Storia Naturale, Milano, Italy;
MUAL	Museo di Allerona, Terni, Italy;
MUSNAF	Museo dell’Accademia dei Fisiocritici, Siena, Italy;
PU	Paleontologia Università di Torino, Torino, Italy.

Anatomical abbreviations

P1-P5	pereiopods 1 to 5;
s3-s6	pleonal somites 3 to 6.

SYSTEMATIC PALEONTOLOGY

Order DECAPODA Latreille, 1802
 Infraorder BRACHYURA Latreille, 1802
 Section EUBRACHYURA Saint Laurent, 1980
 Subsection HETEROTREMATA Guinot, 1977
 Superfamily CALAPPOIDEA De Haan, 1833
 Family CALAPPIDAE De Haan, 1833

Genus *Calappa* Weber, 1795

TYPE SPECIES. — *Cancer granulatus* Linnaeus, 1758, subsequent designation by Latreille (1810).

INCLUDED FOSSIL SPECIES. — See Schweitzer *et al.* (2010) and Pasini & Garassino (2017).

Calappa saheliensis Van Straelen, 1937
(Fig. 2A-D)

Calappa saheliensis Van Straelen, 1937: 473, 474, pl. 33, fig. 1. — Saint Martin & Müller 1988: 251. — Moissette & Müller 1990: 738. — Mayoral *et al.* 1998: 508, fig. 2.4. — Díaz-Medina *et al.* 2017: 181. — Ossó & Gagnaison 2019: 370, 371.

Calappa sahelensis [sic] – Schweitzer *et al.* 2010: 83.

Calappa cf. *saheliensis* – Mayoral *et al.* 1998: 508, fig. 2.3. (*non Calappa saheliensis* Van Straelen, 1936).

TYPE MATERIAL. — Holotype MNHN.FR03768 and five paratypes MNHN.FA28898, A28899, A28900, A28901, A28902 (Arambourg coll.).

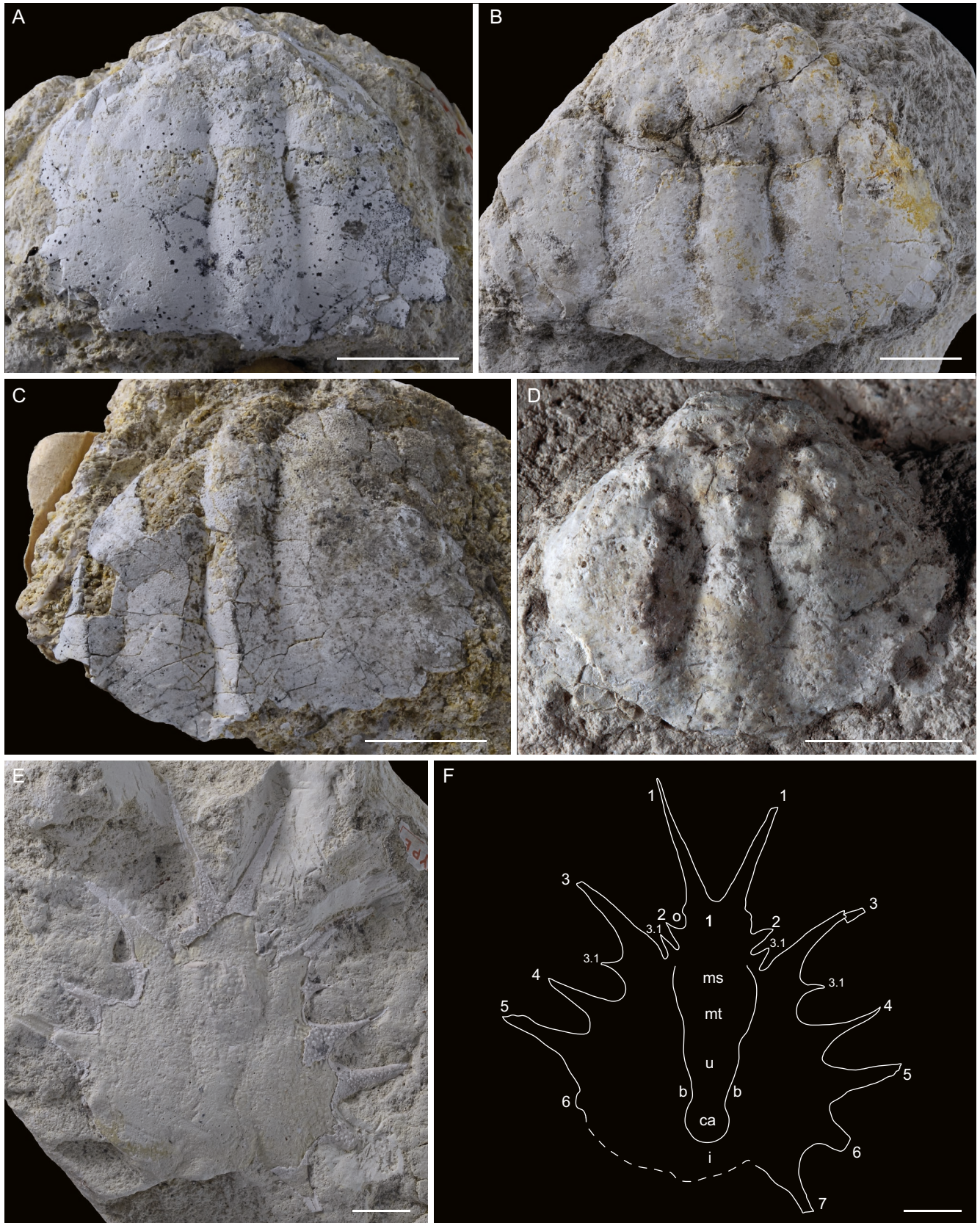


FIG. 2. — Brachyuran crabs from the late Messinian of Oran (Les Planteurs quarry, Arambourg coll.): **A–D**, *Calappa saheliensis* Van Straelen, 1937: **A**, holotype MNHN.F.R03768, dorsal view; **B**, paratype MNHN.F.A28898, dorsal view; **C**, paratype MNHN.F.A28899, dorsal view; **D**, paratype MNHN.F.A28902, dorsal view; **E**, *Wahrania arambourgi* (Van Straelen, 1937), n. comb. holotype MNHN.F.R03773, dorsal view and line drawing of carapace. Abbreviations: **b**, branchiocardiac groove; **ca**, cardiac region; **i**, intestinal region; **ms**, mesogastric region; **mt**, metagastric region; **o**, orbit; **u**, urogastric region; **1**, pseudorostral spine (= rostrum); **2**, postorbital spine; **3**, hepatic spine; **3.1**, accessorial spine of hepatic spine; **4**, epibranchial spine; **5**, mesobranchial spine; **6**, **7**, metabranchial spines. Scale bars: 1 cm. Photographs: Lilian Cazes.

TYPE LOCALITY. — Les Planteurs quarry, Sanaouer district of Sidi El Houari, Oran.

TYPE AGE. — Late Miocene (late Messinian).

DESCRIPTION

Carapace

Carapace subovate, strongly vaulted longitudinally and transversely, with spined posterolateral flanges; maximum width at level of third posterolateral tooth; front poorly preserved; orbits small, rounded; supraorbital margin entire; anterolateral margins strongly arcuate; posterolateral margins strongly convex; flange extensions with five triangular teeth: three teeth equal in size, followed by two teeth decreasing in size posteriorly; posterior margin short, slightly convex; carapace surface covered by small tubercles densely arranged uniformly; tubercles more scattered along posterior margin; central regions bounded longitudinally by deep two parallel grooves running from orbits to cardiac region; small tubercle between metagastric and urogastric regions.

DISCUSSION

Van Straelen (1937) reported eight type specimens partially decorticated. The check of the type material highlighted that two paratypes seem to be lost. Though Van Straelen (1937) did not provide a detailed description of this species, he assigned it to *Calappa* without justification. Based on Schweitzer & Feldmann (2019), we concur with this systematic assignment for the presence of the spined posterolateral flanges.

Regarding the Miocene of the Mediterranean and Paratethys, *Calappa* is represented by three species, *Calappa heberti* Brocchi, 1883, *C. praelata* Lörenthey in Lörenthey & Beurlen, 1929, and *C. saheliensis*. As pointed out by Díaz-Medina *et al.* (2017) the last two species are morphologically very close to each other. However, the reappraisal of the type series of *C. saheliensis* has pointed out that the carapace regions are covered by small tubercles densely and uniformly arranged (*versus* large tubercles in these regions in *C. praelata*). *Calappa heberti* differs from *C. saheliensis* in having large tubercles in the anterior half of the carapace and short squamous ridges in the posterior portion. Therefore, based on the different carapace ornamentations, *C. saheliensis* can be considered as a valid species within *Calappa*.

Mayoral *et al.* (1998) reported an incomplete calappid crab from the early Pliocene of Guadalquivir Basin (Spain) identified as *Calappa* cf. *saheliensis*, based on the smooth ornamentation of the posterior part of the carapace. It is difficult, however, to assert that this poorly preserved specimen could be related to *C. saheliensis* simply for the smooth ornamentation, lacking the main diagnostic characters of this species, such as orbits, antero- and posterolateral margins, urogastric and cardiac regions, and spined posterolateral flanges. In conclusion, we limit the stratigraphic range of *C. saheliensis* to the late Miocene (Messinian).

Superfamily MAJOIDEA Samouelle, 1819

Family EPIALTIDAE MacLeay, 1838

DIAGNOSIS. — Carapace elongate, triangular or cuneate, sometimes with unusually projected antero-lateral margins; rostrum bifid or singular, long or short; eyes without true orbits, supraorbital cave weak, without intercalated spine, eyestalks short or absent, eyes protected by very long rostrum or preorbital spine, sometimes a postorbital spine present but not cupped to protect eye; merus and ischium of maxilliped equally wide; pereopods 3–5 often very short compared to 1 and 2 (after Schweitzer *et al.* 2020).

INCLUDED SUBFAMILIES. — Epialtinae MacLeay, 1838; Periacanthinae Lörenthey in Lörenthey & Beurlen, 1929; Pisinae Dana, 1851; Pliosomatinae Števíč, 1994; Tychinae Dana, 1851; Wahraniinae n. subfam. (this study).

WAHRANIINAE n. subfam.

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TYPE GENUS. — *Wahrانيا* n. gen.

DIAGNOSIS. — Carapace pyriform; long, diverging pseudorostral spines (= rostrum); rimmed supraorbital cave with sharp postorbital spine; one very long, sharp hepatic spine with a pair of basal accessory spines; one long, sharp epibranchial spine; one long, sharp mesobranchial spine; two long, sharp metabranchial spines; dorsal surface of carapace and spines strongly tuberculate.

DISCUSSION

Following Schweitzer *et al.* (2020), Wahraniinae n. subfam. is placed within Epialtidae based on the weak supraorbital cave without intercalated spine, the very long rostrum bifid, protecting the eye, and one postorbital spine present but not cupped to protect eye. Wahraniinae n. subfam. differs from the Epialtinae, Periacanthinae, Pisinae, Pliosomatinae, and Tychinae by its very elongate antero- and posterolateral spines developed only on the margin and not on the dorsal surface, and by its hepatic spine flanked by basal accessory spines. The marginal position of antero- and posterolateral spines is closed to Periacanthinae but *Periacanthus* Bittner, 1875, besides a short bifid rostrum (*versus* very long bifid rostrum in *Wahrانيا* n. gen.), shows a trifurcate spine on branchial region (*versus* single and simple spine in *Wahrانيا* n. gen.) and a preorbital spine to protect the eye (*versus* absent in *Wahrانيا* n. gen.).

Wahrانيا n. gen.

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ETYMOLOGY. — From Wahran, name of Oran in Berber language. The gender of the genus is feminine.

TYPE SPECIES. — *Maia* [sic] *arambourgi* Van Straelen, 1937.

DIAGNOSIS. — As for subfamily.

DISCUSSION

Van Straelen (1937) described *Maja arambourgi* based on one single complete carapace. He assigned the specimen to *Maja* Lamarck, 1801 (Majidae Samouelle, 1819) for the pyriform carapace, lateral margins with spines, and bifid rostrum. We do not concur with this systematic assignment. Indeed, the reappraisal of the holotype has highlighted some characters such as the long diverging pseudorostral spines (= rostrum), the lack of the intercalated spines, and the postorbital spine not cupped to protect eye that do not fit the main diagnostic characters of the genera within the Majidae which have ovate carapace and orbits with intercalated spine (Schweitzer *et al.* 2020). Based on Schweitzer *et al.* (2020), the long diverging pseudorostral spines, the lack of the intercalated spines, and the postorbital spine not cupped to protect eye are diagnostic characters of the Epialtidae to which *Wahrnia* n. gen. is assigned. The five long marginal spines (including the hepatic spine flanked by accessorial spines) plus the very long diverging pseudorostral spines are not shared with the twenty-one fossil genera within the five subfamilies and lead us to place *Wahrnia* n. gen. in its own subfamily.

Wahrnia arambourgi (Van Straelen, 1937), n. comb.
(Fig. 2E, F)

Maia [sic] *arambourgi* Van Straelen, 1937: 475, 476, pl. 33, fig. 3. — Glaessner 1969: R502, fig. 314.9.

Maja arambourgi — Saint Martin & Müller 1988: 251. — Moissette & Müller 1990: 738, 739. — Schweitzer *et al.* 2010: 97.

TYPE MATERIAL. — Holotype by monotypy (MNHN.FR03773, Arambour coll.).

TYPE LOCALITY. — Les Planteurs quarry, Sanaouer district of Sidi El Houari, Oran.

TYPE AGE. — Late Miocene (late Messinian).

DESCRIPTION

Carapace

Carapace pyriform; pseudorostral spines (= rostrum) longer than the half of carapace length; pseudorostral spines sharp, straight, diverging, slightly deflected; supraorbital cave rimmed with sharp postorbital spine; one very long, sharp hepatic spine, as long as the pseudorostral spines, slightly turned downward; a pair of short, sharp, straight accessorial spines at the base of hepatic spine; one long, sharp epibranchial spine, slightly turned upward; one long, sharp, straight mesobranchial spine, as long as epibranchial spine, directed outward; two long, sharp, straight metabranchial spines, as long as mesobranchial spine, directed posteriorly; narrow posterior margin poorly preserved; meso- and metagastric regions slightly inflated; urogastric and cardiac regions slightly inflated and marked by a deep branchiocardiac groove; dorsal surface of carapace and spines strongly tuberculate (based on Van Straelen 1937: pl. 33, fig. 3, we note that the surface of carapace was altered and eroded, inducing the loss of ornamentation).

DISCUSSION

The fossil record of the representatives of the Epialtidae from the Miocene is very scarce. Indeed, only eight genera

of the Epialtinae and Pisinae are known to date from the Miocene of Europe (Hungary and Poland), North America (USA), South America (Argentina, Peru, and Venezuela), Taiwan, and Japan (Schweitzer *et al.* 2020). However, only two fossil species are known to date from the Miocene of the Mediterranean Basin: *Herbstia melitense* Gatt & De Angeli, 2010 (Pisinae Dana, 1851) from Malta and *Wahrnia arambourgi* (Van Straelen, 1937), n. comb. (Wahraniinae n. subfam.) from Algeria.

Family OREGONIIDAE Garth, 1958

INCLUDED GENERA. — *Chionoecetes* Krøyer, 1838; *Macroregonia* Sakai, 1978; *Oregonia*, Dana, 1851; *Hyas* Leach, 1814 (after Ng *et al.* 2008).

Parahyas n. gen.

[urn:lsid:zoobank.org:act:B38E2FCA-0FC0-43E8-99A4-3F94395BEA5E](https://zoobank.org/act:B38E2FCA-0FC0-43E8-99A4-3F94395BEA5E)

ETYMOLOGY. — A combination between *Para* (Latin: similar to) and the extant genus *Hyas* Leach, 1814. The gender of the genus is masculine.

TYPE SPECIES. — *Hyas oranensis* Van Straelen, 1937.

DIAGNOSIS. — Carapace pyriform; orbit composed of supraorbital rim and widely cup-shaped postorbital spine bearing marginal spines; inflated branchial regions with posterolateral margin bearing row of tubercles; intestinal region protruding distally beyond and under branchial regions; urogastric and cardiac regions limited by deep branchiocardiac groove.

DISCUSSION

Parahyas n. gen. is assigned to the Oregoniidae based upon the widely cup-shaped postorbital spine, which is well visible in several extant representatives such as *Hyas coarctatus* Leach, 1815 and *H. ursinus* Rathbun, 1924. *Parahyas* n. gen. differs from *Oregonia*, *Chionoecetes*, *Macroregonia* by the presence of widely cup-shaped postorbital spine (absent in all these genera). *Parahyas* n. gen. differs from *Hyas* by the presence of a row of large tubercles extending along the entire length of the posterolateral margin (*versus* sometimes scarce small tubercles along the margin in *Hyas*), dorsal surface of carapace covered by small tubercles arranged uniformly (*versus* scattered granules and tubercles of varying size in *Hyas*), and gastric, urogastric, and cardiac regions without median raised tubercles (*versus* above-mentioned regions with raised median tubercles in *Hyas*).

Parahyas oranensis (Van Straelen, 1937), n. comb.
(Fig. 3)

Hyas oranensis Van Straelen, 1937: 474, 475, pl. 33, fig. 2. — Saint Martin & Müller 1988: 251. — Moissette & Müller 1990: 738. — Schweitzer *et al.* 2010: 97. — Kato *et al.* 2013: 270, 275-277. — Guinot *et al.* 2019: 307.

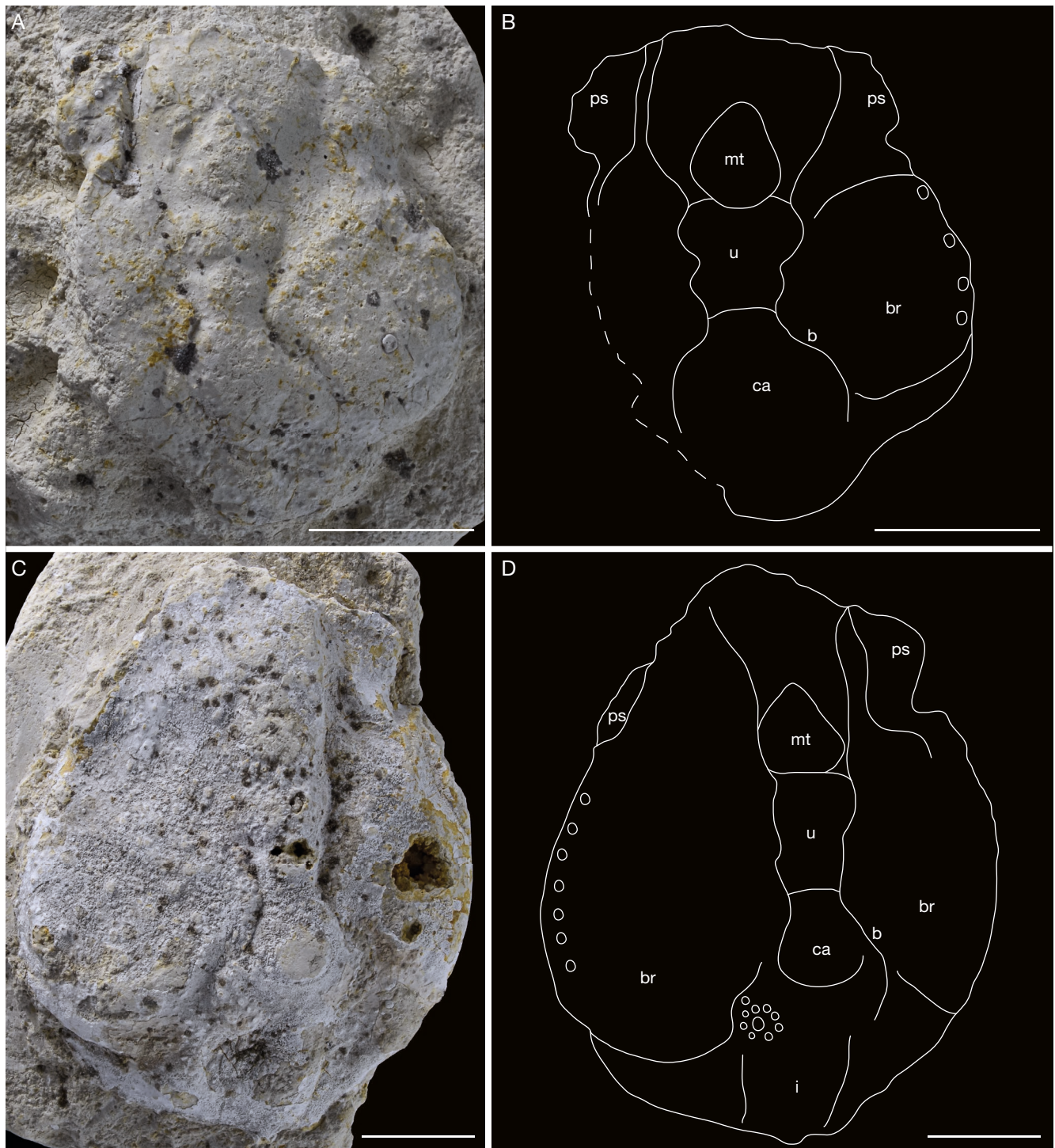


FIG. 3. — *Parahyas oranensis* (Van Straelen, 1937), n. comb. from the late Messinian of Oran (Les Planteurs quarry, Arambourg coll.): **A, B**, holotype MNHN.F.R03767, dorsal view and line drawing of carapace; **C, D**, MNHN.FA28903 (ex paratype of *Calappa sahelensis* Van Straelen, 1937), dorsal view and line drawing of carapace. Abbreviations: **b**, branchiocardiac groove; **br**, branchial region; **ca**, cardiac region; **i**, intestinal region; **mt**, metabranial region; **ps**, cup-shaped postorbital spine; **u**, urogastric region. Scale bars: 1 cm. Photographs: Lilian Cazes.

TYPE MATERIAL. — Holotype MNHN.F.R03767, one paratype MNHN.FA28903 (Arambourg coll.).

TYPE LOCALITY. — Les Planteurs quarry, Sanaouer district of Sidi El Houari, Oran.

TYPE AGE. — Late Miocene (late Messinian).

DESCRIPTION

Carapace

Carapace pyriform, convex both longitudinally and transversely, length slightly exceeding width; widest posteriorly; rostrum not preserved; orbit composed of supraorbital rim and widely cup-shaped postorbital spine bearing marginal

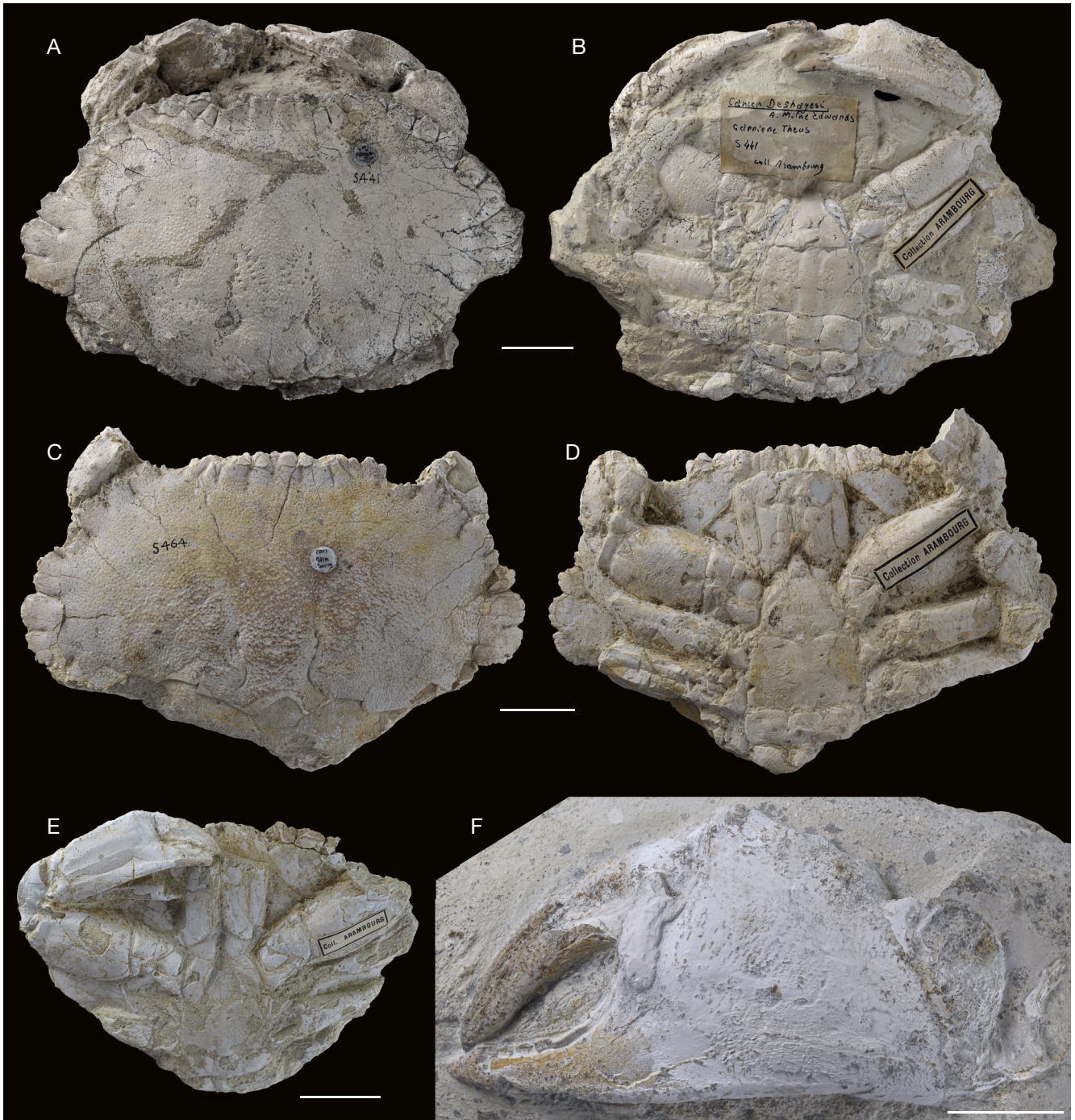


FIG. 4. — Cancrid crabs from the late Messinian of Oran (Les Planteurs quarry, Arambourg coll.): **A-E**, *Cancer sismondai* Meyer, 1843: [MNHN.F.A51761](#), dorsal and ventral views (**A**, **B**); [MNHN.F.A51741](#), dorsal and ventral views (**C**, **D**); [MNHN.F.A51740](#), ventral view (**E**); **F**, *Cancer* sp., [MNHN.F.A51742](#), outer view of P1 chela. Scale bars: 2 cm. Photographs: Lilian Cazes.

spines; anterolateral margins poorly preserved; posterolateral margins rounded, bearing row of 6-7 wide tubercles extending along entire length of margin; posterior margin partially preserved; hepatic region depressed; proto-, meso-, and meta-gastric regions raised; diamond-shaped cardiac region strongly elevated; branchial regions inflated; urogastric and cardiac regions raised and limited laterally by deep branchiocardiac groove; intestinal region protruding distally beyond and

under branchial regions; dorsal surface of carapace covered with small tubercles arranged uniformly.

DISCUSSION

Van Straelen (1937) figured only the holotype but the paratype is better preserved and shows some additional characters such as the wide cup-shaped postorbital spine, the well-developed intestinal region beyond and under the inflated branchial

regions, and the posterolateral margins with a row of large aligned tubercles.

Extant members of the Oregoniidae are relatively rare in the Mediterranean Basin and only *Ergasticus* A. Milne-Edwards, 1882 has been reported (GBIF 2022: <https://www.gbif.org/species/4375129>). In the fossil record, *Hyas meridionalis* Glaessner, 1928 was described from the Miocene of Austria, but the type specimen is poorly preserved and, even if it is surely a member of Majoidea, the generic assignment seems to be doubtful. In conclusion, *Parahyas* n. gen. is most likely the only Mediterranean representative of the Oregoniidae in the fossil record.

Superfamily CANCROIDEA Latreille, 1802

Family CANCRINIDAE Latreille, 1802

Genus *Cancer* Linnaeus, 1758

TYPE SPECIES. — *Cancer pagurus* Linnaeus, 1758, subsequent designation by Latreille (1810).

INCLUDED FOSSIL SPECIES. — See Schweitzer *et al.* (2010).

Cancer sismondai Meyer, 1843

(Fig. 4A-E)

Cancer sismondai Meyer, 1843: 590.

Cancer deshayesii A. Milne-Edwards, 1864a: 74-76, pl. 4, fig. 1, 2, pl. 5, fig. 2.

Lobocarcinus sismondai – Ossó *et al.* 2022: 213, 214, fig. 4a-c (*cum syn.*).

TYPE MATERIAL. — *Cancer sismondai*: holotype from the Pliocene of Santo Stefano Roero, Piedmont, Italy, figured by A. Sismonda (1839: figs A, B), but lost during Second World War after Bonfiglio & Donadeo (1982).

Cancer deshayesii: syntype MNHN.F.B39264 (Marès coll.) from the Pliocene of Alger, Algeria; other syntypes (Deshayes coll.) from the Messinian of Oran are housed in the collection of the Ecole des Mines de Paris deposited at the University Claude Bernard Lyon 1, France.

EXAMINED MATERIAL. — 23 specimens from Les Planteurs quarry, Oran (MNHN.FA51668, A51669, A51670, A51671, A51672, A51673, A51674, A51675, A51676, A51677, A51738, A51739, A51740, A51741, A41743, A41744, A41745, A41746, A41747, A51748, A51750, A51761, A51946, MNHN.F.R03507, R03537, Arambourg coll.).

DISCUSSION

A. Milne-Edwards (1864a) first described *Cancer deshayesii* based on a spectacular specimen from the Pliocene marls of Alger and other specimens (Deshayes coll.) from the Miocene of Oran. This species was later synonymized with *Cancer sismondai* Meyer, 1843 by Ristori (1886). This synonymy and the placement in *Lobocarcinus* Reuss, 1857, was discussed by several authors through the 20th century (e.g., Van Straelen 1937; Bonfiglio & Donadeo 1982) until Ossó *et al.* (2022). All the Algerian specimens assigned to *deshayesii* or *sismondai* are currently in review by the authors and will be the subject of a future publication.

Cancer sp.

(Fig. 4F)

Cancer sp. – Van Straelen 1937: 447.

EXAMINED MATERIAL. — MNHN.FA51742 (Arambourg coll.) from the Messinian of Les Planteurs quarry, Sanaouer district of Sidi El Houari, Oran.

DESCRIPTION

Giant left P1 chela (length: *ca* 9 cm from index apex to carpopropodial articulation), dorsal margin strongly convex, bearing strong tubercles; ventral margin almost straight and smooth; index slightly curved with smooth occlusal margin; dactylus strongly curved with smooth occlusal margin; occlusal opening wide; palm without carinae but with outer surface uniformly covered by very small scaly pits; index and dactylus bearing brownish coloured pattern contrasting with whitish general colour of chela.

DISCUSSION

Van Straelen (1937) proposed to place this isolated P1 chela in *Cancer* sp. based on its similarity with the robust chelae of *Cancer pagurus*. He added that the curvature of the dactylus was different from this extant species. Our examination leads to highlight some new characters: occlusal margin of index strongly incurved and smooth, smooth occlusal margin of dactylus, and strongly convex dorsal margin of propodus with at least three big tubercles. These characters do not fit those of *C. pagurus*, which shows the P1 chela with occlusal margins of fingers bearing molariform teeth and straight smooth dorsal margin of propodus. Based on Nations (1975), some species of *Cancer* show the dorsal margin of propodus with spines or tubercles, but the margin is always straight or slightly convex and the occlusal margins of both finger always bearing big teeth. Moreover, all species of *Cancer* show the outer surface of palm with a variable number of raised tuberculate carinae.

The subquared outline of the P1 palm from Oran is also reminiscent of the P1 palm of some extant genera (*Anatolikos* Schweitzer & Feldman, 2000, *Glebocarcinus* Nations, 1975, and *Platepistoma* Rathbun, 1906). However, all the P1 chela of these living genera bear occlusal margin with molariform teeth and longitudinal carinae on palm (see Schram & Ng 2012: fig. 2).

In conclusion, according to Van Straelen (1937), we leave this giant P1 chela in open nomenclature within *Cancer*, though it could represent a new species of cancrinid crab. We point out the orange brown colour pattern of the fingers, which constitutes a case of exceptional preservation

Superfamily GONEPLACOIDEA MacLeay, 1838

Family EURYPLACIDAE Stimpson, 1871

Genus *Chlinocephalus* Ristori, 1886

TYPE SPECIES. — *Chlinocephalus demissifrons* Ristori, 1886, by monotypy.

INCLUDED FOSSIL SPECIES. — The sole type species.

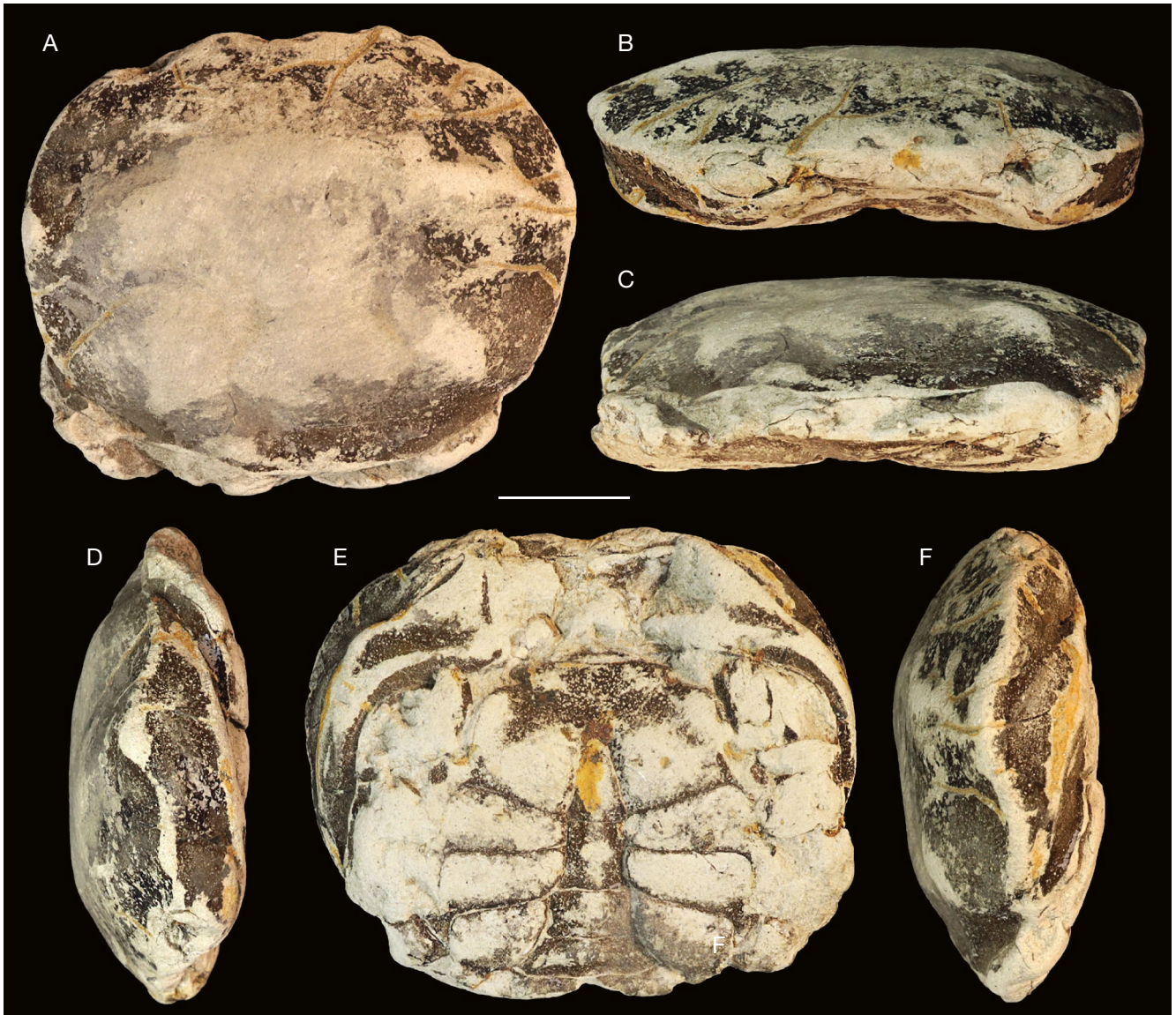


FIG. 5. — *Chlinocephalus demissifrons* Ristori, 1886 from the Pliocene of ?Fornaci (Savona, Liguria, north-west Italy). Lectotype herein designated IGF 628E: A, dorsal view; B, frontal view; C, posterior view; D, left lateral view; E, ventral view; F, right lateral view. Scale bars: 1 cm. Photographs: Stefano Dominici.

Chlinocephalus demissifrons Ristori, 1886
(Figs 5; 6; 7A-C)

Chlinocephalus demissifrons Ristori, 1886: 101-103, pl. 2, figs. 5, 6. — Glaessner 1929: 113. — Delle Cave 1981: 46. — Karasawa & Kato 2003: tab. 5. — Garassino *et al.* 2004: 275-278, figs. 15, 16. — De Angeli & Garassino 2006: 64. — Pasini & Garassino 2013: 321, fig. 2. — Baldanza *et al.* 2018: 27, fig. 7. — Pasini *et al.* 2020: 54, fig. 3c-d.

Geryon latifrons Van Straelen, 1937: 477, 478, pl. 33, fig. 4, n. syn. — Via 1948: 145, fig. 4. — Imaizumi 1961: 165. — Saint Martin & Müller 1988: 251. — Moissette & Müller 1990: 758. — Karasawa & Schweitzer 2006: 60. — Hyžný & Dulai 2021: 228, fig. 89.5.

Geryon cf. latifrons—Müller 1984: 96, pl. 93, fig. 1. — Hyžný 2016: 477.

TYPE MATERIAL. — Ristori (1886: 103) reported “specimens collected in the Pliocene marls”, but he figured just one sole specimen (pl. 2, figs. 5, 6), considered as the unique survived syntype. Indeed, Delle Cave (1981) reported this syntype with the catalogue number IGF

628E. The other syntypes were not found in the palaeontological collection of IGF (S. Dominici, pers. comm. 2023). Therefore, the specimen IGF 628E is herein designated as the lectotype (see Fig. 5).

TYPE LOCALITY. — ?Fornaci (Savona, Liguria, north-west Italy). Ristori (1886) recorded Fornaci as the type locality of the type material. Fornaci is a hamlet of municipality of Savona so named because of the presence of several kilns (= fornaci in Italian language) now dismantled. Mainly bricks were produced in these kilns, using clays excavated at different localities in Savona province and maybe from the southern Piedmont, but there is no historical evidences of outcropping Pliocene clays at this locality. We could suppose that the type material could be collected during some digging works close to Fornaci hamlet. In conclusion, the locality that yielded the only available specimen of the type material remains unknown.

TYPE AGE. — Pliocene.

STRATIGRAPHIC RANGE. — Late Miocene (late Messinian)-early Pleistocene.



FIG. 6. — *Chlinocephalus demissifrons* Ristori, 1886 from the late Messinian of Oran (Les Planteurs quarry, Arambourg coll.): type material of *Geryon latifrons* Van Straelen, 1937 and one additional specimen: **A**, holotype [MNHN.F.R03977](#), dorsal view; **B**, paratype [MNHN.F.R67112](#), dorsal view; **C**, **D**, paratype [MNHN.F.R65071](#), dorsal and ventral views; **E**, paratype [MNHN.F.R66625](#), dorsal view; **F**, [MNHN.F.A51759](#), dorsal view. Abbreviations: **a3–a6**, pleonal somites 3–6; **c1–4**, coxae 1–4; **ep**, epistome; **st1–7**, thoracic sternites 1–7; **t**, telson. Scale bars: 1 cm. Photographs: Lilian Cazes.

ADDITIONAL MATERIAL. — **Algeria**. Type material (Arambourg coll.) of *Geryon latifrons* Van Straelen, 1937 from Les Planteurs quarry, holotype [MNHN.F.R03977](#) (figured by Van Straelen 1937: pl. 33, fig. 4) and three paratypes [MNHN.F.R65071](#), [R66625](#), [R67112](#). — 10 historical

specimens [MNHN.F.A51751](#), [A51752](#), [A51753](#), [A51754](#), [A51755](#), [A51756](#), [A51757](#), [A51758](#), [A51759](#), [A51760](#) (Arambourg coll.) from Les Planteurs quarry. — Three new specimens [MNHN.F.A57345](#), [A87800](#), [A87801](#) (Geslin coll.) from Ravin Blanc quarry.

Italy. MUSNAF/GEO/7179 a, b, figured by Pasini *et al.* (2020: fig. 3c, d), Miocene of Valmarecchia, Emilia-Romagna. — PU 41187 figured by Garassino *et al.* (2004: fig. 16), Pliocene of Cossato, Piedmont. — MSNM i22756 figured by Pasini & Garassino (2013: fig. 2), Pliocene of Castellarano, Emilia-Romagna. — MUAL 2, 10, 11-12 figured by Baldanza *et al.* (2018: fig. 7.2, 7.3), early Pleistocene of Bargiano, Umbria.

DESCRIPTION

Carapace

Suboval carapace convex longitudinally and transversally, longer than wide; wide front extended beyond orbits; straight frontal margin with small, short median fissure (as preserved); rimmed frontal margin; wide orbits oblique to frontal margin marked by narrow incision at inner orbital angle; concave supraorbital margin with one fissure and one short outer-orbital tooth; divergent anterolateral margins with two sharp spines, one at level of hepatic margin and the second, longer than the first one, at level of epibranchial angle; convex, smooth posterolateral margins; wide, straight, and rimmed posterior margin; first transverse, curved, and raised carina crossing whole carapace width at level of epibranchial region; second transverse, curved, and raised carina crossing whole carapace width at level of metabranchial regions; indistinct dorsal carapace regions; urogastric and cardiac regions marked by weak branchiocardiac grooves; short, wide urogastric region; suboval cardiac region; depressed intestinal region; smooth dorsal surface of carapace.

Thoracic appendages

Well-developed P1; subcylindrical P1 propodus, longer than wide, narrowing posteriorly; P1 merus and carpus poorly preserved; elongate fingers; poorly preserved straight fixed finger with several teeth on occlusal margin; curved, pointed dactylus, with almost four strong teeth on occlusal margin; P2-P5 poorly preserved.

Thoracic sternum

Thoracic sternum wide; thoracic suture 2/3 complete, straight, close to anterior margin of sternum; suture 3/4 deep, short, interrupted; sutures 4/5, 5/6, 6/7, 7/8 apparently interrupted. Sterno-pleonal cavity of male deep, long, nearly reaching anterior margin of sternite 4.

Pleon (male)

Male pleon typically narrow, slender (T-shaped), lateral margins of s4-s6 abruptly narrowing from s3 to narrow telson; telson slender, slightly longer than wide; s5 as long as wide; s6 much longer than wide.

DISCUSSION

After Van Straelen (1937), only two doubtful records of *Geryon* cf. *latifrons* were reported from the Miocene of Spain (Vía 1948) and Hungary (Müller 1984), whereas Saint Martin & Müller (1988) and Moissette & Müller (1990) simply listed the species without a critical systematic discussion.

According to Karasawa & Schweitzer (2006: 60), *G. latifrons* cannot be considered as a Geryonidae Colosi, 1923 and they proposed to move it in *Chlinocephalus* Ristori, 1886 though it apparently lacks the arcuate carinae on the dorsal carapace evident on *Chlinocephalus* (Garassino *et al.* 2004: fig. 16).

Ristori (1886) described *Chlinocephalus demissifrons* based on one complete carapace (Fig. 5). Later Garassino *et al.* (2004: 276, figs 15, 16) updated the morphological description and proposed a careful reconstruction of the carapace based on a very well-preserved specimen from the Pliocene of Piedmont (NW Italy).

After direct observation of the type material of *G. latifrons* and additional specimens, we observed the presence of two transverse arcuate carinae on the dorsal carapace, concurring with the generic placement in *Chlinocephalus*.

The specimens from Oran do not preserve or have poorly preserved carapace dorsal cuticle. They result as inner molds partially washed and eroded, not allowing a detailed evaluation of some dorsal characters. Indeed, the studied specimens seem not to have apparently the distinct weak median incision of the frontal margin due to the poorly preserved compressed carapace frontal margins. Anyway, the apparently lacking of these characters do not justify the description of a new species for the Algerian specimens, since the main dorsal and pleonal characters fit well those of *Chlinocephalus demissifrons*. Moreover, the variability of the shape of the carapace outline is a character discussed by Baldanza *et al.* (2018: 11) and considered related to the different stages of growth and/or to intraspecific sexual difference. The studied specimens seem to confirm the high variability of the carapace shape in this species.

In conclusion, we consider *G. latifrons* as a junior synonym of *C. demissifrons* sharing the main morphological characters of the type species, such as the straight, rimmed front with a small median incision, the supraorbital margin with one fissure, the anterolateral margin with two spines, and the two transverse, arcuate carinae.

Chlinocephalus demissifrons had a stratigraphic range from the Miocene (Italy and probably Spain and Hungary) to the early Pleistocene (Italy). Its report in North Africa enlarges its palaeobiogeographic range around the Proto-Mediterranean Basin.

Family GONEPLACIDAE MacLeay, 1838
Subfamily GONEPLACINAE MacLeay, 1838

Genus *Goneplax* Leach, 1814

TYPE SPECIES. — *Ocypoda bispinosa* Lamarck, 1801 by original designation (junior subjective synonym of *Cancer rhomboides* Linnaeus, 1758).

INCLUDED FOSSIL SPECIES. — *Goneplax gulderi* Bachmayer, 1953, *G. rhomboides* (Linnaeus, 1758).

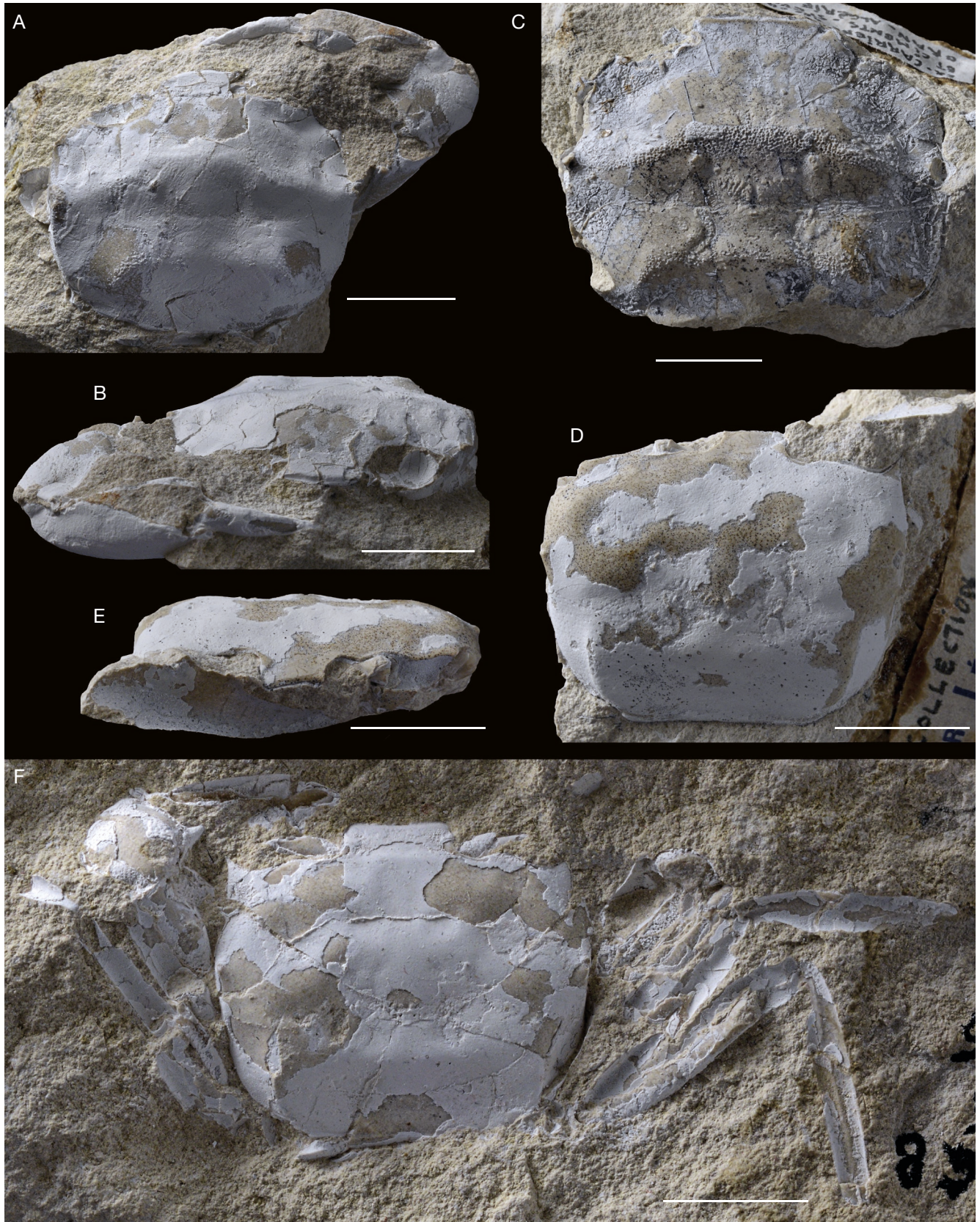


FIG. 7. — **A-C**, *Chlinocephalus demissifrons* Ristori, 1886 from the late Messinian of Oran (Ravin Blanc quarry, Geslin coll.): **A, B**, MNHN.F.A87800, dorsal and frontal views; **C**, MNHN.F.A57345, dorsal view; **D-F**, *Goneplax gulderi* Bachmayer, 1953 from the late Messinian of Oran (Ravin Blanc quarry, Geslin coll.): **D, E**, MNHN.F.A.57347, dorsal and frontal views; **F**, MNHN.F.A.57344, dorsal view. Scale bars: 1 cm. Photographs: Lilian Cazes.

Goneplax gulderi Bachmayer, 1953
(Fig. 7D-F)

Goneplax gulderi Bachmayer, 1953: 143, 144, pl. 9, figs. 1-3. — Müller 1984: 96, pl. 93, figs. 2-3. — Müller 1993: 23, fig. 11 K. — Mayoral *et al.* 1998: 508, 509, fig. 2 (5). — Müller 1998: 38. — Garassino & De Angeli 2004: 45. — De Angeli & Garassino 2006: 65. — Castro 2007: 686. — De Angeli *et al.* 2009: 187, 188, 189, fig. 18 A, B. — Schweitzer *et al.* 2010: 135. — Garassino *et al.* 2012: 46, 47; 2013: 357, 359, fig. 1a. — Pasini & Garassino 2013: 321, 322.

Goneplax cf. *saccoi* [sic] – Vía 1948: 146, fig. 6. — Solé & Vía 1989: 34.

Goneplax cf. *gulderi* – Müller 1979: 6. — Pasini *et al.* 2019: 36, fig. 3c. — Pasini *et al.* 2020 : 52, fig. 3a.

EXAMINED MATERIAL. — MNHN.FA57344, A57347 (Geslin coll.) from the late Messinian of Ravin Blanc quarry, between Es Seddikia and El Makkari districts, Oran.

DESCRIPTION

Carapace

Carapace transversely subtrapezoidal, slightly wider than long, widest at anterolateral spine; front straight; front as wide as orbits; relatively wide orbits; outer-orbital angle with triangular, acute spine; short anterolateral margins slightly narrowing frontally; reduced anterolateral spine; posterolateral margins narrowing posteriorly; straight posterior margin; smooth dorsal surface of carapace, with two raised transverse ridges; regions scarcely evident.

Cephalic appendages

Eyestalk elongate and narrow, as long as the orbit.

Thoracic appendages

Short P1; rounded P1 carpus with one inner distal spine; P1 palm poorly preserved; elongate flat P2-P5.

DISCUSSION

Bachmayer (1953) described *Goneplax gulderi* based on one complete carapace, decorticated and poorly preserved, and one isolated dactylus. Later, De Angeli *et al.* (2009) referred some best-preserved specimens from the Miocene of Tuscany to this species. These additional specimens allowed for the first time to highlight the main diagnostic characters of this species. Finally, Garassino *et al.* (2013: 357) provided an emended diagnosis, confirming the original description and the updated data by Müller (1993) who pointed out that *G. gulderi* differs from the type species in having two well-marked transverse carinae on the wider than long carapace and especially for the anterior margin where each orbit is as wide as the front (*versus* orbits wider than front in the type species).

The two studied specimens share the main morphological characters of *G. gulderi*, such as the straight front as wide as orbits; the outer-orbital angle with triangular, acute spine; short anterolateral margins; reduced anterolateral spine; posterolateral margins narrowing posteriorly; straight posterior margin; and smooth dorsal carapace, with two raised transverse carinae.

Goneplax gulderi was previously reported from the Miocene of Austria (Baden) (Bachmayer, 1953) and Miocene and Pliocene of Italy (Tuscany, Emilia-Romagna) (Pasini *et al.* 2019, 2020). Its first report in North Africa enlarges its palaeobiogeographic range around the Proto-Mediterranean Basin.

CONCLUSION

The Messinian decapod crustacean fauna of Oran region (Western Algeria) is relatively diversified with typical coral-reef assemblage (Saint Martin & Müller 1988) and deeper marl-diatomites assemblage (Moissette & Müller 1990). The historical specimens from Oran belong to the marl-diatomites assemblage, but even much deeper after Moissette & Müller (1990). Thus, the palaeoenvironment is interpreted as a moderately deep water setting most probably about 100-150 m (lower circalittoral zone), especially by the abundance of large specimens of *Cancer sismondai*, which is closed to the extant *Cancer bellianus* Johnson, 1861, living in the littoral zone to 600 m in depth (Zariquey Alvarez 1968).

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REFERENCES

- ARAMBOURG C. 1927. — Les poissons fossiles d'Oran. *Matériaux pour la Carte géologique d'Algérie, 1^{re} série, Paléontologie* 6: 1-291.
- BACHMAYER F. 1953. — *Goneplax gulderi*, eine neue Crustaceen-Species aus dem tortonischen Tegel des Wiener-Beckens. *Paläontologische Zeitschrift* 27: 143-145. <https://doi.org/10.1007/BF03041844>
- BALDANZA A., BIZZARRI R., FAMIANI F., GARASSINO A., PASINI G., CHERIN M. & ROSATINI F. 2018. — The early Pleistocene whale-fall community of Bargiano (Umbria, Central Italy): Paleocological insights from benthic foraminifera and brachyuran crabs. *Palaeontologia Electronica* 21.1.11A: 1-27. <https://doi.org/10.26879/779>
- BENKADA S. 1999. — La "Société savante"; rupture et continuité d'une tradition associative: le cas de la *Société de Géographie et d'Archéologie d'Oran*. *Insaniyat* 8: 119-128. <https://doi.org/10.4000/insaniyat.8330>
- BONFIGLIO L. & DONADEO G. 1982. — *Cancer sismondai* Meyer nel Pliocene di Torre dell'Orso (Puglia). *Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano* 123: 255-296. <https://www.biodiversitylibrary.org/part/325206>
- CASTRO P. 2007. — A reappraisal of the family Goneplacidae MacLeay, 1838 (Crustacea, Brachyura) and revision of the subfamily Goneplacinae, with the description of 10 new genera and 18 new species. *Zoosystema* 29 (4): 609-774.

- CHARBONNIER S. 2021 — Le déménagement des collections de paléontologie du Muséum national d'Histoire naturelle, in 27^e Réunion des Sciences de la Terre, 1-5 novembre 2021, Lyon, France. Livre des résumés: 778.
- DE ANGELI A. & GARASSINO A. 2006. — Catalog and bibliography of the fossil Stomatopoda and Decapoda from Italy. *Memorie della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano* 35 (1): 3-88. <https://www.biodiversitylibrary.org/page/58163937>
- DE ANGELI A., GARASSINO A. & PASINI G. 2009. — New reports of anomurans and brachyurans from the Cenozoic of Tuscany (Italy). *Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano* 150 (2): 163-196. <https://www.biodiversitylibrary.org/part/324963>
- DELLE CAVE L. 1981. — Catalogue of type specimens in the invertebrate palaeontological collections of the Museum of Geology and Palaeontology of the University of Florence. (Italy). Crustacea, Decapoda. *Atti della Società Toscana di Scienze Naturali, Memorie*, Serie A 88: 43-50 [retrieved from http://www.stsn.it/AttiA1981/delle_cave.pdf].
- DÍAZ-MEDINA G., HYŽNÝ M. & KLOMPMAKER A. A. 2017. — A lithostratigraphic and palaeoenvironmental framework for the late Miocene El Caracolar section (Granada Basin, Betic Cordillera, Spain). *Geobios* 50: 173-195. <https://doi.org/10.1016/j.geobios.2017.04.003>
- GARASSINO A. & DE ANGELI A. 2004. — Decapod crustacean fauna from the Pliocene and Pleistocene of Arda, Stirone and Enza Rivers (Piacenza, Parma and Reggio Emilia Provinces, N Italy). *Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano* 145 (1): 29-57. <https://www.biodiversitylibrary.org/page/58530043>
- GARASSINO A., DE ANGELI A., GALLO L. M. & PASINI G. 2004. — Brachyuran and anomuran fauna from the Cenozoic of Piedmont (NW Italy). *Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano* 145 (2): 251-281. <https://www.biodiversitylibrary.org/page/58530256>
- GARASSINO A., PASINI G., DE ANGELI A., CHARBONNIER S., FAMIANI F., BALDANZA A. & BIZZARRI R. 2012. — The decapod community from the Early Pliocene (Zanclean) of "La Serra" quarry (San Miniato, Pisa, Toscana, central Italy): sedimentology, systematics, and palaeoenvironmental implications. *Annales de Paléontologie* 98: 1-61. <https://doi.org/10.1016/j.annpal.2012.02.001>
- GARASSINO A., PASINI G. & CASTRO P. 2013. — Revision of the fossil species of *Goneplax* Leach, 1814 (Crustacea, Decapoda, Brachyura, Goneplacidae). *Boletín de la Sociedad Geológica Mexicana* 65 (2): 355-368. <https://www.jstor.org/stable/24921231>
- GBIF 2022. — *Ergasticus* A. Milne-Edwards, 1882 in GBIF Secretariat (2022). GBIF Backbone Taxonomy. Checklist dataset <https://doi.org/10.15468/39omei> accessed via GBIF.org on 2023-04-25.
- GAUDANT J. 2008. — Paléobiodiversité et paléoenvironnements: l'exemple des gisements de poissons téléostéens du Messinien préévaporitique d'Oran et du bassin du Chélib (Algérie), in SAINT MARTIN J.-P. (ed.), *Biodiversité et crises de la biodiversité au Néogène en Afrique du Nord*. *Geodiversitas* 30 (1): 141-163.
- GLAESSNER M. 1929. — Crustacea Decapoda, in POMPECKJ F. J. (ed.), *Fossilium Catalogus, I: Animalia, Pars 41*. W. Junk, Berlin: 1-464.
- GLAESSNER M. 1969. — Decapoda, in MOORE R. C. (ed.), *Treatise on Invertebrate Paleontology, Part R, Arthropoda 4* (2). Geological Society of America, Boulder, Colorado, and University of Kansas Press, Lawrence, Kansas: R400-R533, R626-R628.
- GUINOT D., CARBOT-CHANONA G. & VEGA F. J. 2019. — Archaeochiapiasidae n. fam., a new early Cenomanian brachyuran family from Chiapas, Mexico, new hypothesis on Lecythocaridae Schweitzer & Feldmann, 2009, and phylogenetic implications (Crustacea, Decapoda, Brachyura, Eubrachyura). *Geodiversitas* 41 (7): 285-322. <https://doi.org/10.5252/geodiversitas2019v41a7>. <http://geodiversitas.com/41/7>
- HYŽNÝ M. 2016. — Diversity and distribution patterns of the Oligocene and Miocene decapod crustaceans (Crustacea: Malacostraca) of the Western and Central Paratethys. *Geologica Carpathica* 67 (5): 471-494. <https://doi.org/10.1515/geoca-2016-0030>
- HYŽNÝ M. & DULAI A. 2021. — *Badenian decapods of Hungary*. GeoLittera Publishing House, Institute of Geoscience, University of Szeged, 296 p.
- IMAIZUMI R. 1961. — A critical review and systematic descriptions of known and new species of *Carcinoplax* from Japan. *The science reports of the Tohoku University, second series, Geology* 32 (2): 155-193 [retrieved from <https://cir.nii.ac.jp/crid/1050001202741892096>].
- KARASAWA H. & KATO H. 2003. — The phylogeny, systematics and fossil record of the Goneplacidae MacLeay (Crustacea, Decapoda, Brachyura) revisited. *Contributions to Zoology* 72 (2-3): 147-152. <https://doi.org/10.1163/18759866-0720203016>
- KARASAWA W. & SCHWEITZER C. E. 2006. — A new classification of the Xanthoidea *sensu lato* (Crustacea: Decapoda: Brachyura) based on phylogenetic analysis and traditional systematics and evaluation of all fossil Xanthoidea *sensu lato*. *Contributions to Zoology* 75 (1/2): 23-73. <https://doi.org/10.1163/18759866-0750102002>
- KATO H., NAKASHIMA R. & YANAGISAWA Y. 2013. — Two new Early Pliocene species of the crab genus *Hyas* Leach, 1814 (Majoidea, Oregoniidae) from northeast Japan, in FRAAIJE R. H. B., HYŽNÝ M., JAGT J. W. M., KROBICKI M. & VAN BAKEL B. W. M. (eds), *Proceedings of the 5th Symposium on Mesozoic and Cenozoic Decapod Crustaceans*. Krakow, Poland, 2013: A tribute to Pál Mihály Müller. *Scripta Geologica* 147: 269-287.
- LATREILLE P. A. 1810. — *Considérations générales sur l'ordre naturel des animaux composant les classes des crustacés, des arachnides et des insectes*. F. Schoell, Paris, 444 p. <https://doi.org/10.5962/bhl.title.34917>
- MANSOUR B. & SAINT MARTIN J.-P. 1999. — Conditions de dépôt des diatomites messiniennes en contexte de plateforme carbonatée d'après l'étude des assemblages de diatomées: exemple du Djebel Murdjadjo (Algérie). *Geobios* 32 (3): 395-408. [https://doi.org/10.1016/S0016-6995\(99\)80016-3](https://doi.org/10.1016/S0016-6995(99)80016-3)
- MAYORAL E., MÜLLER P. & MUÑIZ F. 1998. — Lower Pliocene decapod crustaceans from the southwestern Iberian Peninsula (Guadalquivir Basin, Sevilla, Spain). *Geobios* 31 (4): 505-510. [https://doi.org/10.1016/S0016-6995\(98\)80122-8](https://doi.org/10.1016/S0016-6995(98)80122-8)
- MEYER H. VON 1843. — Briefliche Mittheilungen an Prof. Bronn gerichtet. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde* 1843: 579-590. <https://www.biodiversitylibrary.org/page/36300129>
- MILNE-EDWARDS A. 1861. — Faune carcinologique des terrains quaternaires. *L'Institut, journal universel des sciences et des sociétés savantes en France et à l'étranger* 29: 88.
- MILNE-EDWARDS A. 1864a. — Monographie des Crustacés fossiles de la famille des Cancériens. *Annales des Sciences naturelles, Zoologie et Paléontologie* (série 5) 1: 31-88. <https://www.biodiversitylibrary.org/page/29128796>
- MILNE-EDWARDS A. 1864b. — *Histoire des Crustacés Podophthalmes fossiles: Monographies des portuniens et des thalassiniens*. Victor Masson et Fils, Paris, 222 p. <https://doi.org/10.5962/bhl.title.6296>
- MOISSETTE P. 1984. — Les faunes de Bryozoaires du Messinien d'Oranie. *Comptes rendus de l'Académie des sciences. Série 2, Mécanique, physique, chimie, sciences de l'univers, sciences de la terre* 298 (1): 321-324. <https://gallica.bnf.fr/ark:/12148/bpt6k5831698v/f327.item>
- MOISSETTE P. & MÜLLER P. 1990. — Crustacés Décapodes des faciès marno-diatomitique du Messinien d'Oranie (Algérie Occidentale). *Geobios* 23 (6): 737-747. [https://doi.org/10.1016/S0016-6995\(06\)80339-6](https://doi.org/10.1016/S0016-6995(06)80339-6)
- MÜLLER P. 1979. — Décapodes du Badénien et Sarmatien de Bulgarie. *Paleontology, Stratigraphy and Lithology* 10: 3-8.
- MÜLLER P. 1984. — Decapod Crustacea of the Badenian. *Geologica Hungarica, (Palaeontologica)* 42: 1-317.

- MÜLLER P. 1993. — Neogene decapod crustaceans from Catalonia. *Scripta Musei Geologici Seminarii Barcinonensis* 225: 1-39.
- MÜLLER P. 1998. — Catalogus Fossilium Austriae. Ein systematisches Verzeichnis aller auf österreichischem Gebiet festgestellten Fossilien. *Verlag der Österreichischen Akademie der Wissenschaften* 7 (b/2b), Crustacea Decapoda, 46 p.
- NG P. K. L., GUINOT D. & DAVIE P. J. F. 2008. — Systema Brachyurorum: Part I. An annotated checklist of extant brachyuran crabs of the world. *The Raffles Bulletin of Zoology Supplement* 17: 1-286.
- NATIONS J. D. 1975. — The genus *Cancer* (Crustacea: Brachyura): systematics, biogeography and fossil record. *Natural History Museum of Los Angeles County Science Bulletin* 23. 104 p.
- OSSÓ A. & GAGNAISON C. 2019. — An appraisal of the middle-late Miocene fossil decapod crustaceans of the 'Faluns' (Anjou-Touraine, France). *Geodiversitas* 41 (9): 367-383. <https://doi.org/10.5252/geodiversitas2019v41a9>. <http://geodiversitas.com/41/9>
- OSSÓ A., GAGNAISON C. & GAIN O. 2022. — A re-appraisal of the middle-late Miocene fossil decapod crustaceans of the 'Faluns' (Anjou-Touraine, France). *Geodiversitas* 44 (6): 207-228. <https://doi.org/10.5252/geodiversitas2022v44a6>. <http://geodiversitas.com/44/6>
- PASINI G. & GARASSINO A. 2013. — Records of brachyuran crabs from the Pliocene (Piacenzian) of Reggio Emilia (Emilia Romagna, N Italy). *Boletín de la Sociedad Geológica Mexicana* 65 (2): 319-328.
- PASINI G. & GARASSINO A. 2017. — *Calappa damarchoi* n. sp. (Crustacea, Brachyura, Calappidae) from the early Oligocene of the Ligure Piemontese Basin, Piedmont (NW Italy). *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* 283 (1): 73-76. <https://doi.org/10.1127/njgpa/2017/0628>
- PASINI G., GARASSINO A. & PIZZOLATO F. 2020. — First report of decapod crustaceans from the middle-late Miocene of Valmarecchia, Romagna Apennines (Emilia-Romagna, Italy). *Palaeodiversity* 13 (1): 49-56. <https://doi.org/10.18476/pale.v13.a5>
- PASINI G., GARASSINO A. & SAMI M. 2019. — Decapod assemblage from the late Miocene (early-middle Messinian) of the Romagna Apennines nearby Brisighella, Emilia-Romagna (N Italy). *Natural History Sciences. Atti della Società italiana di Scienze naturali e del Museo civico di Storia naturale in Milano* 6 (1): 27-32. <https://doi.org/10.4081/nhs.2019.394>
- RISTORI G. 1886. — I crostacei brachiuri e anomuri del Pliocene italiano. *Bollettino della Società Geologica Italiana* 5: 93-128. <https://www.biodiversitylibrary.org/page/51446512>
- SAINT MARTIN J.-P. & MÜLLER P. 1988. — Les Crustacés Décapodes du Messinien récifal d'Oranie (Algérie). *Geobios* 21 (2): 251-257. [https://doi.org/10.1016/S0016-6995\(88\)80022-6](https://doi.org/10.1016/S0016-6995(88)80022-6)
- SCHWEITZER C. E. & FELDMANN R. M. 2019. — Part R, Revised, Volume 1, Chapter 8T4: Systematic descriptions: Superfamily Calappoidea. *Treatise Online* 121: 1-8. <https://doi.org/10.17161/to.v0i0.11742>
- SCHWEITZER C. E., FELDMANN R. M., GARASSINO A., KARASAWA H. & SCHWEIGERT G. 2010. — Systematic list of fossil decapod crustacean species. *Crustaceana Monographs* 10: 1-222. <https://doi.org/10.1163/ej.9789004178915.i-222>
- SCHWEITZER C. E., FELDMANN R. M. & KARASAWA H. 2020. — Part R, Revised, Volume 1, Chapter 8T11: Systematic descriptions: Superfamily Majoidea. *Treatise Online* 136: 1-31. <https://doi.org/10.17161/to.vi.14519>
- SISMONDA A. 1839. — Notizie intorno a due fossili trovati nei Colli di San Stefano Roero. *Memorie dell'Accademia di Torino Classe Scienze Matematiche e Fisiche* serie 2 1: 85-90. <https://doi.org/10.5962/bhl.title.46966>
- SOLÉ J. & VIA L. 1989. — Crustacis Decàpodes fòssils dels Països Catalans. *Batalleria* 2: 23-42.
- SCHRAM F. R. & NG P. K. L. 2012. — What is *Cancer*? *Journal of Crustacean Biology* 32: 665-672. <https://doi.org/10.1163/193724012X640650>
- VAN STRAELEN V. 1934. — Les Crustacés Décapodes cénozoïques de l'Algérie. *Comptes Rendus sommaires des Séances de la Société Géologique de France* 4: 206-208.
- VAN STRAELEN V. 1937. — Sur quelques crabes du Sahélien moyen des environs d'Oran (Algérie). *Bulletin de la Société géologique de France*, série 5, 6: 473-480.
- VÍA L. 1948. — Braquiuros fósiles de Barcelona y sus alrededores. *Anales de la Escuela de Peritos Agrícolas y de Servicios Técnicos de Agricultura* 7: 143-152.
- ZARIQUIEY ÁLVAREZ R. 1968. — Crustáceos Decápodos Ibéricos. *Investigación Pesquera* 32: 1-499.

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