A new species of the genus Nanosesarma (Crustacea: Decapoda: Brachyura: Sesarmidae), and redescription of Nanosesarma jousseaumei (Nobili, 1906), including new records from the Persian Gulf

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Online publication date: 02 December 2009

To cite this Article Naderloo, Reza and Türkay, Michael (2009) 'A new species of the genus Nanosesarma (Crustacea: Decapoda: Brachyura: Sesarmidae), and redescription of Nanosesarma jousseaumei (Nobili, 1906), including new records from the Persian Gulf', Journal of Natural History, 43: 47, 2911 — 2923

To link to this Article DOI: 10.1080/00222930903219996
URL: http://dx.doi.org/10.1080/00222930903219996
A new species of the genus Nanosesarma (Crustacea: Decapoda: Brachyura: Sesarmidae), and redescription of Nanosesarma jousseaumei (Nobili, 1906), including new records from the Persian Gulf

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(Received 31 January 2009; final version received 25 June 2009)

A new species of sesarmid crab from the Persian Gulf, Nanosesarma sarii n. sp. is described. Further, a poorly known species, N. jousseaumei (Nobili, 1906), is recorded from the Persian Gulf and recognized as a valid species. N. sarii n. sp. is allied to N. minutum (De Man, 1887) and N. jousseaumei (Nobili, 1906), but is easily distinguishable from them through a number of characters, in particular the upper surface of the palm with a longitudinal granular ridge, the upper surface of the movable finger fully covered with tubercles, and abdomen of the male with the sixth segment wide and the seventh segment remarkably elongate. N. jousseaumei differs from its remaining congeners in having a large gap between the cheliped fingers, a large tubercle proximally on the outer surface of the movable finger, and large teeth on the posterior margin of the merus of the walking legs.

Keywords: Nanosesarma sarii n. sp.; Nanosesarma jousseaumei; Crustacea; Brachyura; Sesarmidae; Persian Gulf

Introduction

Tweedie (1950) established the genus Nanosesarma based on Sesarma andersoni De Man, 1888, and enumerated three main features for its definition: posterodistal part of the merus of the ambulatory legs spinate or denticulate, all members of the genus are small-sized, and on the outer surface of chelipeds, at least on those of the female, there is one or more raised finely granular lines (except N. vestita). Tweedie (1950) referred six described species to this genus, viz. N. minuta (De Man, 1887), N. batavica (Moreira, 1903), N. gordoni (Shen, 1935), N. vestita (Stimpson, 1858), N. edamense (De Man, 1887), N. andersoni (De Man, 1888), N. nunongi Tweedie, 1950.

Serène and Soh (1970) divided Nanosesarma into two subgenera, N. (Nanosesarma) and a new subgenus, N. (Beanium) and added two species to the subgenus Nanosesarma, i.e. N. pontianacensis (De Man, 1895) and N. jousseaumei (Nobili, 1906). However, they did not resolve the taxonomic problems associated with species such as Nanosesarma gordoni (Shen, 1935), and N. jousseaumei. Holthuis (1977) in his short introduction to the genus Nanosesarma, criticized Serène and Soh’s (1970) dividing of this genus into two subgenera and stated that “the differences given by Serène and Soh (1970) for their two subgeneric taxa are rather vague and not too clear cut”. He believed that dividing this genus on the basis of the male abdomen was not acceptable, as this character either was not included in original descriptions (e.g. N. edamense

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(De Man, 1887); *N. batavicum* (Moreira, 1903)) or was not clearly described (e.g. *N. andersoni* (De Man, 1895); *N. nunongi* Tweedie, 1950).

Ng et al. (2008), in their catalogue of extant Brachyura “Systema Brachyurorum”, mentioned that according to Holthuis (1977) and Abele (1979) the genus *Beanium* Serène and Soh, 1970 [as *Nanosesarma* (*Beanium*)] is a junior subjective synonym of *Nanosesarma* Tweedie, 1950. Subsequently they included nine valid species into the genus *Nanosesarma*. However, they discussed that certain aspects of the systematics of *Nanosesarma* remain unresolved, in particular the situation regarding the taxonomic status of some species of the subgenus *Nanosesarma* (*Nanosesarma*). They commented that a new name would probably be needed for some members of the group previously referred to the subgenus *Beanium*. A revision of the whole genus *Nanosesarma* is now underway by P.J.F. Davie (Ng et al., 2008; pers. comm.)

In the present paper we describe a new species, *Nanosesarma sarii* n. sp., from the Persian Gulf, and redescribe *Nanosesarma jousseaumei* Nobili, 1906, illustrating both species in detail. We refrain from making any generic rearrangements and include both in *Nanosesarma* s. l, pending the forthcoming revision of the genus.

One further species was erroneously recorded from the Arabian side of the Persian Gulf under the name *Nanosesarma minutum* (De Man, 1887) (Jones 1986; Apel 2001). The taxonomy of this species is also briefly discussed.

In the present study, numerous specimens were collected from muddy substrates of mangrove forests and tidal flats along the shores of the Persian Gulf and the Gulf of Oman. Additionally, the species was found on most sampling stations on rocky shores. All measurements reported in the text are in millimeters. Abbreviations used are as follows: CL, carapace length; CB, carapace breadth; G1, first gonopod; G2, second gonopod; SMF, Forschungsinstitut Senckenberg, Frankfurt am Main; ZUTC, Zoology Museum of the University of Tehran; NHM, Natural History Museum, London; MNHN, Muséum national d’Histoire naturelle, Paris.

**Systematics account**

*Family SESARMIDAE* Dana, 1851

*Nanosesarma* Tweedie, 1950

*Nanosesarma sarii* n. sp.  
(Figures 1A, B, 2A–F, 3A–I)

*Nanosesarma (Nanosesarma) minutum* Tirmizi and Ghani, 1996, p. 159, Figure 61 A–D.  
[not *Sesarma minutum* De Man, 1887]

*Nanosesarma minutum* Jones, 1986, p. 160, pl. 46.  
[not *Sesarma minutum* De Man, 1887]

**Material examined**


*Paratypes*. Persian Gulf, Iran: 23♂, 11♀ (ZUTC Brach1151), the same locality as holotype; 4♂, 8♀ (4 ovig.) (ZUTC Brach1152), Khuzestan, Bandar-Mahshahr, fisheries jetty, 30°28′N, 49°11′E, muddy substrate with planted mangroves, 16.04.2006,

Other material. 1♀ (NHM 1985:512 CR08/21), previously identified as Nanosesarma minutum (De Man, 1887), Manora Island, West Wharf, Karachi, Pakistan, S. S. Hashmi.
Figure 2. *Nanosesarma sarii* n. sp., holotype (SMF-34376). (A) carapace; (B) basal segments of first and second antenna; (C) right third maxilliped; (D) palm of left cheliped (outer face); (E) upper surface of palm and finger of left cheliped; (F) *N. sarii* n. sp., female paratype (ZUTC Brach1151), palm of left cheliped. Scale bars = 1 mm.
**Description**

Carapace square (Figures 1A, 2A), slightly broader than long (CB/CL about 1.13–1.17), greatest breadth across second anterolateral teeth, evenly convex, sparsely covered with short and thin plumose setae. Front (including the inner lobe of orbit) about 0.6 times maximum CB, slightly less than twice breadth of the posterior edge of carapace, sinuous, with two wide lobes, lobes convex and moderately produced, slightly beyond inner supraorbital angle, separated by a semicircular median notch, frontal edge serrated, beaded upwards, frontal region gently deflexed, a broad shallow sulcus running posteriorly separating two distinct frontal ridges. Inner orbital angle nearly rounded, upper margin sinuous, finely serrated like frontal margin, without fissure, infraorbital margin straight, prominently serrated, completely separated from outer triangular part, a raised line on inferior surface of outer angle, completely serrated with long setae.

Anterolateral margin with two teeth (including exorbital angle), first one widely triangular, second one triangular, small, with pointed tip, separated from former by a shallow V-shaped notch, lateral border behind second tooth slightly convergent.

Carapace regions (Figure 2A) well defined, gastric region surrounded by a deep groove, cardiac region with a shallow groove, a small depression behind supraorbital margin, very fine granules on upper surface of carapace, always two or more granules in a line, two oblique granulated ridges along lateral part, first one shortly behind second anterolateral tooth, extending from lateral margin towards central region of carapace, second one near end of lateral margin, parallel to first, longer, ending at posterolateral edge, two further less-prominent, short ridges present, one running from second lateral tooth, subparallel to first prominent ridge, other behind first prominent one, nearly parallel to that.

Basal antennal segment long (Figure 2B), reaching to about middle of second segment, flagellum of antennae short, but reaching to cornea of eye. Proximal half of eye-stalk covered with granules similar to those on carapace.

Third maxillipeds (Figure 2C) covering buccal cavity, with a large inner gap between them, merus with a longitudinal furrow along outer surface, internal and external margins crenulated, long setae along internal margin, internal margin of ischium crenulated, with long setae, exopod relatively slender.

Chelipeds subequal, inner margin of ischium distally denticulated, a long stiff medial bristle on inner margin. Inner margin of merus proximally crenulated, inner surface smooth, with a longitudinal line of short setae, and some scattered short setae, outer surface with transverse lines of small granules same as those on carapace. Carpus with prominent transverse lines of granules on outer surface, inner smooth surface with a line of long stiff setae. Manus (Figure 2D) slightly swollen, outer surface with a large patch of dense setae, covering whole manus above lower row of granules, extending to proximal part of fingers, three rows of granules thereon, concealed by a tuft of setae, lower one long, regularly granulated, extending from proximal part to middle of immovable finger, middle one short, with irregular large granules, subparallel to lower one, upper one short, with irregular granules, curving upwards, surfaces above these granular rows granulated, below long line smooth, a crenulated longitudinal line (Figure 2E) along upper margin, inner surface of manus with granules on proximal part same as those on carapace.

Movable finger (Figure 2E) as long as manus, upper surface, except apical part, completely tuberculated, with densely set small tubercles on proximal part, six relatively
large granules proximally on outer surface, proximal ones always larger, all concealed by tufts of setae, cutting edge with small teeth of various sizes. Immovable finger short, smooth, cutting edge with several small teeth, a large prominent one medi ally, brown apical part of fingers spoon-shaped.

Chelipeds of female (Figure 2F) small, slightly slender, manus with a patch of setae as in males, with same granulation pattern under tufts of setae as in male, movable finger smooth, with granulation on the proximal part of upper surface.

Walking legs (Figure 3A–D) medium-sized, second and third longer than two others, which are of same size, anterior margin of merus weakly crenulated, with a pointed subdistal tooth, posterior margin crenulated, posterodistal lobe denticulate, first denticule large, in first and second legs especially prominent and spined, posterior surface of merus with granules similar to those on carapace. Carpus of walking legs 1, 2, and 3 with two distinct carinae on posterior surface and one on anterior surface, carpus of last walking leg without any carina on posterior face. Propodus with an oblique carina on posterior face, stiff long setae along propodus, mainly in two rows on anterior and posterior margins, small brown setae on anterior margin of propodus of first three legs, setae of first one dense, prominent, two groups of three to five spines on distal end of posterior margin, median one prominently large. Dactylius distinctly more than half as long as propodus, with 8–10 spines, in two rows, on posterior margin, 2–3 spines on anterior margin of last walking leg, last walking leg of female without any spine on anterior margin.

Male abdomen (Figure 3E) elongate, triangular, smooth, sixth segment slightly more than twice as broad as long, with converging lateral margins, telson markedly elongate, about 1.6 times as long as broad.

Female abdomen (Figure 3F) large, completely round, length of sixth segment more than others, telson small, remarkably inserted into sixth segment, long setae on margins of all segments, margin of telson with short setae.

G1 (Figure 3G) medium-sized, nearly straight, corneous distal part directed out wards, with long, stiff setae around it, some setae along lateral margin, sperm channel curved along proximal part, with terminal opening on lateral side (Figure 3H).

Genital opening of female (Figure 3I) with a nearly long oval operculum on inner side, a small semicircular process on outer side.

Size
Like other members of this genus, specimens of this species are small but seem to be larger than other congeners. Mean size CL = 4.5, CB = 5.5. Maximum sizes of largest male CB = 8.77, CB = 9.95, largest female CB = 8.24, CB = 9.21, smallest ovigerous female CL = 3.1, CB = 3.6.

Colour
Living specimens with carapace relatively light brown, darker brown in anterior part. Chelipeds, walking legs, and abdomen lighter than carapace, sometimes with brown banding on walking legs. Dark brown setae on the outer surface of manus of chelipeds and upper margin of propodus of walking legs, giving a dark appearance to these parts.
Figure 3. *Nanosesarma sarit* n. sp. Holotype (SMF-34376) (A–E, G–H) and female paratype (ZUTC Brach1151) (F, I). (A) first walking leg (left); (B) second walking leg (left); (C) third walking leg (left); (D) last walking leg (left); (E) abdomen of male; (F) abdomen of female; (G) G1, right (ventral face); (H) G1, right (posterior face); (I) genital opening of female. Scale bars = 1 mm.
Habitat
This species lives in different habitats with a variety of sediment grain-sizes. On rocky shores and in coral beds it is found hiding under small stones and corals. In mangrove forests it lives among the roots of mangrove trees, under decaying wood, and under large dead shells. In oyster banks it is found amongst oyster shells, and also occurs in sheltered sandy-muddy shores burrowing in the sediments.

Distribution
Coasts of the Persian Gulf, Gulf of Oman and Pakistan.

Etymology
This species named after Dr Alireza Sari, Associate Professor in the University of Tehran, who was the supervisor of the MSc thesis of the first author and encouraged him to study brachyuran crabs of the Persian Gulf.

Remarks
_Nanosesarma sarii_ n. sp. differs distinctly from all other species of the genus by the following two features. Firstly, the granulation pattern on the cheliped is quite different. There is a longitudinal low of small granules on the upper surface of the cheliped palm, the movable finger is relatively more granulated, being nearly completely covered with small tubercles on the upper surface and with six prominent granules present proximally on the outer surface of the movable fingers. Secondly, the male abdomen is prominently elongate, more so than in almost all other congeners, with the sixth segment and telson differing markedly in size and shape. The elongation of the abdomen is mainly due to the long sixth segment and telson. The new species is closest to _N. minutum_ De Man, 1887 and _N. jousseaumei_ in particular, in having the carapace wider than long. However, it is easily distinguishable from its closest relatives in having the two features listed previously. While it resembles _N. minutum_ with regard to the size of the basal antennal segment, morphology of the G1 and the presence of an acute epibranchial tooth, _N. sarii_ n. sp. is not nearly as setose as _N. minutum_. Large specimens of this new species have very sparse setae on the carapace and appendages; the carapace sometimes looks nearly glabrous. The crabs figured by Jones (1986: 160, pl. 46) from the Kuwait coast of the Persian Gulf and by Tirmizi and Ghani (1996: 159, Figure 61 A–D) from Pakistan waters under the name _N. minutum_ are most probably identical with this new species. Furthermore, one female specimen of _Nanosesarma_ from Karachi, Pakistan deposited in NHML (under the name of _N. minutum_) was also identified as _N. sarii_.

_Nanosesarma jousseaumei_ (Nobili, 1906)  
(Figure 1C, D, 4A–F)

Type locality
Gulf of Aden (Djibouti and Obock).
Figure 4. *Nanosesarma jousseaumei* (Nobili, 1906), lectotype (MNHN B16696): (A) carapace; (B) basal segments of first and second antenna; (C) palm of the right cheliped (outer surface); (D) left last walking leg; (E) abdomen of male; (F) G1 (ventral face). Scale bars = 1 mm.
Material examined

**Lectotype.** 1♂ (MNHN B16696) (Cl = 4.8, Cb = 5.3), Dr. Jousseaume, Mer Rouge, 1897.

**Paralectotype.** 1♀ (MNHN B16696) (Cl = 4.0, Cb = 4.5), Dr. Jousseaume, Mer Rouge, 1897.

**Material from the Persian Gulf, Iran.** 1♂ (ZUTC Brach1161), Hormuzgan, Parsian (Gavbandi), 35 km E. to Gavbandi, Morghdan village, 27°06’N, 53°03’E, sandy-rocky, 12.05.2006, R. Naderloo; 2♂, 5♀ (ZUTC Brach1162), Qeshm Island, S. coast, 10 km E. of Salakh, 26°40’N, 55°44’E, rocky bed, 11.05.2008, R. Naderloo and A. Kazemi; 1♀ (SMF-34380), Qeshm Island, S. coast, 26° 51’N, 56° 08’E, sandy-cobble, 10.01.2008, M. Türkay and R. Naderloo.

**Further material.** 1♂, 3♀ (SMF-25147), Djibouti, City of Djibouti, Plage de Triton, intertidal zone, under stones, 18.03.1987, leg. Allspach, Fischer and Türkay; 1♂ (MNHN B16193) Madagascar, Nosy Bé, intertidal, A. Crosnier col. et det. as *Nanosesarma cf. minutum*; 1♂, 1♀ (MNHN B16195), Madagascar, Nosy Bé, in intertidal oyster bank, A. Crosnier col et det. as *Sesarma (cf) minutum* De Man; 2♀ (MNHN B16196), Madagascar, Nosy Bé, intertidal, sand stone beds, A. Crosnier col et det. as *Sesarma cf. minutum* De Man; 2♂, 1♀ (MNHN B16194), Madagascar, Tuléar, intertidal, Plante collection, A. Crosnier det. as *Sesarma cf. minutum* De Man; 4♂, 2♀ (1 ovig.) (NHM1973: 89 CR08/21T), Tansania, Dar es Salam area, rocky cliff, leg. R. G. Hartnoll, April 1972, identified as *Nanosesarma minutum* (De Man).

Description

Carapace (Figure 1C,D, 4A) square, slightly broader than long (CB/CL about 1.1), nearly uneven, smooth, covered with short plumose setae, long setae sparsely set among shorter ones, regions well defined, frontal region with two lobes, a shallow sulcus separating them, extending backward to gastric region, straight depression separating gastric region from cardiac, two very short, oblique, depressed lines centrally in front of this straight depression, cardiac region with two small elevations, separated from intestinal region by a shallow depression, a prominent depression behind orbits, one weakly granulated oblique ridge on posterior surface of carapace, extending from lateral margin towards posterior edge, stopping at small elevation near posterolateral edge.

Frontal region relatively sharp and deflexed, frontal ridge about half as broad as carapace, weakly serrated, two-lobed, slightly protruded, not overreaching inner angle of orbit, separated by a wide semicircular notch.

Orbit about one fourth carapace breadth, posterior margin sinuous, finely serrated, exorbital angle widely triangular, infraorbital margin straight, completely denticate, denticles becoming nearly large in middle part, inner margin subrectangular rather than triangular.

Basal antennal segment (Figure 4B) long, reaching to base of flagellum. Third maxilliped morphology identical to that of *N. sarii.*
Chelipeds distinctly unequal, ischium denticulate on anterior margin, merus relatively large, very small tubercles sparse on outer surface, inner surface smooth, posterior, anterior and lower margins granulated, anterodistal margin with a rectangular process, small tubercles sparse on posterior surface of carpus, outer margin with slightly more numerous tubercles, inner angle triangular, minutely serrated. Palm (Figure 4C) relatively large, outer surface fully covered with dense setae, three rows of tubercles underneath the setae, lower one with small tubercles, extending from proximal part to basal third length of lower finger, middle one shortest, oblique, with relatively large tubercles, upper row of granules short, nearly parallel to median one. Lower margin with an elevation on proximal half of lower finger, upper margin with sparse tubercles, inner surface smooth on lower part, some tubercles present on upper part. Fingers slightly narrow, shorter than palm, with a large gap in proximal half, getting narrower distally, movable finger straight, small granules proximally on upper surface, a large distinct tubercle proximally on outer surface, cutting edge of movable finger with six to seven low tubercles on distal half, distal one large, cutting edge of immovable finger with a large prominent tubercle in middle part, two low ones proximally next to the large one, tips of fingers spoon-shaped. Chelipeds of female nearly equal, small, narrow, movable finger without proximal tubercles on outer face, cutting edge of fingers with distinct teeth on proximal part.

Walking legs medium-sized, first and second ones longest, anterior margin of merus weakly serrated, without subdistal spine, posterior margin (Figure 4D) with some distinct tooth-shaped granules, two large ones medially, posterodistal margin with spiniform teeth, proximal one largest. Carpus with a longitudinal line of very small tubercles on anterior and posterior margins, last leg (Figure 4D) without this line on posterior surface of carpus. Propodus length about twice width or slightly longer, about 1.5 times dactylus length, smooth, with two groups of three small spines on posterodistal end. Dactylus ending in a large spine, six spines, in two rows along posterior margin, getting larger distally, all segments of walking legs, except dactylus, densely covered with short plumose setae, long bristles between them.

Male abdomen (Figure 4E) with sixth segment about 3.5 times as broad as long, lateral margin gently converging distally, telson not elongate, very slightly longer than broad, apical part rounded.

G1 (Figure 4F) straight, with a long corneous distal part, gently bending outward, covered with long bristles, posterior surface concave, sperm channel nearly straight, distal opening in posterior apical part. Some plumose setae along lateral margin. Genital opening of female exactly same as that of *N. sarii* n. sp.

**Size**

This species is relatively small sized compared to the other species of the genus *Nanosesarma*. The male lectotype measures CL = 4.8, CB = 5.3, female paralectotype CL = 4, CB = 4.5.

**Colour**

Fresh specimens from the Persian Gulf are generally light brown on the upper surfaces of the carapace and appendages, with some irregular dark-brown flecks on the anterior region of the carapace. Short brown setae on the appendages give a dark appearance to these parts.
Habitat
Nobili (1906) did not report the habitat of the type material. The material deposited in the Senckenberg Museum was collected in the intertidal zone, living under stones as the specimens from the Persian Gulf.

Distribution
Madagascar, Dar es Salam, Gulf of Aden (Djibouti and Obock) and Persian Gulf.

Remarks
Serène and Soh (1970) synonymized *N. jousseaumei* (Nobili, 1906) with *N. minutum*, De Man, 1887. Subsequently, Holthuis (1977) redescribed this species based on one small female from Ethiopia, and stated that this species is closer to *N. gordoni* (Shen, 1935), rather than to *N. minutum*; he did not doubt the validity of *N. gordoni*. *Nanosesarma gordoni* (Shen, 1935) is, however, in all respects identical with *N. minutum*. So far three studies have considered *N. gordoni* to be a junior synonym of *N. minutum* (Serène and Soh, 1970; Davie 1998; Ng et al. 2008). Some specimens of *N. gordoni* [1♂, 2♀ (SMF-30920) Japan, Shikimi, M. Matsuo] and *N. minutum* (10♂, 8♀ (BMNH1961.11.13.130-140) Japan, Natake-Sima, I. Gordon and K. Sakai) were available for us to compare them with each other and with other species of this genus. We could not find any difference between *N. minutum* and *N. gordoni*, in particular in comparisons of the male cheliped, walking legs and the male abdomen. The original description and drawings provided by Shen (1935) are also insufficient to separate these two species. Therefore, we support the synonymy of both species. Further, Holthuis (1977) mentioned that specimens of *Nanosesarma cf. minutum* (De Man) which Crosnier (1965) had reported from Madagascar, are probably identical with *N. jousseaumei* based upon the description and illustration given by Crosnier (1986: 70–74, Figures 109–115). The first author had an opportunity to examine Crosnier’s specimens from Madagascar deposited in the MNHN, and would like to support Holthuis’s statement, however description and drawings (especially that of the cheliped) of Crosnier’s specimens from Madagascar are slightly different from here examined specimens of *N. jousseaumei* (see Figure 4).

Ng et al. (2008) already listed this species as a valid species in their catalogue of Brachyura. We are now confirming the validity of *N. jousseaumei*, which is similar in most respects to *N. minutum*. These two species are easily distinguishable as follows: The second epibranchial tooth of *N. jousseaumei* is blunt, that of the *N. minutum* remarkably triangular and pointed; the shape of the male palm is distinctly wider in *N. jousseaumei*. The large gap between the proximal part of the fingers of the male in *N. jousseaumei* and the presence of a large tubercle proximally on the outer surface of movable finger of the male of this species also makes it different from *N. minutum*.

Furthermore, the size of the walking legs, in particular the size of the propodus, which is about one and half times as long as broad, and the granulation of the posterior margin of the merus of the walking legs with some blunt and comparably large teeth in the middle part, allows *N. jousseaumei* to be separated from all other congers. In the remaining species, the propodus is usually longer, about twice as long as wide, and the posterior margin of the merus of the walking legs is either slightly serrate or possesses very small denticles.
Conclusions

Until now, only one species of the genus *Nanosesarma, N. minutum* De Man, had been recorded from the Arabian side of the Persian Gulf (Jones 1986; Apel 2001), which in reality belongs to the new species *N. sarii* n. sp. With the new records of *N. jousseaumei* from our material, the number of species of *Nanosesarma* in the Persian Gulf now rises to two. Both, *N. sarii* and *N. jousseaumei* have a western Indian Ocean distribution including the Persian Gulf and Pakistan. *Nanosesarma jousseaumei* has been found in the Gulf of Aden and off the east coast of Africa. It is possible that *N. sarii* will be found further westwards once more studies are done of small sesarmids in this region.

Acknowledgments

We would like to thank Dr Peter Davie, Queensland Museum for his valuable comments on the species and manuscript, Dr Alireza Sari, University of Tehran for his support towards the first author and providing opportunity for sampling. Our thanks also are due to Mr A. Kazemi, University of Tehran, for his valuable help during our field work. This study was supported by University of Tehran and through a grant of the German Academic Exchange Service (DAAD), Bonn, Germany, which we gratefully acknowledge.

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