

RECORD OF THE BARNACLE
OCTOLASMIS ANGULATA (AURIVILLIUS, 1894) FROM THE GILLS
OF THE CRAB *PORTUNUS SEGNIS* (FORSKÅL, 1775)
OFF IRAQI MARINE WATERS

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ABSTRACT

Ten blue swimming crabs *Portunus segnis* (Forskål, 1775) were collected from the north west of the Arabian Gulf off the Iraqi marine waters from October to November 2017 at 29° 37' N to 48° 47' E.

The barnacle *Octolasmis angulata* (Aurivillius, 1894) was found on the gills of the present species of crab, the mean incidence of infestation was 30%, while the mean Intensity of infestation was 12.3. The barnacle have a long and slim shaped calcareous plate with the presence of carina and the absence of tergum, in addition to the elongated shape of carina and scutum. The current study represents the first record of the barnacle *O. angulata* in the Arabian Gulf.

Keywords: Arabian Gulf, Cirripedia, Crab, Gills, Symbiosis.

INTRODUCTION

Cirripedia are crustaceans belonging to the maxillipoda which using the first antenna as an attachment organ (Debelius, 2001); the malacostraca is the largest and most diverse groups and is divided into 14 orders, with over 20000 species, marine, freshwater, terrestrial, benthic, scavengers and predators. The largest Order of that is Decapoda that includes most crustaceans such as shrimp, lobsters, crayfishes and crabs (Kazmi and Khaton, 2016).

Portunidae has six subfamilies namely: Caphyrinae, Carupinae, Lupocyclinae, Poalophthalminae, Portuniae and Thalamitinae (WoRMS, 2018a), the Portuniae Rafinesque, 1815 has 11 genera, of which *Portunus* has 24 species, the modern species is *P. mokyeyskii*

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Zarenkov, 1970, while the oldest species is *P. segnis* (Forskål, 1775) (WoRMS, 2018b). In temperate, subtropical and tropical coastal waters of the world pedunculate barnacles of the genus *Octolasmis* are frequently found on decapod crustaceans, the stalked barnacles of the genus *Octolasmis* are sessile crustaceans frequently found attached to the decapods mainly in the branchial chamber of the crabs (Jeffries and Voris, 1996).

The crabs have short life span due to molting, and the barnacles occupy space on the gills normally used for respiration, thus the host is debilitated and may die (Jeffries and Voris, 1996); severe case of infection may occur in confined places like fish ponds for portunids restocking and stock enhancement programs (Tweedley, 2017).

The present study represents the first record of the barnacle species *O. angulata* that found attached on the gill crab *P. segnis* off the Iraqi waters of the Arabian Gulf.

MATERIALS AND METHODS

Ten specimens of the crab *Portunus segnis* (Forskål, 1775) were collected from the Iraqi marine waters from October to November 2017 at 29° 37' N to 48° 47' E; the crabs which collected by using trawl nets were transported to the laboratory at the Marine Science Center.

The specimens were frozen for laboratory analysis; the brachyurans were identified according to Lai *et al.* (2010); the cirripedes were carefully removed from the gills of the crabs by forceps; the dorsal carapace of the crabs was removed to inspect epibionts in the branchial chambers. The attached sites epibionts were recorded according to their location on the gill (counting from anterior to posterior) (Voris *et al.*, 1994; Santos *et al.*, 2000). Some specimens were stained with Neutral red mixed with 15% glycerin jelly for about five minutes and then transfer to modify glass slides instead of wooden slide (Humes and Gooding, 1964; Adday, 2013), this method is a modification of the method of Ihwan *et al.* (2014a) which use glycerin jelly only (Pl. 1). The measurements of the cirripedes were done using a calibrated micrometer.

All measurements are in millimeter (mm); specimens were examined under a compound microscope Olympus CX 21 FSI; some of the gills of the crabs with the barnacles were sent to Dr. Alireza Sari of the College of Science, University of Tehran, Iran for confirmation of the identification. Detail morphological characters and measurements of *P. angulata* as in (Pl. 2).

RESULTS AND DISCUSSION

Among the examined crabs, three specimens (out of ten) were infested with *O. ctolasmis* with a prevalence of 30% and mean intensity of 12.3; the carapace length of the crabs were 6-7(6.35) cm, carapace width were 12.0-13.5 (12.67) cm and weight 81.3-96.71 gm (99.14) (Tabs. 1, 2).

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Plate (1): Location and shape of the plates of *O. angulata* (40X).

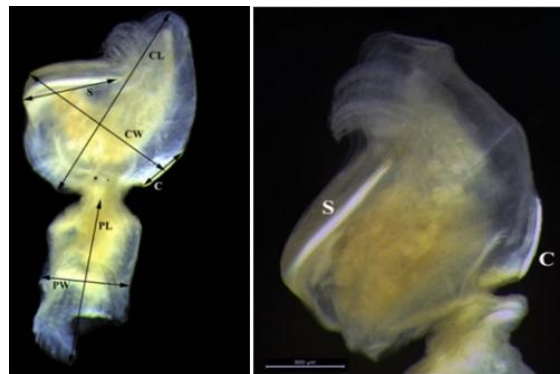


Plate (2): Morphological characters and measurements of *O. angulata* (CL) Carina length, (CW) Carina width, (PL) Peduncle length, (PW) Peduncle width, (S) Scutum, (C) Carina (Scale bar: 0.8 mm).

Table (1): Distribution and means of *O. angulata* on the gills of three infected of *P. segnis* crabs.

Gill filament length (cm)	Proximal region	Middle region	Distal region
3.0	7	1	0
2.8	4	0	0
2.8	10	1	0
2.6	-	2	0
2.0	-	1	0
2.2	-	1	0
2.2	-	2	0
1	8	0	0
Total (mean)	29 (9.67)	8 (2.67)	0

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Table (2): Numbers of *O. angulata* isolated from three *P. segnis* crabs.

Carbs number	Carapace length (cm)	Carapace width (cm)	Weight (gm)	No. of cirripedes
1	6.0	12.3	96.71	0
2	6.5	13.1	113.57	0
3	6.0	13.0	98.58	5
4	6.0	13.3	101.12	0
5	7.0	12.5	81.3	15
6	6.5	12.0	95.33	0
7	6.0	13.5	101.51	17
8	6.0	13.0	97.20	0
9	6.5	12.0	93.95	0
10	7.0	12.0	112.13	0

About 19 of specimens were measured for the length of capitulum, peduncle, scutum and carina of *O. angulata*; detail of measurement (in cm) as in Table (3), the capitular (shell) length 1.63 -2.58 (2.11±0.26). The peduncular length 1.07-3.22 (1.94 ± 0.48) cm, and width 0.61-1.41 cm (1.11±0.23), the length of scutum was 0.999-1.130 cm (1.025), length of carina was 0.631-0.920 cm (0.942).

Table (3): Dimensions of *O. angulata* found in *P. segnis*.

Length of peduncle	Width of peduncle	Length of shell	Width of shell	Length of carina	Length of scutum
1.99	1.17	2.02	1.91	0.61	1.18
1.87	1.34	2.04	1.80	0.68	1.27
2.22	1.26	2.22	2.08	0.89	1.45
1.87	1.01	2.00	1.95	0.72	1.26
2.55	0.99	2.49	2.07	0.96	1.45
1.64	0.61	1.86	1.53	0.57	1.02
1.71	0.90	1.94	1.87	0.75	1.13
1.30	1.01	1.80	1.50	0.57	0.91
1.77	1.41	2.20	1.74	0.70	0.78
1.07	0.66	1.63	1.21	0.50	0.92
1.73	1.25	2.04	1.99	0.75	1.39
2.41	1.26	2.58	1.71	1.71	0.77
3.22	1.36	2.53	2.21	2.21	1.43
2.02	0.93	2.22	1.97	1.97	1.27
2.32	1.15	2.07	1.72	1.72	1.16
1.60	1.05	1.90	1.70	1.70	1.21
1.85	1.30	2.07	1.79	1.79	0.95

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1.80	1.25	2.38	2.21	2.21	1.59
(Avr.) 1.94	1.11	2.11	1.83	1.17	1.17
(S. D.) 0.48	0.23	0.26	0.26	0.63	0.24
(Min.) 1.07	0.61	1.63	1.21	0.50	0.77
(Max.) 3.22	1.41	2.58	2.21	2.21	1.59

The species of *P. segnis* represents one of the most important crabs resources in the Arabian Gulf (Giraldes *et al.*, 2016); the impact of *P. segnis* as an alien species may have an effect on local habitats either by impacting on native keystone species or by taking their places (Rabaoui *et al.*, 2015). About 30 valid species of *Octolasmis* have been identified worldwide, the oldest species was *O. warwicki* Gray, 1825 whereas the most recent was species is *O. unquisiformis* Kobayashi and Katy, 2003 (Chan, 2017; Froese and Pauly, 2018).

According to Lai *et al.* (2010) four species of *Portunus* namely *P. pelagicus*, *P. reticulatus*, *P. armatus* and *P. segnis* were recognized worldwide based on morphological and DNA characters; the barnacle *O. angulata* was reported from high number of hosts. Jeffries *et al.* (1991) listed it in four families, 13 genera and 17 species; from the other hand, Jeffries *et al.* (2005) recorded six species of *Octolasmis*, five of these species recorded from Portunidae (including *O. angulata*), and three species of barnacles from Scyllaridae.

Kumaravel *et al.* (2009) examined 128 individuals of *O. angulata* from three species of *Portunus* namely *P. pelagicus*, *P. sanguinolenis* and *Scylla serrate*; in the present report, no correlation was found between the size of the crab and the numbers of octolasmids (Tab. 2), whereas were strongly correlation in many studies around the world (Rasheed and Mustaqim, 2017; Kumaravel *et al.*, 2009); the barnacles were found most frequently in the gill chamber on the floor of the wall, which a mean capitular length 2.37 mm, and three reduce capitular plates, 2 scuta and a carina; some barnacles like *O. tridens* was found attached to the antennae, external mouth parts and on the base of the chelae and incurrent openings (Jeffries *et al.*, 2005).

In the current study the high density of the barnacle *O. angulata* was incidence in the proximal region of the gill filaments 29 (9.67), the middle region was 8 (2.67), while the distal region was uninfected (Tab.1, Pl. 3); Jeffries *et al.* (2005) reported the distribution of the barnacles inside and outside of gill filaments, such distribution not indicated in the study.

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Plate (3): Distribution of *O. angulata* on the gill filament of *P. segnis* (10X).

Invasive present species are one of the foremost damaging environmental problems in biology and conservation, and can affect human health and man-made structures (Bojko, 2017); the barnacle *P. segnis* may be infected by the other cirripedes, *Heterosaccus dollfus* and *P. segnis* were reported to hosts the barnacle *Chelonibia platula* from Turkish coasts (Özean, 2012); on the other side, Voris and Jeffries (1997) mentioned 28 species of *Octolasmis* in their study, the range of capitular length of 19 specimens of *O. angulata* was 1.15–2.60 mm (1.57), conclude that the host gill chamber affords protection and causes a reduction of capitular plates.

Shahadadi *et al.* (2014) listed four species of *Octolasmis* from unknown locality including *O. angulata*, *O. cor*, *O. lowi*, *O. nirestraszi* and *O. warwicki* from Kuwait; also these species were found attached to the abdomen and pleopods of large crabs, and large crustaceans and distribution in the Indian Ocean (Jones, 1986).

According to Jeffries *et al.* (2005), the main identification tracts of *Octolasmis* species are a body shape and size, the presence or absence of calcareous plates as well as the variations in the plate's size, shape and disposition.

O. angulata was observed in the gill chamber of three hosts crabs of two families: Menippidae and Portunidae, the mean capitular length was 2.40 mm, 3 reduced capitular plates, 2 scuta and a carina (Jeffries *et al.*, 2005). In the present study the capitular (shell) length was 1.63-2.58 mm (2.11 ± 0.26), the capitular width was 1.21-2.21 mm (1.83 ± 0.26); the peduncular length was 1.07-3.22 mm (1.94 ± 0.48), while the peduncular width was 0.61-1.41 mm (1.11 ± 0.23); the scutum length was 0.999-1.130 mm (1.025), the length of carina was 0.631-0.920 mm (0.942). The measurement were carried out to the scutum and carina of the branchial plates because the tergum, if present, is connected to the scutum close to the apex of the barnacle; the tergum is not easily seen in *O. angulata*, in addition to exceptionally small plates (Ihwan *et al.*, 2014b). It was noticed in the present study that identification of this barnacle was quite difficult because their plates are a bit confusing as some looks like *O. core* and some are similar to *O. lowei* (Fig. 1, Tab. 4).

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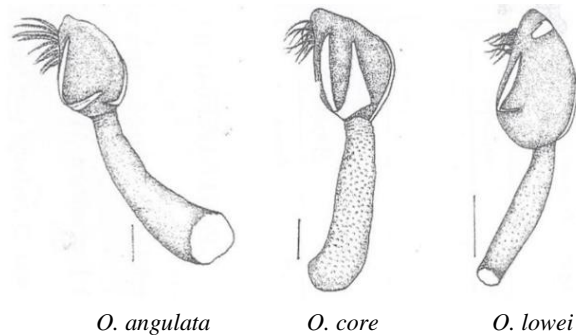


Figure (1): A comparison of the branchial plates of *O. angulate* with *O. core* and *O. lowei* (from Rasheed and Mustaqim, 2017) (Scale bar: 1mm).

Table (4): Comparison of morphological characteristic of *O. angulata* collected from various sources and the present study.

Parameters*	Jeffries <i>et al.</i> (2005)	Chan <i>et al.</i> (2011)	Ihwan <i>et al.</i> (2014 a)	Present study
CL	2.40	1.34	1.6	2.11
CP	3	3	3	3
PL	-	1.15- 4.06	2.2	1.94
No S	2	2	1.8	2
L S	-	-		1.17
P C	✓	✓	✓	✓
L C	-	-	0.9	1.17
No t	-	-	-	-

*CL Capitular Length, CP Capitular Plates, PL Peduncular Length, No. S Number of Scuta, LS Length of Scutum, PC presence of Carina, No t number of terga.

However, Ihwan *et al.* (2014b) recorded *O. angulata*, *O. cor* and three unidentified species, they mentioned that *O. angulata* is have a long and fine shape of calcareous plates, a presence of carina and absence of tergum, in addition to the shape of carina and scutum. Moreover, one of the three unidentified species was similar to *O. lowei* because of its short shape of branched scutum or apparent the calcareous plates were not developed well (Gittings, 1985; Voris and Jeffries, 1997; Ihwan *et al.*, 2014b). The *Octolasmis* species are mostly found in shallow water and only a few found in depths greater than 1000 m, there are no free living adult Octolasmids (Jeffries and Voris, 1996).

It is important to note that the first stage “pupa” of *O. angulata* was recorded for the first time by Nilson-Cantell (1934) together with the younger stage has a total length of 1.1mm, the tergum was absent, and the carina was reduced. In the current article total length of the young stage was 2.52 mm (Pl. 4); cyprid larvae unique feature of barnacles non-feeding, which follows the nauplius stages, the specimen in the current article seems to be recently metamorphosed.

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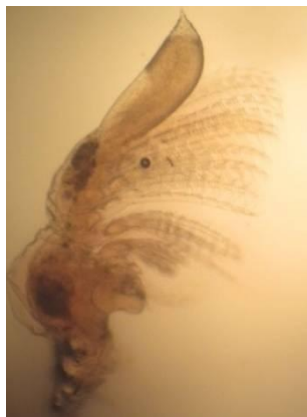


Plate (4): Young specimen of *O. angulata*, (1.446 cm capitular length, 1.078 peduncular length, 40X).

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تسجيل البرنقيل (*Octolasmis angulata* (Aurivillius, 1894)
من غلاصم السرطان السابح الأزرق (*Portunus segnis* (Forskål, 1775)
عند المياه البحرية العراقية

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الخلاصة

جمعت عشرة نماذج من سرطان السابح الأزرق (*Portunus segnis* (Forskål, 1775) عند المياه
البحرية العراقية شمال غرب الخليج العربي، للمدة من أيلول الى تشرين الأول ٢٠١٧ عند 29° 37'
شمالاً الى 48° 47' شرقاً.

سجل النوع (*Octolasmis angulata* (Aurivillius, 1894) على خياشيم سرطان البحر المدروس،
كان معدل نسبة الاصابة ٣٠% بينما كان معدل شدة الاصابة ١٢,٣، يمتلك هذا البرنقيل صفائح
طويلة ونحيفة الشكل مع وجود الصفيحة الجؤجؤية وغياب الصفيحة الظهرية، اضافة الى الشكل
المتطاوّل للصفيحيتين الجؤجؤية والدرعية. تمثل الدراسة الحالية أول تسجيل للبرنقيل
O. angulata في الخليج العربي.