

Effect of Locality, Host Species and Sex on the Metazoan Parasitic Infestation of Two, Species of *Scarus* Fish from the Red Sea Coast at Jeddah and Rabigh in Saudi Arabia

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Abstract

A total number of 60 specimens of two different species of *Scarus* fish caught from the Red Sea coast at Jeddah (30) and Rabigh (30) cities in Saudi Arabia were examined to determine their metazoan parasitic fauna, their prevalences, and mean intensities. Collected parasites were identified as, Isopoda (praniza larva of *Gnathia* sp.), Copepoda (*Hatschekia* sp.) Monogenea (*Diplectanum* sp.) and Digenea (*Lecithoclaster* and *Bucephalus* spp). Out of 30 specimens of fish caught from Jeddah coast 13 (43.4%) were infested by 90 parasites comprising of two parasite species, praniza larva and *Hatschekia* sp., with prevalence of infestation 40% and 3.33%, and mean intensity 7 and 6 parasites per fish respectively. 19 (63.3%) of *Scarus* fish caught from Rabigh coast were infested by 205 parasites representing 4 parasite spp. *Diplectanum* sp. represents the most commonly encountered parasite with prevalence (53.3%) and mean intensity (10.94%), followed by (*Lecithoclaster* sp. then praniza larva, prevalences (16.66% and 13.3%) and mean intensities (3.4. and 1.75) respectively. *Bucephalus* sp. showed the minor, prevalence (3.33%) and mean intensity (6). Generally *Scarus* fish species from Rabigh had higher prevalence and mean intensity (63.3% and 7.59%) than *Scarus* fish species from Jeddah (43.4% and 6.92%). Female fish from Jeddah showed no parasitic infestation, while males were infested (prevalence 65% and mean intensity 6.92). Female fish from Rabigh had higher prevalence (84.21) and lower intensity (6.43) than males which showed prevalence (27.27%) and intensity (19). Relationship between parasitic infestation and fish species and sex were also studied in the two different localities and discussed.

Keywords

Scarus Fish, Metazoan Parasites, Prevalence, Intensity, Fish Species, Fish Sex,

Red Sea

1. Introduction

Both wild and farmed marine fish face a wide range of threats, including parasites that impair their health, growth, and survival. Such parasite-related threats cause economic losses to fish farmers [1].

Among the parasites affecting fish health are parasitic crustaceans and monogenetic trematodes that cause severe destruction of fish gills, leading to anemia and death [2] [3]. Multiple factors can alter the relationships between host fishes and their parasites [4] [5] [6] [7].

Monogenea and parasitic crustaceans (Isopoda and Copepda) as well as digenetic trematodes have been studied in various species of *Scarus* fish (Scaridae) worldwide.

Jones and Cabral [8] described *Hatschekia manea* (Copepoda) from the gills of *Scarus gibbus* in the South Pacific Ocean. The variability in the interactions between seven reef fish species (including *Scarus sordidas*) and their ectoparasitic fauna were studied by Alexandra [9] from Australia. Williams and Bunkly-Williams [10] recorded *Nerocila californica* (Isopoda) from the external body surface and gills of *Scarus compressus* from the Eastern Pacific Ocean. Parasitic crustaceans, including praniza larvae of *Gnathia* sp. and *Hatschekia leptoscari*, were described and recorded by Toulah [11] and Bakhrebah [12] from *Scarus ferrugineus* from the Red Sea by Jeddah, Saudi Arabia. Morsy *et al.* [3] described *Diplectanum harid* (Monogenea) from the gills of the parrotfish *Scarus harid* from the Red Sea near Hurghada, Egypt. Kardousha [13] studied the helminth parasites of 51 marine fish species from the Arabian Gulf and referred to the infestation of the parrot fish *Scarus gobban* with digenetic trematoda and acanthocephala. Some of the ecto- and endoparasites of *Scarus* fish, (praniza larva, *Hatschekia*, *Bucephalus* and *Lecithocladium spp.*) were also recorded from other different fishes from the Red Sea coast of Jeddah city in Saudi Arabia [11] [14] [15]. Most of the previous mentioned studies were taxonomic.

The aim of the present investigation is to review the different types of metazoan parasites infesting two different species of *Scarus* fish (Family Scaridae) from the Red Sea coast of Saudi Arabia with special reference to their host-parasite relationship.

2. Materials and Methods

The present study was carried out on total number of 60 specimens of two different species of Scarid, parrot fish (Family Scaridae). Each species consisted of 30 fish of different sexes, one caught from Jeddah and the other from Rabigh cities at the Red Sea coast of Saudi Arabia.

Captured fishes were freshly brought to the laboratory and their sexes were

determined. Skin surface, fins and gills were visually examined for any external parasites with the help of a dissecting microscope. Visceral organs of fish were slit open and their contents were collected in Peteri dishes then examined under a dissecting microscope. Copepoda and Isopoda were preserved in 10% buffered formalin and cleared with lactophenol. Trematodes were preserved in formalin-alcohol-acetic acid and stained with Semichons acetic carmine stain.

Statistical analyses were done by using Mann Whitney U test or student t-test. Significant level was at 0.05.

3. Results

Parasitological examination revealed that *Scarus* fish under consideration harboured Monogenea, Isopoda and Copepoda on their gills and Digenea in their intestines. **Table 1** represents the five species of parasites collected from the two different species of *Scarus* fish of Jeddah and Rabigh, their prevalences and mean intensities.

Diplectanum sp. from *Scarus sp.* of Rabigh was the most common parasite, followed by praniza larva from *Scarus sp.* of Jeddah, followed by *Lecithoclaster sp.* from *Scarus sp.* of Rabigh. *Hatschekia* and *Bucephalus spp.* were the minority. Generally *Scarus* fish species from Rabigh had higher prevalence and mean intensity of parasite than those from Jeddah. Monogenea and Digenea were not represented in *Scarus* fish from Jeddah as well as Copepoda in *Scarus* fish from Rabigh. Difference in the prevalence of infestations and parasite intensities for

Table 1. Prevalence (%) and intensity (M ± S.E.) of different parasites infesting the two *Scarus* fish species from Jeddah and Rabigh.

Parasite sp.	Jeddah				Rabigh			
	No. of fish Infected (%)	No. of parasite	Mean intensity (range)	M ± S.E	No. of fish Infected (%)	No. of parasite	Mean intensity (range)	M ± S.E
Monogenea: <i>Diplectanum sp.</i>	-	-	-	-	16 (53.3)	175	10.94 (2 - 30)	10.94 ± 2.85
Isopoda: Praniza larva of <i>Gnathisa sp.</i>	12 (40)	84	7 (1 - 15)	7 ± 1.66	4 (13.3)	7	1.75 (1 - 3)	1.75 ± 0.48
Copepoda: <i>Hatschekia sp.</i>	1 (3.33)	6	6 (6)	-	-	-	-	-
Digenea: <i>Bucephalus sp.</i>	-	-	-	-	1 (3.33)	6	6 (6)	-
<i>Lecithoclaster sp.</i>	-	-	-	-	5 (16.66)	17	3.4 (2 - 5)	3.4 ± 0.68
Total Digenea	-	-	-	-	6 (20)	23	3.8 (2 - 6)	3.8 ± 0.70
No. of fish examined		30				30		
No. of fish infected (%)	13 (43.4)	-	-	-	19 (63.3)	-	-	-
No. of Parasite species	-	2	-	-	-	4	-	-
No. of Parasites	-	90	-	-	-	205	-	-
Total mean intensity	-	-	3.92 (1 - 15)	6.92 ± 1.53	-	-	7.59 (1 - 30)	7.59 ± 1.86

each fish species in the two different localities was not significant (significant value = 0.651).

All female *Scarus* fish of Jeddah were not infested. Males of the same species were infested with pranza larva of *Gnathia sp.* and *Hatschekia sp.* with overall prevalence (65%) and mean intensity 6.92 (Table 2). Male *Scarus* fish from Rabigh were infested with only one parasite species, *Diplectanum sp.* (prevalence 27.3% and mean intensity 19) while females showed higher prevalence and lower intensity of monogenetic infestation than male fishes and were infested with four parasite species, with overall prevalence and mean intensity of parasite (84.2%) and (6.43) respectively (Table 3).

Statistical analysis showed significant difference in the prevalence and mean intensity of parasite between female and male fish (Significant value = 0.029).

4. Discussion

The present study, up to our knowledge, is the first done in Saudi Arabia Red Sea coast (Jeddah and Rabigh) to show the parasitic fauna (type and number of species and degree of parasitic infestation in relation to some factors) in two species of *Scarus* fish.

Distinct variation in composition of the parasitic fauna was noted in the two different localities. In Jeddah, *Scarus* fish was infested with parasitic Crustacea on their gills (Isopoda and Copepoda) while in Rabigh it was infested with Trematoda (Monogenea on their gills and Digenea in their intestines). Bauer [16] and Ramadan and Shakweer [17] reported that the type and rate of parasitic infestation in fishes depend on ecological and hydrobiological conditions of water. Barse [5] investigated the prevalence and intensities of gill parasites of *Fundulus heteroclitus* from two creeks different in salinity. He found that parasite densities were greater in the less saline creek for all collected parasite taxa.

Host specificity phenomenon was well established in this work where Monogenea, *Diplectanum sp.* showed the highest prevalence and mean parasitic intensity

Table 2. comparison of prevalence (%) and intensity (M \pm S.E.) of different parasites infecting female and male examined *Scarus* fish in Jeddah.

Parasite sp.	Female				Male			
	No. of fish Infected (%)	No. of parasite	Mean intensity (range)	M \pm S.E.	No. of fish Infected (%)	No. of parasite	Mean intensity (range)	M \pm S.E.
Isopoda: Pranza larva of <i>Gnathisa sp.</i>	0.00	0.00	0.00	0	12 (60)	84	7 (1 - 15)	7 \pm 1.66
Copepoda: <i>Hatschekia sp.</i>	0.00	0.00	0.00	0	1 (5)	6	6 (6)	-
No. of fish examined		10				20		
No. of fish infected (%)	0.00	0.00	0.00	0.00	13 (65)	2	0.00	0.00
No. of Parasite species	0.00	0.00	0.00	0.00	0.00	90	6.9 (1 - 15)	6.92 \pm 1.53
No. of Parasites	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total mean intensity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 3. comparison of prevalence (%) and intensity ($M \pm S.E.$) of different parasites infecting female and male examined *Scarus* fish in Red Sea of Rabigh.

Parasite sp.	Female				Male			
	No. of fish Infected (%)	No. of parasite	Mean intensity (range)	$M \pm S.E$	No. of fish infected (%)	No. of parasite	Mean intensity (range)	$M \pm S.E$
Monogenea: <i>Diplectanum</i> sp.	13 (68.4)	118	9.08 (2 - 30)	9.08 (2 - 30)	3 (27.3)	57	19 (7 - 25)	19 \pm 6.0
Isopoda: Praniza larva of <i>Gnathia</i> sp.	4 (21.05)	7	1.75 (1 - 3)	1.75 \pm 0.48	-	-	-	-
Digenea: <i>Bucephalus</i> sp.	1 (2.26)	6	6 (6)	-	-	-	-	-
<i>Lecithocaster</i> sp.	5 (26.32)	17	3.4 (2 - 5)	3.4 \pm 0.68	-	-	-	-
	6 (31.59)	23	3.8 (2 - 6)	3.8 \pm 0.70	-	-	-	-
Total Digenea			19				11	
No. of fish examined	16 (84.21)	-	-	-	3 (27.27)	-	-	-
No. of fish infected (%)	-	4	-	-	-	1	-	-
No. of Parasite species	-	148	-	-	-	57	-	-
No. of Parasites	-	-	6.43 (1 - 30)	6.43 \pm 0.85	-	-	19 (7 - 25)	19 \pm 6.0
Total mean intensity	-	-	-	-	-	-	-	=

and was collected from the gills of *Scarus sp.* of fish from Rabigh only. This was lined up with Llewlyn [18], Rhode [4] and Whittington *et al.* [6]. They reported that most of the Monogenean gill parasite was found to be strictly specific to particular host. Llewlyn [18] proved that there was an exacting topographical relationship between a parasite and its host and this was probably an important factor in the mechanism of host specificity.

Praniza larva infested the two *Scarus sp.* with lower prevalence and intensity of parasites than *Diplectanum sp.* According to Sasal *et al.* [19] *Diplectanum sp.* could be classified as a specialist parasite of fish species (found only in one species) and Praniza larva as generalist (found in two or many host species).

In Rabigh, a statistically significant finding was observed where the female fish of *Scarus sp.* was infested with four parasite species while male fish had only one species (*Diplectanum sp.*). Prevalence of Monogenetic and overall parasite infestation was higher in female than male fishes, but the reverse was seen in the mean intensity. These findings may be due to mode of life, physiological and behavioral characters of each sex. Another interesting finding was found in Jeddah where no female fish showed any infestation as opposed to male that showed infestation with only parasitic crustacea (Isopoda and Copepoda). Our findings are different to Khalil [20], Barse [5], Adou *et al.* [21] and Aydogdu *et al.* [22] who found no definite difference in the prevalence and intensity of parasitic infestation according to fish sex.

In summary, this study identifies a variety of factors that might influence the parasitic fauna of *Scarus* fish species in the Red Sea coast of Saudi Arabia.

Further studies are warranted to identify additional factors in our region and

explain the interesting finding of sex effect demonstrated in our work.

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