

## SPECIES

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# New records of *Aquilonastra iranica* (Mortensen, 1940) and *Callopatiria granifera* (Gray, 1847) (Echinodermata: Asteroidea) from Balochistan coast (Pakistan)

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## ABSTRACT

The present paper is based on data collected as part of the survey of Balochistan's coast. Seven specimens of the Asteroid echinoderm species *Aquilonastra iranica* (Mortensen, 1940) were collected from Gwader (Lat. 25°07'00" N Long. 62°20'00" E) and five specimens of *Callopatiria granifera* (Gray, 1847) were collected from Ormara (Lat. 25°11'00" N Long. 67°41'00" E). Those are only being reported from Pakistan's coastal waters for the first time. The species are briefly described and illustrated.

**Keywords:** *Aquilonastra iranica*, *Callopatiria granifera*, new records, Pakistan.

## 1. INTRODUCTION

Asterinidae is a worldwide family composed mostly of shallow water species with narrow distribution ranges, but including some species that are more widespread in deeper water throughout the world. This family contains about 21 genera and 116 species as stated by O'Loughlin and Waters, (2004), while the World Asteroidea Database status that it includes 150 species in 25 genera (Mah, 2013). Clark and Row, (1971) described 13 species of starfishes from Persian Gulf. Price, (1983) was account 14 species from the Saudi coasts in the Persian Gulf in 1981 and 1983. Price and Rezai, (1996) reported the species of *Acanthaster planci* from Larak and Tonb-e-Kouchak Islands. O'Loughlin and Rowe, (2006) explained asterinid genus, *Ailsastra*, from the Indo-West Pacific region.

Six species were allocated to *Ailsastra*. Pourvali, (2015) reported six species of starfishes from Hormuz Island. Morphological identification and phylogenetic analysis of Asteroidea in the northern coast of the Persian Gulf explained by (Adeli et al., 2020). Adeli et al., (2022) have been recorded eleven species of starfishes (*Astropecten hemprichi*, *Astropecten indicus*, *Astropecten polyacanthus*, *Astropecten polyacanthus phragmorous*, *Luidia hardwicki*, *Aquilonastra iranica*, *Linckia multifora*, *Culcita novaeguineae*, *Pentaceraster mammillatus*, *Aquilonastra watersi* and *Linckia laevigata*) from Persian Gulf. *Aquilonastra* is a genus of small sea stars within the family Asterinidae. It has more than 20

reported species. O'Loughlin and Rowe, (2006) amended the genus *Aquilonastra*. *Aquilonastra* has usually five rays, apart from fissiparous species which have five to eight ones. It seems to resemble a star, as inter-radial margins are intensely incurved (O'Loughlin and Waters, 2004).

The genus *Callopatiria* has 3 reported species (*Callopatiria cabrinovici*, *Callopatiria formosa*, *Callopatiria granifera*) (WoRMS, 2012). Members of the genus *Callopatiria* have five long, narrow rays, rounded on the upper surface and tapering to a rounded tip. The body is flat on the oral (under) surface but convex on the aboral (upper) surface. From a systematic and ecological perspective, our knowledge of the identification of starfish in Pakistan remains unsatisfactory since studies on their morphological identification are very limited. As part of this work, we aim to enhance our understanding of the morphological characteristics of the species of *Aquilonastra* and *Callopatiria* from Pakistani coastal waters and complement the molecular analysis carried out by (O'Loughlin and Waters, 2004).

## 2. MATERIALS AND METHODS

The fresh specimens were collected from the rocky cum muddy shore of Gwader (Balochistan coast) (Lat. 25°07'00" N Long. 62°20'00" E) and Ormara (Lat. 25°11'00" N Long. 67°41'00" E). The abundant phylogenetic information provided by DNA sequences data. The dried specimens were sent to Dr. Mark O'Loughlin (Museum Victoria, Australia) for identification through DNA sequences. DNA was extracted by using the COI primers (Waters et al., (2004), clade IV, part; O'Loughlin and Waters, (2004)). The material is housed in MRC & RC.

### Systematic

Phylum Echinodermata

Subphylum Eleutherozoa

Class Asteroidea

Order Valvatida (Perrier, 1884)

Family Astrinidae (Gray, 1840)

Genus *Aquilonastra* (O'Loughlin in O'Loughlin & Waters, 2004)

*Aquilonastra iranica* Mortensen & Heding, 1940 (Figure 1A - D)

Genus *Callopatiria* Verrill, 1913

*Callopatiria granifera* (Gray, 1847) (Figure 2A - D)

## 3. AQUILONASTRA IRANICA (MORTENSEN, 1940) (FIGURE 1A – D)

*Asterina cephea* var. *iranica* Mortensen, 1940: 65 - 66, pl. 1 figs. 1- 4.

*Asterina burtoni*, A.M. Clark and Rowe, 1971: 68, 69, tbl. 1.- Price, 1983: 47 -48, fig. 14 (part, non-fissiparous).

*Asterina burtoni burtoni* var. *iranica*, A.M. Clark, 1993: 207, 208.

*Aquilonastra iranica*, O'Loughlin and Waters, 2004: 11, 13 - 15.

### Results and description

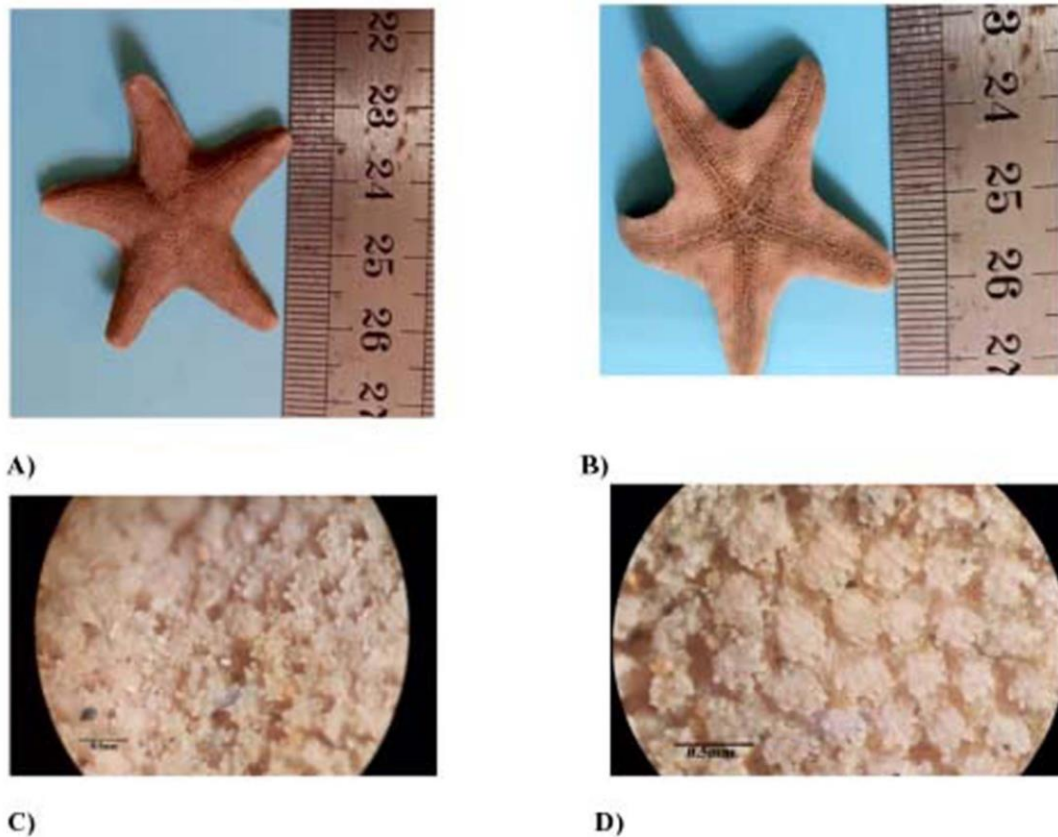
Gwader: 24th December, 1977. 7 specimens. Mean R, 20 -29 mm, Mean r. 12 – 16mm, Rr. 1:1. 7 -1.8. A total of seven specimens obtained from Gwader were part of the collection of the MRC & RC. They look like *A. burtoni* in the shape and convexities of arms. Despite this, two specimens were sent to Dr. Mark O Loughlin of Museum Victoria, Australia, due to the fact that the abactinal and the actinal armature were different. He has confirmed that the material at hand refers to a new record from the Pakistan.

### Diagnosis

The body is stellate. The disc is large with five rounded frank tipped arms. The arms are triangular, wide at the bottom, somewhat bigger than in the other species of the family Asterinidae particularly *A. lorioli* and *A. burtoni*. The crest is lacking along the middorsal line. The abactinal surface (Figure 1A) is somewhat convex, whereas the actinal (Figure 1B) is smooth. The marginal plates are small. The abactinal plates (Figure 1C) are all covered with tufts of typically 2 to 6, occasionally three spinelets. The actinal plates (Figure 1D) are crescentic in form and are covered with tufts of 2 to 5 coarse spinelets (typically four), these spinelets are well developed around the anus and madrepoite.

The madreporite is prominent and effortlessly visible, being single, small, rounded, deeply channeled, and located interradially. The madreporite is covered by coarse radiating gyri. The papulae are secluded and present just on the abactinal surface apart from

in the interradial area. The pedicellariae are missing. The oculars are somewhat elevated, semicircular in form and covered through tubercles. The mouth plates are broad, prominent, and roundly triangular. There are eight extended, tapering, webbed oral spines, with an assemblage of four to five small, piercingly pointed suboral spines on all plate.



**Figure 1** *Aquilonastra iranica*. A: Abactinal view; B: Actinal view; C: Abactinal plates; D: Actinal plates

#### Color

Preserved specimens creamy white, both actinal and abactinal uniformly colored.

#### Habitat

Collected from rocky cum muddy shore of Gwader (West Bay Lat. 25°07' 00" N Long. 62°20' 00" E).

#### Ecology

This starfish feeds on food detritus.

#### Distribution

Iranian Gulf and now for the first time reported from the Arabian Sea, Pakistan.

### 4. CALLOPATIRIA GRANIFERA (GRAY, 1847) (FIGURE 2A -D)

*Callopatiria granifera* (Gray, 1847)

*Asterina granifera* (Gray, 1847)

*Patiria granifera* Gray, 1847 : 72 - 83.

*Asterina granifera* var. *sporacantha* H.L.Clark, 1923 : 221-435, 23 pls.

*Callopatiria bellula* (Sladen, 1889) : xlii + 893 pages, 118 plates.

*Paranepanthia bellula* (Sladen, 1889)

*Patiria bellula* Sladen, 1889 : xlii + 893 pages, 118 plates.

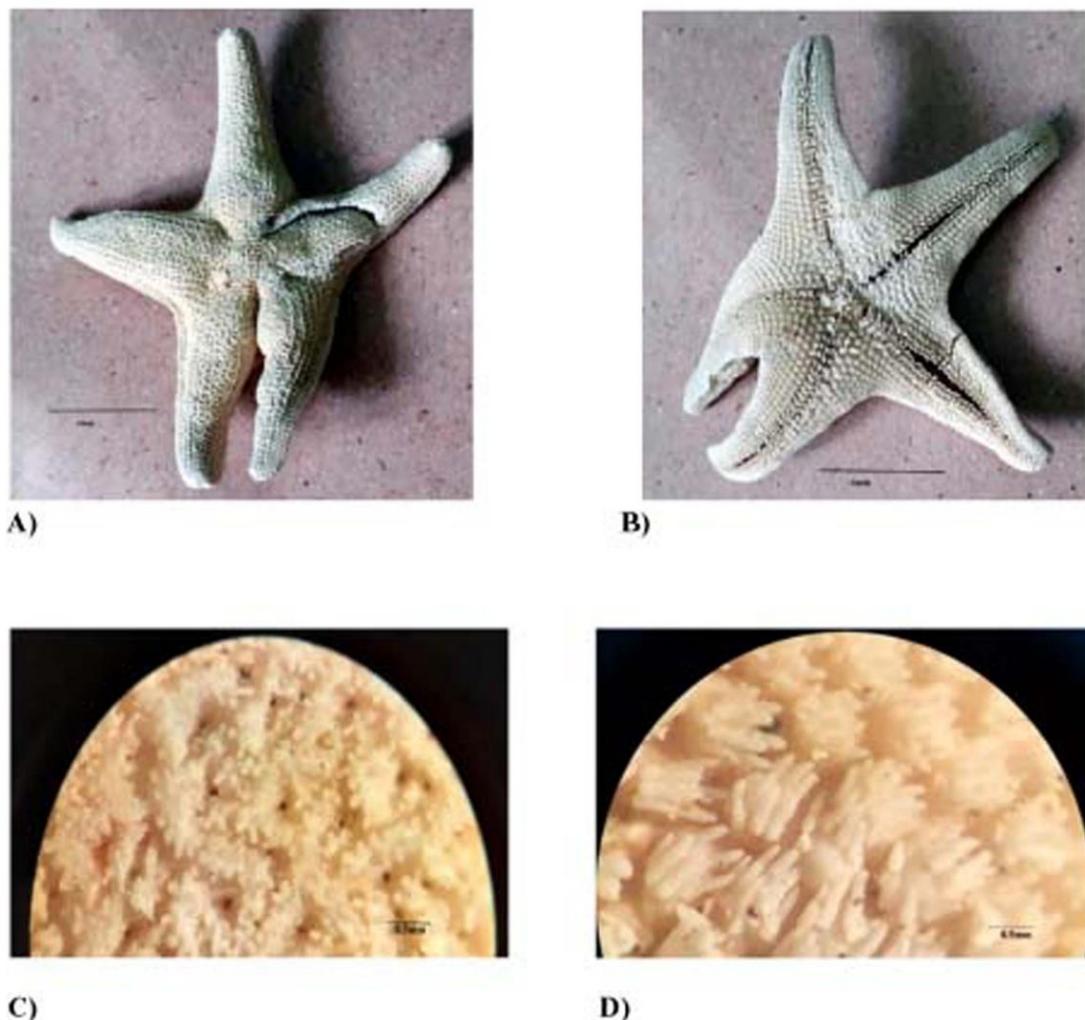
## Results and description

Ormara: 20th December, 1977. 5 specimens. Mean R, 24 - 20mm, Mean r. 10- 7mm, Rr. 1:2.4.

### Diagnosis

Interradial margin intensely incurved, rounded proximally (Figure 2A), rays separate, tapered base tapering to rounded end, form long-rayed stellate; body smooth actinally (Figure 2B), wider actinally than breadth of upper ray, high convex abactinally, sides of rays close to perpendicular exceeding angular margin; missing pedicellariae; not fissiparous. Abactinal surface coarse (Figure 2A), erratically arranged crescentiform plates; occasionally distended rounded plates distally; missing carinal series of plates; papulate areas wide; papular spaces large, not obviously bordered, up to about 10 large to small secondary plates and up to about 10 papulae per space; abactinal plates (Figure 2C) erratically notched for papulae, all plate with small rounded elevation, a few subpaxilliform, intimately covered with up to about 60 spinelets, skinny conical pointed on secondary plates; occasionally longitudinal series of plates and papulae obvious on sides of rays; series of big subequal superomarginal and inferomarginal plates, covered intimately with digitiform spinelets, not in marginal tufts; inferomarginals projecting just slightly at about right-angular margin.

Actinal plates within oblique series (Figure 2D). Actinal spines per plate: oral 7; suboral 7-8; furrow 5 proximally; subambulacral 4-6; actinal interradian up to 10 (fans proximally, clusters distally); adradial actinal plates by complete series of spines; actinal plates by spine-bearing low vault; interradian spines digitiform. Superambulacral plates as asymmetrical series, variable size, sometimes paired or absent, contiguous by superactinals for nearly all of ray; marginal angle filled by numerous superactinal plates; abactinal and actinal plates close to margin missing interior projections assemble at angle; superambulacral and superactinal plates entrenched in resinous interior lining.



**Figure 2** *Callopatiria granifera*. A: Abactinal view; B: Actinal view; C: Abactinal plates; D: Actinal plates

**Color**

Preserved specimens creamy white, both actinal and abactinal unvaryingly colored.

**Habitat**

Collected from rocky cum sandy shore of Ormara (Lat. 25° 11' 00" N Long. 067° 41' 00" E).

**Ecology**

This starfish feeds on food detritus.

**Distribution**

It is found from the South African coast, and now for the first time reported from the Arabian Sea, Pakistan.

## 5. CONCLUSIONS

It can be concluded that Asterinidae is a cosmopolitan family, mainly of shallow-water narrow-range genera but including some more widespread in deeper waters of all oceans. *Aquilonastra iranica* and *Callopatiria granifera* both are omnivores and they have sexual reproduction. The present specimens are the first consequent record from Pakistan. *Aquilonastra* seastar, body stellate, arms five, convex and blunt tipped. Marginal plates small. Abactinal plate with two to five spines, actinal with tufts of two to six coarse spinelets. *Callopatiria granifera* dorsal surface similar to a tiled roof and its arms narrow to rounded ends. Rays broadly flat actinally, marginal rim muscularly angular; missing pedicellariae; missing transactional plates. This study has increased expertise of the biodiversity of asteroids, particularly in the northern Arabian Sea, greater sampling is wanted, mainly in deeper waters, and shows the possibility of extra starfish taxa being present.

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The second author wishes to express sincere gratitude to Dr. Mark O'Loughlin of Museum Victoria, Australia, for confirming the species.

**Conflicts of interests**

The authors declare that there are no conflicts of interests.

**Ethical approval & declaration**

In this article, as per the animal regulations in Marine Reference Collection and Resource Centre, University of Karachi, Pakistan, the authors observed the *Aquilonastra iranica* (Mortensen, 1940) and *Callopatiria granifera* (Gray, 1847) (Echinodermata: Asteroidea) species from Balochistan coast (Pakistan). The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

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The study has not received any external funding.

**Data and materials availability**

All data associated with this study are present in the paper.

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