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## Miocene brachyuran Crustacea from Konar-Takhteh and Ahram sections, southwestern Iran

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### Abstract

Five species of brachyuran Crustacea from the Middle Miocene are described from the Guri Member of the Mishan Formation in southwestern Iran. The species include the leucosioideans *Leucosia persica*; *Seulosia* sp. cf. *S. rhomboidalis*; *Myra* sp.; the portunoid *Portunus withersi* and the xanthid *Demania ahramensis* n. sp. The paleobiogeographic affinities of these genera reinforce previous interpretations of a wide distribution between the Persian Gulf and the Indopacific regions.

Keywords: Crustacea, Decapoda, Brachyura, Miocene, southwestern Iran.

### Resumen

Se describen cinco especies de crustáceos braquiuros del Mioceno Medio del Miembro Guri de la Formación Mishan en el suroeste de Irán. Las especies incluyen a los leucosioideos *Leucosia persica*; *Seulosia* sp. cf. *S. rhomboidalis*; *Myra* sp.; el portunoideo *Portunus withersi* y el xántido *Demania ahramensis* n. sp. Las afinidades paleobiogeográficas de éstos géneros refuerzan las interpretaciones previas sobre una amplia distribución entre las regiones del Golfo Pérsico y el Indopacífico.

Palabras Clave: Crustacea, Decapoda, Brachyura, Mioceno, suroeste de Irán.

### 1. Introduction

After the Burdigalian (Early Miocene) lake depositional system of Gachsaran Formation (on the depression of areas between Fars platform and Dezful expression), marine environments expanded and the Gachsaran Formation was covered by a transgressive and shallow marine sequence (the Mishan Formation). The Mishan Formation contains about 943 m of green to grey marl and clay-limestone with rich fossil content. The lower 60 m of this formation consist of burrowed limestone, which is replaced by reef limestone, called the “Guri member” of Mishan Formation (Fig. 1). In the type section (Gachsaran oil field), its name

is derived from a village (Mishan village) located in 50 km south – southeast of Gachsaran city at Southwestern Iran (Figs. 2, 3). The Mishan Formation is mainly sandy at the type section area and changes laterally to siltstone facies at inner Fars and Bandar Abbas regions.

In other regions, except for inner Fars in which Mishan Formation is located over the Razak Formation, the Mishan Formation overlies the Gachsaran Formation and is overlaid by the Aghajari Formation. The lower boundary is sharp and the upper boundary transitional. Reef limestone from Guri Member of Mishan Formation is an index due to its large content of *Operculina* and other microfossils. In addition to plankton foraminifera, bivalves, gastropods, echinoids and



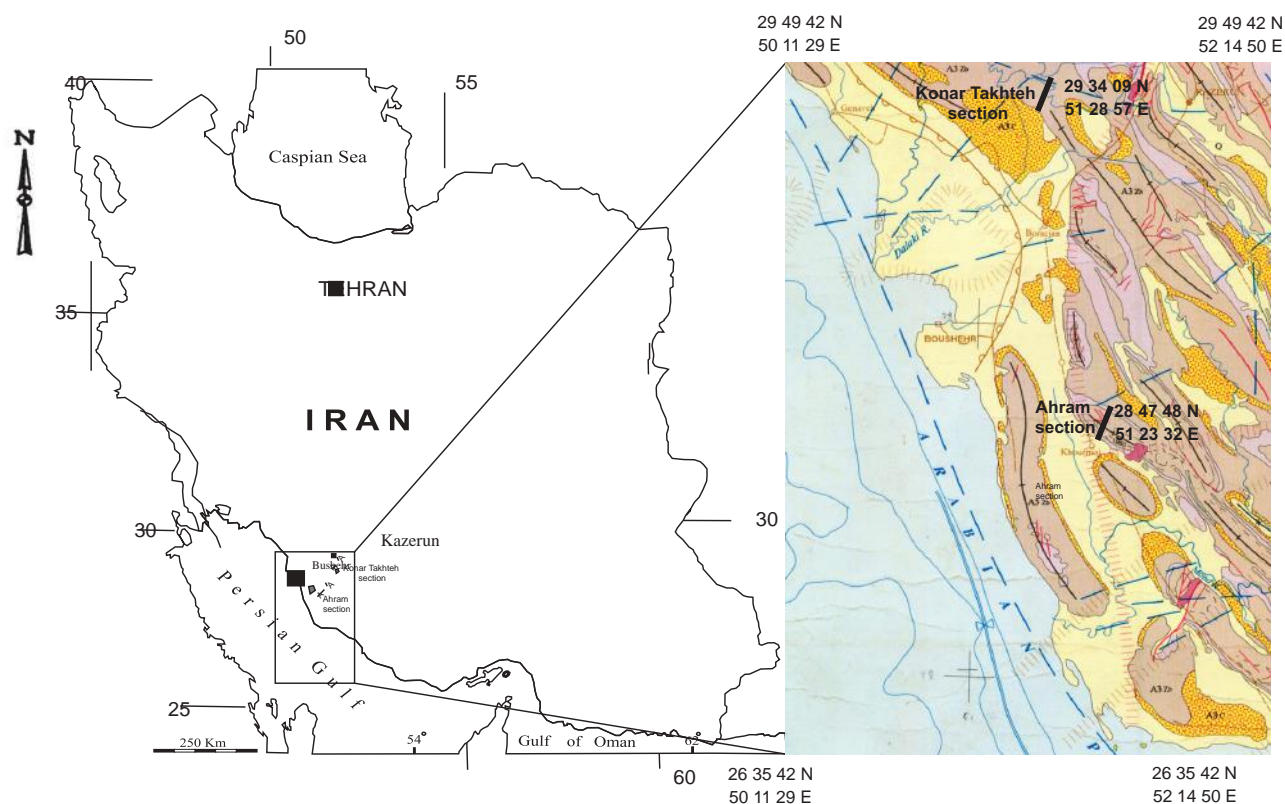


Figure 2. Location map of the Konar Takhteh and Ahram sections, Southern Iran.

Indopacific region (see Karasawa *et al.*, 2008 for examples and references).

## 2. Geological setting

The studied sections are part of Iranian oilfields at the Southwestern portion of the country. Konar-Takhteh section (Fig. 3) is located 10 km from Konar-Takhteh city, 35 km southeast of Kazerun, before (Tunnel 2 Pisa) underground highway at coordinates: Base N 29° 34' 9" E 51° 28' 57" (Fig. 2).

Ahram section is located 15 km east of Ahram city, close to the Beniun village, 175 km southeast of Kazerun, with coordinates: Base N 28° 47' 48" E 51° 23' 32" (Fig. 2)

The main lithology of the Mishan Formation in the studied section consists of reef limestones of the Guri Member at the base of the formation and green to grey marls with several sandy limestones, thin layers of gypsum and sub minors of sandstone. Because of the similar lithology and fossil contents between the two studied sections, only one section is here described.

The detailed measured sequence and lithologic features (top to base) of the Mishan Formation at Konar-Takhteh section is as it follows:

- Top: Alternation of fine grained micro-conglomerate, gray marl, sandstone, sandy limestones, anhydrite and halite with bituminous shales, (Aghajari Formation) - 500 m.

- Green marl with thin sandstone layers, sandy limestones intercalations and thin bedded gypsum layers - 100 m.

- Yellow to grey sandy limestones layers rich in gastropods, bivalves and crustaceans (Crab bearing beds) - 20 m.

- Olive to greenish marls with gypsum layers - 80 m.

- Yellow to grey sandy limestones layers rich in gastropods, bivalves and crustaceans (Crab bearing beds) 15 m.

- Platy green marl and sandy brown limestones - 260 m.

- Grey to white thin bedded sandy limestones with bivalves, gastropods and bryozoans - 50 m.

- Olive to green marl with thin bituminous shale layers - 315 m.

- Green marls - 150 m.

- Green to grey marls with sandy brownish limestones and gypsum intercalations - 20 m.

- Base: Red to brown thick bedded gypsum, halite and grey to brown shale (Gachsaran Formation).

## 3. Systematic palaeontology

Infraorder Brachyura Latreille, 1802  
 Section Eubrachyura de Saint-Laurent, 1980  
 Superfamily Leucosioidea Samouelle, 1819  
 Family Leucosiidae Samouelle, 1819  
 Subfamily Leucosiinae Samouelle, 1819



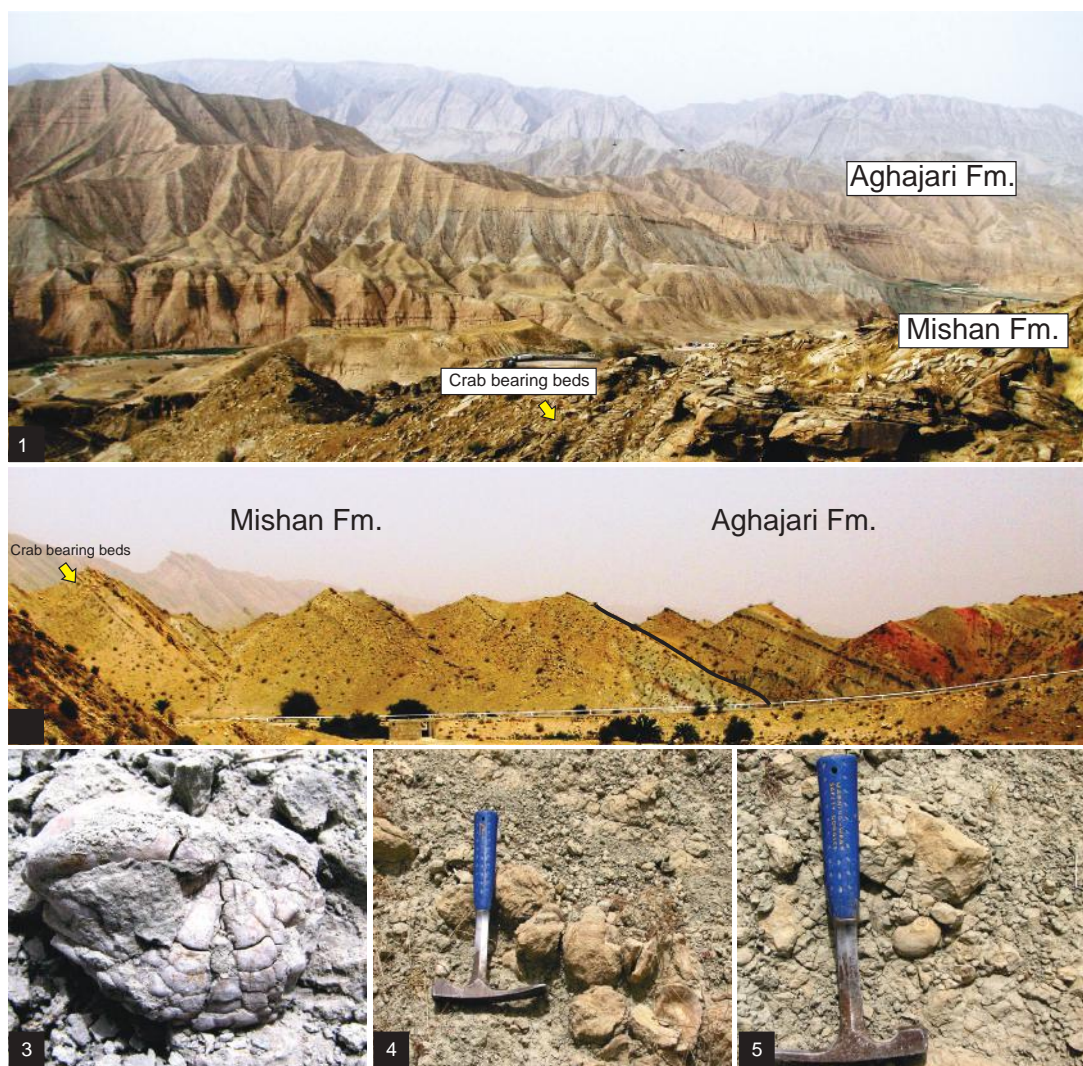


Figure 3. Panoramic view of Gachsaran, Mishan and Aghajari Fms. at Konar-Takhteh section with position of studied horizons.

Genus *Leucosia* Weber, 1795

**Type species:** *Cancer craniolaris* Linnaeus, 1758, by subsequent designation of Holthuis (1959).

*Leucosia persica* Vega, Gholamalian and Bahrami, 2010  
Fig. 4.1 – 4.11

*Leucosia persica* Vega, Gholamalian and Bahrami, 2010, p. 486, fig. 5 a-p.

**Description:** see Vega *et al.* (2010, p. 487).

**Material:** Seven incomplete carapaces, EUIC 503 – EUIC 509, Konar-Takhteh section, Middle Miocene Mishan Formation, Iran.

**Measurements:** EUIC 503, carapace length = 24 mm, width = 20mm, height = 6 mm; EUIC 504, carapace length = 28 mm, width = 22 mm, height = 6 mm; EUIC 505, carapace length = 24 mm, width = 25 mm, height = 5 mm; EUIC 506, carapace length = 24 mm, width = 23 mm, height = 6 mm; EUIC 507, carapace length = 27 mm, width = 26 mm, height

= 8 mm; EUIC 508, carapace length = 22 mm, width = 17 mm, height = 7 mm; EUIC 509, carapace length = 20mm, width = 21 mm, height = 6 mm.

**Discussion:** The species was described from the Middle Miocene Mishan Formation of the Hormozgan Province, southern Iran (Vega *et al.*, 2010).

Genus *Seulocia* Galil, 2005

**Type species:** *Leucosia rhomboidalis* de Haan, 1841, by subsequent designation of Galil (2005).

*Seulocia* sp. cf. *S. rhomboidalis* (de Haan, 1841)  
Fig. 4.12, 4.13

**Description:** Subrhomboidal carapace, constricted front, widest at midlength; anterolateral margin one-third the total carapace length; rimmed posterolateral margin; rounded posterior margin; elongate sternum; subquadrate, fused sternites 3 and 4; sternites 5 constricted on median

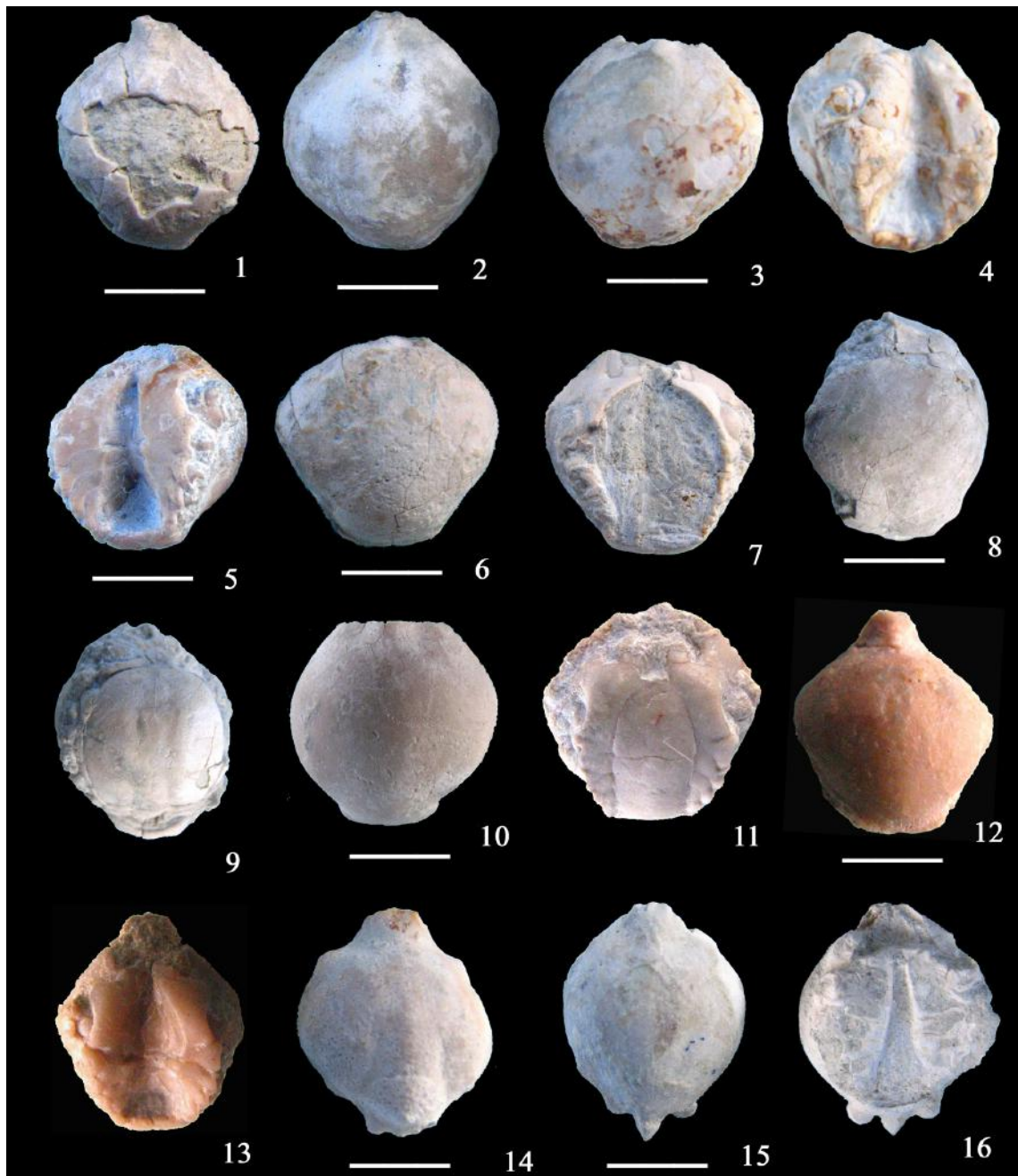


Figure 4. 1 – 11: *Leucosia persica* Vega, Gholamalian and Bahrami, 2010. 1: Dorsal view of carapace, EUIC 503. 2: Dorsal view of carapace, EUIC 504. 3, 4: Dorsal and ventral view of carapace, EUIC 505. 5: Ventral view of carapace, EUIC 506. 6, 7: Dorsal and ventral view of carapace, EUIC 507. 8, 9: Dorsal and ventral view of female carapace, EUIC 508. 10, 11: Dorsal and ventral view of carapace, EUIC 509. 12, 13: *Seulosia* sp. cf. *S. rhomboidalis* (de Haan, 1841), Dorsal and ventral view of carapace, EUIC 510. 14 – 16: *Myra* sp. 14: Dorsal view of carapace, EUIC 511. 15, 16: Dorsal and ventral view of carapace, EUIC 518. Scale bars = 1 cm.

portion; subovate sternites 6, postero-laterally inclined; subovate sternites 7 and 8 similar.

**Material:** One incomplete carapace, EUIC 510, Ahram section, Middle Miocene Mishan Formation, Iran.

**Measurements:** EUIC 510, carapace length = 14 mm, width = 10 mm, height = 4 mm.

**Discussion:** *Seulosia rhomboidalis* is an extant species, with a fossil record from the Pliocene-Pleistocene of Taiwan

(Hu and Tao, 1996). The single Iranian specimen is similar to this species, but more complete specimens are needed to confirm the specific identity.

Subfamily Eballiinae Stimpson, 1871

Genus *Myra* Leach, 1817

**Type species:** *Leucosia fugax* Fabricius, 1798, by monotypy.



*Myra* sp.  
Fig. 4.14 – 4.16

**Description:** Subovate carapace, constricted anteriorly, wider at anterior third, surface covered by fine granules; narrow anterior margin; sinuous anterolateral margin; posterolateral margin broadly curved; narrow posterior margin, about one-fourth the maximum carapace level, with short, rounded posterolateral tubercles; posterior spine relatively short, twice the length of anterolateral tubercles; sternum subovate longitudinally; subtrapezoidal, fused sternites 3 and 4; sinuous sternites 5 to 7, decreasing progressively in size towards posterior portion.

**Material:** Two incomplete carapaces, EUIC 511 and EUIC 518, Konar-Takhteh section, Middle Miocene Mishan Formation, Iran.

**Measurements:** EUIC 511, carapace length = 15mm, width = 14 mm, height = 6 mm; EUIC 518, carapace length = 13mm, width = 12 mm, height = 5 mm.

**Discussion:** The Iranian specimens differ from *Myra garii* Vega, Gholamalian, Hassani, Sajadi and Schaaf, 2012 (also from the Middle Miocene Mishan Formation), in having a much constricted anterior carapace region, granulose dorsal carapace surface, much shorter posterior spine and deeper grooves separating branchial from cardiac and intestinal areas. More complete specimens are needed to confirm a possible new species.

Superfamily Portunoidea Rafinesque, 1815

Family Portunidae Rafinesque, 1815

Genus *Portunus* Weber, 1795

**Type species:** *Cancer pelagicus* Linnaeus, 1758, by subsequent designation of Rathbun (1926).

*Portunus withersi* (Glaessner, 1933)

Fig. 5.1 – 5.4

*Neptunus (Achelous) withersi* Glaessner, 1933, p. 8, pl. 2, figs. 1–3.

*Portunus (Achelous) withersi* (Glaessner, 1933); Glaessner, 1969, p. R510, fig. 319.2.

*Portunus withersi* (Glaessner, 1933); Karasawa et al., 2008, p. 127.

*Portunus withersi* (Glaessner, 1933); Heidari et al., 2012, p. 3, fig. 5.

**Description:** Carapace one-third wider than long; curved anterolateral margin, with at least five antero-lateral spines of uniform size; slightly curved posterolateral margin, smooth, about two-thirds the total carapace length; posterior margin nearly straight, smooth, half the maximum carapace width; dorsal carapace regions not clearly marked; broad branchial areas; relatively deep cervical groove; distinct gastroduodenal and lateral cardiac grooves; relatively wide third maxillipeds, with median longitudinal groove; elongate sternum, fused, triangular sternites 1 and 2, inverted triangular sternite 3, inverted subtrapezoidal sternite 4,

with median longitudinal deep groove and lateral process, subrectangular sternites 5, with rounded outer margins, two-thirds the length of sternite 4, sternites 6 nearly identical to sternites 5, sternites 7 one-third longer than sternites 6, sternites 8 small, subtriangular, one-third shorter and narrower than sternites 7; triangular male pleon, triangular telson, one-third longer than sternites 5, subtrapezoidal, fused somites 5-6, one-third shorter than length of sternites 6 and 7 together, trapezoidal, fused somites 3-4, base nearly as wide as posterior margin, one-third longer than somite 6; wide third maxillipeds with median longitudinal groove.

**Material:** Three incomplete carapaces, EUIC 512 and EUIC 513, Konar-Takhteh section, Middle Miocene Mishan Formation, Iran.

**Measurements:** EUIC 512, carapace length = 53 mm, width = 64 mm, height = 12 mm; EUIC 513, carapace length = 55 mm, width = 67 mm, height = 12 mm; EUIC 519, carapace length = 50 mm, width = 61 mm, height = 11 mm.

**Discussion:** The species has been reported from the Lower Miocene of Iran by Glaessner (1933), from the Fars Group near Sulabadar and the Guri Member of the Mishan Formation at Hormozgan, Southern Iran (Heidari et al., 2012). This report extends the biostratigraphic record of the species to the Middle Miocene.

Family Xanthidae MacLeay, 1838, *sensu* Karasawa and Schweitzer, 2006

Subfamily Xanthinae MacLeay, 1838

Genus *Demanian* Laurie, 1906

**Type species:** *Demanian splendida* Laurie, 1906, by original designation.

*Demanian ahramensis* n. sp.

Fig. 5.5 – 5.10

**Diagnosis:** Subhexagonal carapace, widest at mid-length; fronto-orbital margin half the maximum carapace width; narrow orbits, with two notches on dorsal surface; anterolateral margin with three lobes; strongest lobe at mid-length; smooth posterolateral margin; straight posterior margin; dorsal carapace regions and cervical groove well defined; elongate sternum; triangular male pleon; chelipeds relatively massive, equal; elongate, slender P2-P4.

**Description:** Subhexagonal carapace, one-third wider than long, widest at mid-length; fronto-orbital margin half the maximum carapace width; anteriorly protruded front, bilobed; narrow orbits, with two notches on dorsal surface; convex anterolateral margin, with three lobes that become stronger towards posterior portion; strongest lobe at mid-length; convex posterolateral margin, nearly as long as anterolateral margin, without lobes; straight posterior margin, half the maximum carapace width; well defined dorsal carapace regions; inverted subtriangular potogastric lobes; clearly marked mesogastric process, extends to level of orbits; subpentagonal mesogastric region; subquadrate cardiac region; depressed intestinal region;

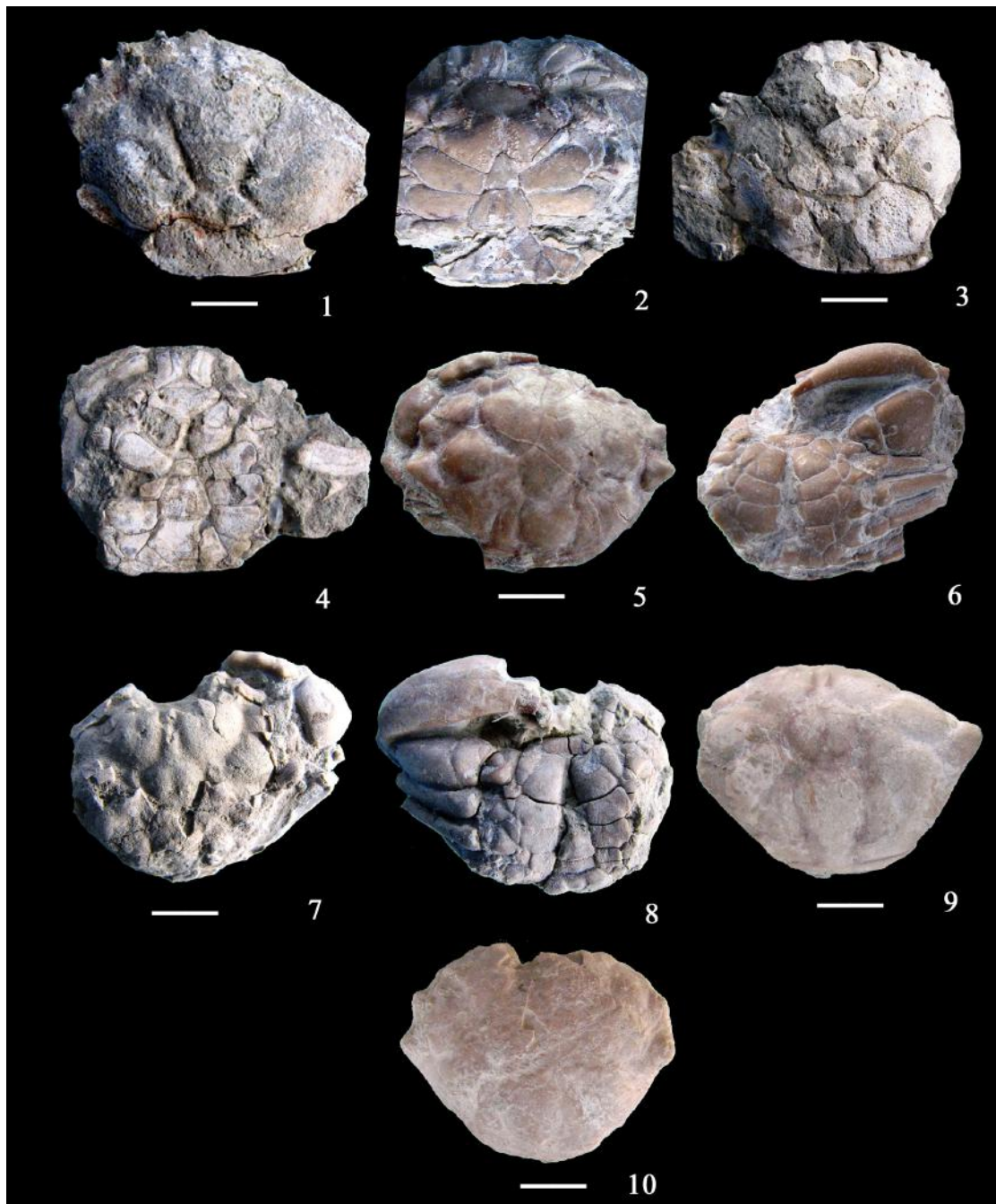


Fig. 5. 1 – 4: *Portunus withersi* (Glaessner, 1933). 1, 2: Dorsal and ventral view of male carapace, EUIC 512. 2, 3: Dorsal and ventral view of male carapace, EUIC 513. 5 – 10: *Demania ahramensis* n. sp. 5, 6: Dorsal and ventral view of male carapace, holotype EUIC 514. 7, 8: Dorsal and ventral view of male carapace, paratype EUIC 515. 9: Dorsal view of carapace, paratype EUIC 516. 10: Dorsal view of carapace, paratype EUIC 517. Scale bars = 1 cm.

transversely ovate hepatic lobes; transversely subovate, elevated mesobranchial regions; flat metabranchial regions; elongate sternum; transversely subovate sternite 3; inverted subtrapezoidal sternite 4, with lateral process; subrectangular sternites 5, as wide but one-third shorter than sternite 4, with lateral process; subquadrate sternites 6, one-third longer than sternites 5, with lateral process; sternites 7 subquadrate, as long but half the width of sternites 6; triangular male pleon, triangular telson, one-third longer

than sternites 5, subtrapezoidal; somite 6, one-third shorter than length of sternites 6 and 7 together; subrectangular somite 5, half the length of somite 6; rectangular somite 4, one third wider but slightly shorter than somite 5; equal, massive chelipeds; subrectangular coxa of right cheliped, two-thirds the length of sternite 4; small basis, subtriangular; subrectangular ischium, one-third wider than coxa; subrectangular merus, massive, three times the length of ischium; massive carpus, subquadrate, half the



length of merus; subrectangular palm, with a row of three tubercles on dorsal surface; articles of left cheliped nearly identical to those of right cheliped, except for merus that is more massive; subrectangular coxae of P2-P4; basis small; subquadrate ischia; elongate, subrectangular meri.

**Etymology:** The specific name is derived from the Ahram section, Southern Iran.

**Material:** Four carapaces, two of them nearly complete, EUIC 514 – EUIC 517, Konar-Takhteh section, Middle Miocene Mishan Formation, Iran.

**Measurements:** Holotype EUIC 514, carapace length = 30 mm, width = 44 mm, height = 15 mm; paratype EUIC 515, carapace length = 30 mm, width = 42 mm, height = 15 mm; paratype EUIC 516, carapace length = 28 mm, width = 30 mm, height = 18 mm; paratype EUIC 517, carapace length = 40 mm, width = 45 mm, height = 18 mm.

**Discussion:** The fossil record of the extant genus *Demanina* includes *Demanina caltripis* (Alcock, 1898) from the Pliocene-Pleistocene of Taiwan (Hu and Tao, 1996); *D. chayiensis* (Hu, 1981) from the Late Miocene to Early Pliocene of Taiwan (Hu, 1981; Hu and Tao, 1996); *D. pilipinas* Karasawa and Kato, 2008 (in Karasawa et al., 2008) from the Early Pleistocene of the Mandog Formation, Philippines (Karasawa et al., 2008); *D. reynaudi* (H. Milne Edwards, 1834) from the Pliocene-Pleistocene of Taiwan (Hu and Tao, 1996); *D. scamberrima* (Walker, 1887) from the Pliocene of Java (Van Straelen, 1938); *D. wardi* Garth and Ng, 1985, from the Pleistocene of New Hebrides (Garth and Ng, 1985) and *Demanina* sp. from the Early Pleistocene of the Mandog Formation, Philippines (Karasawa et al., 2008).

The new species differs from the other fossil species of *Demanina* in having a smooth dorsal carapace surface, while the previously known fossil species have tubercular or granular surfaces. The Iranian species extends the biostratigraphic and paleogeographic range for the genus to the Middle Miocene of the eastern Tethys.

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