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ORIGINAL RESEARCH ARTICLE

The World Scenario Survey on the Crab External and Internal Parasites, South East Coast of India

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ABSTRACT

The parasites are organisms that derive nourishment and protection from other living organisms known as hosts. These organisms can transfer from one living thing to another as they develop and they can remain in the same host. The parasites that remain on a host's body surface to feed and other activities its ectoparasites, while those that live inside a host's body are called endoparasites and it is a highly successful biological adaptation. The parasites in their crustaceans hosts have often reported a significant impact on host survival, fecundity and growth and it's usually gains all the benefits of this relationship. It's always affecting crustaceans on every form of life and suffers from various diseases. In the present study were collected parasites on the commercially important crabs from external and internal parts. The parasites found in the examined external parts prominent contribution was by polychaete larvae, followed by *Rhizocephalan* sp, Barnacle nauplii, Crab zoea, *Rhizocephalan sacculina*, Ophioplutes larvae, Copepod nauplii, Shrimp zoea, Sea weeds, Ehinopluteus larvae, Diatoms, Oikopleura sp, Fish egg, Crustacean nauplii, Mysis zoea, Fish larvae, Gastropod veliger, *Oikopleura parva*, Dinoflagellates, Bivalve veliger, Alcyonarians, Ascidians, Actiniarians, Sponges, Bryozoans , Echinoderm, Zooanthids and Hydroids. The parasites found in the examined internal parts prominent contribution was by polychaete larvae, followed by *Rhizocephalan* sp, *Rhizocephalan sacculina*, Barnacle nauplii, Crab zoea, Mysis zoea, Ophioplutes larvae, Oikopleura sp, Fish egg, *Oikopleura parva*, Copepod nauplii, Diatoms, Ehinopluteus larvae, Crustacean nauplii, Shrimp zoea, Gastropod veliger, Bivalve veliger, Sea weeds, Ascidians, Bryozoans, Sponges, Alcyonarians, Echinoderm, Actiniarians, Dinoflagellates, Fish larvae, Hydroids and Zooanthids. This study was designed to assess the general knowledge and identify the attitudes of inhabitants of the external and internal parasites on a high awareness, prevention of aquaculture practices and consumer preferences.

Key words: Internal, external, parasites, commercial crab, awareness.

INTRODUCTION

The portunid crabs are common constituents of marine, coastal and near shore habitats. Most upon the crabs omnivorous scavengers, predatory and herbivorous, it can be locomotion in all directions and move sideways [1,2,3]. The parasites are generally harmful to their hosts and also the damage they do ranges widely from little problem to high range of disease [4,5] . It is found anywhere where crab species live, which parasites use for food, housing and reproduction. The parts of crab anywhere, the parasite presented that are observed at an early stage to sub adult and adult also [6]. The capture, transportation and culture of crabs can spread damaging organisms between ecosystems and can impact significantly on a fishery [7,8]. It can affect the general quality of the meat of the crabs and that they are able to control their hosts to increase their rates of transmission. However the crustaceans' parasitology is an important study in aquatic evaluation research. It is play role in marine biodiversity and used as estimates of many species of crab parasites. Different workers have been reported that the parasites of the crab, [9] in land-crabs, Jamaican crabs [10], sand crab *P.pelagicus* [11], blue crab *C. sapidus* [12], blue crab *C.sapidus* [13], blue crab *C. sapidus* [14], crustacean hosts [15], blue crab [16], blue crab *C. sapidus* [17], *S. serrata* [18], *C. maenas* [19]. The parasite has a systematic study is habitually difficult because many of their morphological

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structures have undergone drastic reduction. The present work was carried out the symbionts and host organisms of crabs internally and externally was investigate along palk bay coastal waters.

MATERIALS AND METHODS

The study was carried out for one year from September 2010 to August 2011. The decapod crabs of *S. serrata*, *S. tranguebarica* and *P.pelagicus* were collected from Pointcalimere in Palk bay coastal waters. After reaching the laboratory they were examined for ectoparasites and endoparasites were collected from the parts of crabs. For the carapace of the crabs were split open by a pair of scissors and emptied in a petri dish for examination with the help of zoom dissection binocular microscope. The collected ectoparasites and endoparasites were preserved in 70% alcohol for further identification. The collections of the parasites were made as per the methods and identification of parasites was carried out in accordance with the keys of [20- 24]. The data such as number of crab, number and percentage of parasites collected were tabulate and analysed.

RESULTS AND DISCUSSION

Table 1: The number of the external and internal parasites in different commercial crab

S. No	Name of the crab	Ss		St	Pp	
	Average value of crab	57		53	51	
	Name of the parasite	Exoparasite			Entoparasite	
		Ss	St	Pp	Ss	St	Pp
1	*Okiopleura parva*	4	5	3	3	2	4
2	Oikopleura sp	7	5	4	2	4	3
3	Copepod nauplii	8	7	9	3	4	2
4	Diatoms	5	8	4	3	4	2
5	Dinoflagellates	4	5	3	3	2	1
6	Barnacle nauplii	14	10	12	8	7	9
7	Polychaete larvae	27	19	24	12	10	17
8	Ophioplutes larvae	7	9	12	4	5	2
9	Ehinopluteus larvae	7	6	5	3	4	2
10	Fish egg	5	7	4	3	4	3
11	*Rhizocephalan sacculina*	12	10	9	10	8	7
12	*Rhizocephalan* sp	24	19	15	9	10	13
13	Crustacean nauplii	7	5	4	3	4	2
14	Shrimp zoea	8	7	5	3	4	2
15	Mysis zoea	5	4	7	4	3	5
16	Crab zoea	14	9	10	5	4	7
17	Gastropod veliger	7	5	3	3	4	2
18	Bivalve veliger	4	5	3	3	4	2
19	Fish larvae	5	7	4	2	1	3
20	Sponges	4	3	4	4	1	2
21	Sea weeds	7	5	8	4	2	3
22	Alcyonarians	5	4	3	1	4	2
23	Echinoderm	2	5	3	2	3	2
24	Ascidians	4	5	3	1	4	3
25	Hydroids	1	4	2	1	2	1
26	Zooanthids	2	4	3	1	2	1
27	Actiniarians	3	5	4	2	3	2
28	Bryozoans	3	5	3	2	4	2
	Total	**205**	**192**	**173**	**104**	**113**	**106**

Table 2: The percentage composition of the external and internal parasites in different commercial crab

S. No	Species	Name of the Parasites	Percentage(%)of the ectoparasites	Percentage(%) of the entoparasites
	Ss		0.48	0.75
	St	*Oikopleura*	0.6	0.9
1	Pp	*parva*	0.36	0.6
	Ss		1.12	0.18
	St		0.8	0.36
2	Pp	*Oikopleura* sp	0.64	0.27
	Ss		1.92	0.27
	St	Copepod	1.68	0.36
3	Pp	nauplii	2.16	0.18
	Ss		0.85	0.1
	St		1.36	0.05
4	Pp	Diatoms	0.68	0.1
	Ss		0.48	0.18
	St		0.6	0.12
5	Pp	Dinoflagellates	0.36	0.06
	Ss		1.36	0.27
	St	Barnacle	0.68	0.18
6	Pp	nauplii	0.85	0.36
	Ss		18.9	4.68
	St	Polychaete	13.3	3.9
7	Pp	larvae	16.8	6.63
	Ss		1.89	0.44
	St	Ophioplutes	2.16	0.55
8	Pp	larvae	3.24	0.22
	Ss		1.26	0.27
	St	Ehinopluteus	1.08	0.36
9	Pp	larvae	0.9	0.18
	Ss		0.8	0.3
	St		1.12	0.4
10	Pp	Fish egg	0.64	0.3
	Ss		5.16	3.8
	St	*Rhizocephalan*	4.3	3.04
11	Pp	*sacculina*	3.87	2.66
	Ss		6.44	1.14
	St	*Rhizocephalan*	7.82	0.95
12	Pp	sp	6.9	1.52
	Ss		1.12	0.24
	St	Crustacean	0.8	0.32
13	Pp	nauplii	0.64	0.08
	Ss		1.6	0.27
	St		1.4	0.36
14	Pp	Shrimp zoea	1.0	0.18
	Ss		0.8	0.48
	St		0.64	0.36
15	Pp	Mysis zoea	1.12	0.6
	Ss		4.62	0.8
	St		2.97	0.64
16	Pp	Crab zoea	3.3	1.12
	Ss		1.05	0.27
	St	Gastropod	0.75	0.36
17	Pp	veliger	0.45	0.18
	Ss		0.48	0.24
	St		0.6	0.32
18	Pp	Bivalve veliger	0.36	0.08
	Ss		0.8	0.1
	St		1.12	0.05
19	Pp	Fish larvae	0.64	0.1
	Ss		0.44	0.28
	St		0.33	0.07
20	Pp	Sponges	0.44	0.14
	Ss		0.18	0.14
	St		0.27	0.07
21	Pp	Sea weeds	0.36	0.28
	Ss		0.6	0.07
	St		0.48	0.28
22	Pp	Alcyonarians	0.36	0.14
	Ss		0.2	0.14
	St		0.5	0.21
23	Pp	Echinoderm	0.3	0.14
	Ss		0.48	0.08
	St		0.6	0.32
24	Pp	Ascidians	0.36	0.24
	Ss		0.07	0.04
	St		0.28	0.08
25	Pp	Hydroids	0.14	0.04
	Ss		0.18	0.04
	St		0.36	0.08
26	Pp	Zoanthids	0.27	0.04
	Ss		0.36	0.14
	St		0.6	0.21
27	Pp	Actiniarians	0.48	0.14
	Ss		0.33	0.16
	St		0.55	0.32
28	Pp	Bryozoans	0.33	0.16

In the present study investigation of the *Oikopleura parva*, it was occurs on the number of crab ectoparasites like *S.serrata* (4) *S. tranquebarica* (5) and *P. pelagicus*(3), Oikopleura sp it was presented in numbers on external regions of *S. serrata* (7), *S. tranquebarica* (5) and *P. pelagicus*(4), Copepod nauplii it was occurs on the number on external region of *S. serrata* (8), *S.tranquebarica* (7) and *P. pelagicus*(9), Diatoms it was occurs on the number on external parts of *S. serrata* (5), *S. tranquebarica* (8) and *P. pelagicus*(4), Dinoflagellates it was collected on the number on external region of *S. serrata*(4), *S. tranquebarica* (5) and *P. pelagicus*(3), Barnacle nauplii it was presented in numbers on external site of *S. serrata*(14), *S. tranquebarica* (10) and *P. pelagicus*(12), Polychaete larvae it was observed on the number on external sites of *S.serrata* (27), *S.tranquebarica* (19) and *P. pelagicus*(24). The Ophioplutes larvae it was presented in numbers on external host of *S. serrata*(7), *S. tranquebarica* (9) and *P. pelagicus*(12), Ehinopluteus larvae it was occurs on the number on external regions of *S. serrata*(7), *S.tranquebarica*(6) and *P. pelagicus*(5), Fish egg it was presented in numbers of crab on external site of *S.serrata*(5), *S.tranquebarica* (7) and *P. pelagicus*(4), *Rhizocephalan sacculina it* was occurs on the number on external region of *S. serrata*(12), *S. tranquebarica*(10) and *P. pelagicus*(9), *Rhizocephalan* sp it was occurs on the number on external parts of *S. serrata*(24), *S. tranquebarica* (19) and *P. pelagicus*(15). The Crustacean nauplii it was presented in numbers on external sites of *S. serrata*(7), *S. tranquebarica* (5) and *P.pelagicus*(4), Shrimp zoea it was occurs on the number on external parts of *S. serrata*(8), *S. tranquebarica* (7) and *P. pelagicus*(5), Mysis zoea it was presented in numbers on external sites of *S.serrata*(5), *S. tranquebarica* (4) and *P. pelagicus*(7), Crab zoea it was observed on the number on external parts of *S. serrata*(14), *S. tranquebarica* (9) and *P.pelagicus*(10), Gastropod veliger it was presented in numbers on external region of *S. serrata*(7), *S. tranquebarica* (5) and *P.pelagicus*(3), Bivalve veliger it was collected in numbers of crab on external regions of *S. serrata*(4), *S. tranquebarica* (5) and *P. pelagicus*(3), Fish larvae it was presented in numbers on external region of *S.serrata* (5), *S. tranquebarica* (7) and *P. pelagicus*(4), Sponges it was observed in numbers on external parts of *S. serrata*(4), *S. tranquebarica* (3) and *P. pelagicus*(4). The Sea weeds it was collected in numbers on external sites of *S. serrata*(7), *S. tranquebarica* (5) and *P. pelagicus*(8), Alcyonarians it was occurs on the number on external inhabitants of *S. serrata*(5), *S. tranquebarica* (4) and *P.pelagicus*(3), Echinoderm it was occurs on the number on external region of *S. serrata*(2), *S. tranquebarica* (5) and *P. pelagicus*(3), Ascidians it was observed in numbers on external parts of *S. serrata*(4), *S. tranquebarica* (5) and *P. pelagicus*(3), Hydroids it was collected on the number on external region of *S. serrata*(1), *S. tranquebarica* (4) and *P. pelagicus*(2), Zooanthids it was presented in numbers on external host of *S.serrata*(2), *S. tranquebarica* (4) and *P. pelagicus*(3), Actiniarians it was observed on the number on external locations of *S. serrata*(3), *S.tranquebarica* (5) and *P. pelagicus*(4). The Bryozoans it was collected in numbers on external parts of *S.serrata*(3), *S.tranquebarica* (5) and *P. pelagicus*(3). In the present study indicate that the *Oikopleura parva*, it was occurs on the number of crab entoparasites such as *S.serrata* (3), *S. tranquebarica* (2) and *P. pelagicus*(4), Oikopleura sp it was presented in numbers of internal parts of *S. serrata*(2),*S. tranquebarica*(4) and *P. pelagicus*(3), Copepod nauplii it was occurs on the number of internal sites of *S. serrata*(3), *S. tranquebarica* (4) and *P. pelagicus*(2). The Diatoms it was occurs on the number of internal regions of *S. serrata*(3), *S.tranquebarica* (4) and *P.pelagicus*(2), Dinoflagellates it was collected on the number of internal parts of *S. serrata*(3), *S. tranquebarica* (2) and *P. pelagicus*(1), Barnacle nauplii it was presented in numbers of internal sites of *S. serrata*(8), *S. tranquebarica* (7) and *P. pelagicus*(9), Polychaete larvae it was observed on the number of internal parts of *S. serrata*(12), *S. tranquebarica* (10) and *P.pelagicus*(17), Ophioplutes larvae it was presented in numbers of internal sites of *S.serrata*(4), *S. tranquebarica* (5) and *P. pelagicus*(2). The Ehinopluteus larvae it was occurs on the number of internal parts of *S. serrata*(3), *S.tranquebarica* (4) and *P. pelagicus*(2), Fish egg it was presented in numbers of internal areas of *S. serrata*(3), *S. tranquebarica* (4) and *P.pelagicus*(3), *Rhizocephalan sacculina* it was occurs on the number of internal site of *S. serrata*(10), *S.tranquebarica* (8) and *P. pelagicus* (7), *Rhizocephalan* sp it was occurs on the number of internal parts of *S. serrata*(9), *S.tranquebarica* (13) and *P. pelagicus* (10), Crustacean nauplii it was presented in numbers of internal regions of

S.serrata(3), *S. tranquebarica* (4) and *P.pelagicus*(2), Shrimp zoea it was occurs on the number of internal sites of *S.serrata*(3), *S. tranquebarica* (4) and *P. pelagicus*(2), Mysis zoea it was presented in numbers of internal sites of *S. serrata*(4), *S. tranquebarica* (3) and *P.pelagicus*(5), Crab zoea it was observed on the number of internal parts of *S. serrata*(5), *S. tranquebarica* (4) and *P. pelagicus*(7), Gastropod veliger it was presented in numbers of internal regions of *S. serrata*(3), *S. tranquebarica* (4) and *P. pelagicus*(2), Bivalve veliger it was collected in numbers of internal parts of *S. serrata*(3), *S. tranquebarica* (4) and *P. pelagicus*(2), Fish larvae it was presented in numbers of internal sites of *S. serrata*(2), *S. tranquebarica* (1) and *P.pelagicus*(3),Sponges it was observed in numbers of internal regions of *S. serrata*(4), *S. tranquebarica*, (1) and *P. pelagicus* (2), Sea weeds it was collected in numbers internal sites of *S. serrata* (4), *S. tranquebarica* (2) and *P.pelagicus*(3). The Alcyonarians it was occurs on the number of internal parts of *S. serrata*(1), *S. tranquebarica* (4) and *P. pelagicus*(2), Echinoderm it was occurs on the number of internal sites of *S. serrata*(2), *S. tranquebarica* (3) and *P.pelagicus*(2), Ascidians it was observed in numbers of internal regions of *S. serrata*(1), *S.tranquebarica* (4) and *P. pelagicus*(3), Hydroids it was collected on the number of internal parts of *S. serrata*(1), *S. tranquebarica* (2) and *P. pelagicus*(1), Zooanthids it was presented in numbers of internal sites of *S.serrata*(1), *S. tranquebarica* (2) and *P. pelagicus*(1). The Actiniarians it was observed on the number of internal parts of *S. serrata*(2), *S. tranquebarica* (3) and *P.pelagicus*(2), Bryozoans it was collected in numbers of internal sites of *S. serrata* (2), *S. tranquebarica* (4) and *P. pelagicus*(2) (Table1&2).

The parasites in crabs are a natural occurrence and indicative of a healthy environment, the parasite of crustaceans mostly in any ecosystem is affected by host availability and characteristic and behavioral patterns, availability of intermediate hosts and physico-chemical characteristics of the waters. Almost all groups of animals and plants contain at least a few parasites. Parasites are a group of organisms that can and cannot cause illness in crab, depending on a number of factors. The portunid crabs presented many symbionts of parasites due to the environmental factors, it is vital role of parasites as for recruitment, transmission, colonization, fecundity and survival. Similar study were made by previous studies, low salinities, *O. mulleri* [25], *L. texanus* [26], *C. indica* and *C. mitsukurii* [27] and low temperatures *C. mitsukurii* on *P. pelagicus* [27]. The host factors like molt stage, size, age and maturity status contribute significantly to the infestation dynamics of several parasites and symbionts in other portunid crabs [28].

In the present study were investigate the different symbionts parasites recorded from the external and internal parts of commercial crabs such as, *S. serrata, S.tranguebarica* and *P. pelagicus* during the study period are presented in Table1&2. The parasites found in the examined external parts prominent contribution was by polychaete larvae (70), followed by *Rhizocephalan* sp (58), Barnacle nauplii(36), Crab zoea (33), *R. sacculina* (31), Ophioplutes larvae(28), Copepod nauplii(24), Shrimp zoea(20), Sea weeds(20), Ehinopluteus larvae(18), Diatoms(17), Oikopleura sp(16), Fish egg (16), Crustacean nauplii(16), Mysis zoea(16), Fish larvae(16), Gastropod veliger(15), *O. parva* (12), Dinoflagellates(12), Bivalve veliger(12), Alcyonarians(12), Ascidians(12), Actiniarians(12), Sponges(11), Bryozoans(11), Echinoderm(10), Zooanthids(9) and Hydroids(7). The parasites found in the examined internal parts prominent contribution was by polychaete larvae (39), followed by *Rhizocephalan* sp(32), *R. sacculina* (25), Barnacle nauplii (24), Crab zoea(16), Mysis zoea(12), Ophioplutes larvae(11), Oikopleura sp(10), Fish egg(10), *O. parva* (9), Copepod nauplii (9), Diatoms(9), Ehinopluteus larvae(9), Crustacean nauplii(9), Shrimp zoea(9), Gastropod veliger (9), Bivalve veliger(9), Sea weeds (9), Ascidians(8), Bryozoans(8), Sponges(7), Alcyonarians(7), Echinoderm(7), Actiniarians(7), Dinoflagellates (6), Fish larvae (6), Hydroids(4) and Zooanthids(4) (Table1&2).

The crustacean farming as a major aquaculture activity is well established in many countries. Recently, crab farming accounts for partitioned as 70% wild fishery and 30% aquaculture world crab production. However, critical damage to crustacean fisheries worldwide has been associated with parasites. Internal and external parasites can cause poor performance of crab and can lead to economic loss for the farmer. Ecosystems, like food and water are the most common sources of parasite and invading organism transmission. The parasites found in crab can vary in size from organisms that cannot be seen by the naked eye and also the ranging in size from tiny, single celled organisms to worms

visible to the naked eye. Wild or cultured in candidate species like commercial crab can be infected with various parasites, it can invade crab bodies through food and water intake, through transmitting agents in diverse ways. Internal and external parasites tend to infest young, sub adult and adult crabs most commonly [12,13]. Parasites that live on the surface and internal parts of the host, most parasites are beneficial not a cause of host. Most upon the parasites are usually smaller or larger and more powerful than their host. Both the adults and immature stages of parasites feed by devouring their crab or by sucking their crab fluids, as for example the Polychaete, Oikopleura sp, Barnacle, *Rhizocephalan* sp and *R. sacculina* worms finds a crab, it slides inside at a joint and spreads feeding tubes throughout its host's body. Minute stages of larvae attached on the esophagus and foregut, midgut and hindgut, brood pouch etc., a number of parasites even continued to penetrate the intestine wall into the body cavity, extending as far as the liver and gonads. The presence of parasite eggs caught between the parasites and gut wall can lead to epithelial abrasion, exfoliation of host cells and indentation of the mucosa. Host tissue surrounds the posterior part of the parasite, but as the host encapsulation is incomplete, the surrounding tissue becomes necrotic due to invasion of sea water through the eroded tissues [30,31]. In some situations, it will also be a good idea to move a wounded crab to a fattening and anywhere culture since a wounded crab can serve as a breeding ground for commonly occurring parasites that would normally not be able to affect the healthy crab in culture area. Selected species can have parasites lurking around in culture for years without noticing it, until a wounded crab gives them a chance to multiply and start attacking healthy crab in huge numbers.

In the present study indicate that the use of a culture can make parasite treatment unnecessary in many situations. Even the safe and effective treatment and control methods exist for most internal and external parasites and most parasite treatments are stressful for the cultured species. The prevention and correction of parasitism is based on knowledge of factors that affect both the survival of parasites in the environment and their transmission to the host. Increased interest in crab culture has also increased awareness and experience with parasites that can be affected crab in differentially like, health, growth, survival, shell discoloration, chalky in hemolymph, quality changes and market price. The parasites generally don't kill their crabs, but some can severely stress and also the crab populations can be reduced. Due to the observed and identified of parasite occurs in many parts of commercial crabs, externally such as, antennae, carapace, coxa, merus, carpus, propodus, palm, polex, abdomen, front, antennae, abdominal segment, branchial chamber, anterolateral teeth, central grave, lateral spine, eyestalk, eye, orbit, rostrum, immovable finger, movable finger and cheliped and internally following them, oviducts, digestive gland, ovary, proventriculus, heart, gastric mussel, gills, flank, ostia, branchial chamber, maxillepedal flabellae, gills, hemolymph, body fluid, etc., however, information provided in this globular is future for the cultivable on the crustacean culturist as a guide to common parasites of crab. Similar observations were also made by [29] studied the parasitic oligochaete and other inhabitants of the gill chambers of land crabs. [30] studied Tte parasites and commensals of some crabs of Beaufort, North Carolina. [10] studied that the effects of sacculinid parasites on two Jamaican crabs. [12] studied that the physiology and nutrition of *L. callinectes*, a fungal parasite of the blue crab *C. sapidus*. [13] reported that the protozoan symbionts and related diseases of the blue crab, *C. sapidus*. [14] reported that the distribution, size and reproduction of the pendunculate barnacle, *O. mulleri* [31], on the blue crab, *C. sapidus*. [32] reported that the effects of crustacean parasitic castrators on growth of their crustacean hosts. [35] studied distribution of *O. mulleri*, an ectocommensal gill barnacle on the blue crab. [17] studied that the physiological effects of an ectocommensal gill barnacle, *O.muelleri*, on gas exchange in the blue crab, *C. sapidus*. [18] studied that the age of the mangrove crab *S. serrata* at colonization by stalked barnacles of the genus Octolasmis. [7] studied the parasites and symbionts of the crab *P. pelagicus* from Moreton Bay, eastern Australia.[34] reported that the physiological effects of a gill barnacle on host blue crabs during short-term exercise and recovery. [35] have been reported the effects of parasitism by the barnacle *L. panopaei* (Gissler) (Cirripedia: Rhizocephala) ongrowth and survival of the host crab *R. harrisii* (Gould) (Brachyura: Xanthidae).[36] studied distribution of *L. texanus* (Cirripedia: Rhizocephala) parasitizing crabs of the genus *Callinectes*. [37] studied that the parasitization of *C.rathbunae* and *C. sapidus* by the rhizocephalan barnacle *L. texanus*. [38] studied notes on the population structure of the

portunid crab, *C. longicollis*, parasitized by the rhizocephalan, *H. dollfusi*.

The crustaceans, just like crabs, can become infected with parasites and unhealthy organisms. Internally, contaminated water and food can spread the problem to species inhabitants. Externally, crustaceans become infected by organisms on their bodies, because of exposure to infected animal wastes. Even in the industrialized nations of the world, almost everybody has some kind of health problem. Internal and external parasites can cause great discomfort, transmit disease to shellfish and significantly interfere with the relationship between people and animals. The parasites are relatively uncommon in crab parts and are easily destroyed by normal processing and cooking procedures, they rarely cause public health problems arise only when shellfish are consumed raw and lightly preserved crab [39,40]. In the present investigations clearly show that the parasite data can be an economically important indicator for seafood processing area and depends people to get a better understanding of the occurrence of potential harmful parasites and the natural infestation patterns in order to estimate the real threat to human consumers as well as to the crab handling industry. However, this study supports our findings and indicates that parasites of crab has been use full for the practiced by the aquacultures since long and has become a part of our cultural heritage.

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