

A Comparison Study Between External Parasites that Infect *Scarus* Fish (Osteichthyes) and *Carcharhinus melanopterus* Fish (Chondrichthyes) in Red Sea Coast of Jeddah, Saudi Arabia

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The type of hosts that parasites choose is an interesting topic of study. The harmful diseases that infect marine animals are mostly known to be parasitic, such as monogeneans, Copepods and Isopods infections. The primary purpose of this study was to determine the parasitic infections of shark (*Carcharhinus melanopterus*) and of *Scarus* fish in the Red Sea located in Jeddah City of Saudi Arabia. For this purpose, 33 *Carcharhinus melanopterus* and 30 *Scarus* fish were examined for ectoparasites using wet mount under a light microscope. Collected parasites were identified as, monogenea (*Dactylogyrus* sp and *Erpocotyletiburonis*), Copepoda (*Pandarus sinuatus*, *Anchistrotos tangi* and *Hatschekia* sp) and Isopoda (praniza larva of *Gnathiasp*). The second purpose of this study was to compare the percentage between *Scarus* (Osteichthyes) and shark fish (Chondrichthyes) in terms of parasitic infection. Our findings revealed that Monogenea and Copepod infections were found on gills of sharks while *Scarus* fish were infected by Copepod and Isopod parasites. Parasitic infections can be caused by a number of factors; it might include the biological and ecological characteristics of the parasite and the host it infests.

Keywords: Comparison, *Carcharhinus Melanopterus*, *Scarus* fish, Monogenea, Copepoda, Isopoda, Chondrichthyes, Osteichthyes, Red Sea, Saudi Arabia (Jeddah).

Fish are considered an important nutritional source among many cultures especially in coastal areas and fish are signified from other meats due to its cheap economical cost and digestibility and the fact that it contains many essential elements like proteins, phosphorus, potassium and more.

Fish resources are considered one of the most important economical sources in kingdom of Saudi Arabia which is a reason of why authorities are interested in establishing different fish farms and rearing different types of fish to satisfy the needs of the population.

Fish from different water natures and especially in fish farms get infected with different types of external and internal parasites that can be rapidly contagious due to the fish being crowded together. This can cause major loss in the fish industry and therefore effects the fishery resources of a country. In addition, humans feeding on the infected fish can cause them various diseases and these parasites are known to have various impacts on the infected fish that can lead to death of the fish.

Parasites are usually the least known component of biodiversity, although they can be

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considered a diverse ecosystem, if not the most, on the planet (Reaka-Kudla 1997). Parasitic diseases that infect fish are one of the most common catastrophes that effect fish growth as well as its production rate.

The Red Sea is one of the common areas of biodiversity in the world. It has a very high rate of endemism compared to adjacent marine areas (DiBattista *et al.* 2016). In the Red Sea, infections are intense, which is a reason of why Monogenea, parasitic Crustacea (Isopod and Copepd) and Digenetic Trematode were collected from different species of fish.

Monogenea is one of the largest classes of phylum Platyhelminthes, and they possess anterior and posterior attachment apparatus that are used for locomotion, feeding, and host-to-host transfer as well as attachment (Yamaguti 1963, Tinsley and Owen 1975, Kearns 1998). Monogenea infections are easily considered a major problem on requiem fish (Carcharhinidea) and *Scarus* fish, resulting in diseases and death (Rand *et al.* 1986, Cheung *et al.* 1988, Morsy *et al.* 2014).

The Isopoda are small diverse crustaceans that are usually found in all ecosystems (Khalaji-Pirbalouty and Bruce 2014). Marine Isopods appear on the outer body, fins, in the mouth, gill chambers, or nostrils of the hosted fish (Hoffman *et al.* 1998). Isopods cause major economic loss to fisheries due to killing, delaying, or damaging the fish, they can also kill or impair immature fishes which causes a lower production rate (Bunkley-Williams *et al.* 2006). In addition, fish population may be impacted by the secondary infections by pathogenic microbes caused by infections with the parasitic isopods (Ravichandran *et al.* 2009). Marine isopods are known to be poorly studied animals in many regions among the globe and some groups till this day can remain totally unidentified (El-Shahawy and Desouky 2010). This is unfortunately the situation in the Red Sea, as the parasitic isopod fauna of fishes is not studied sufficiently (Hiekal and El-Sokkary 1990).

Copepods are one of the most wide spread and abundantly present metazoans on earth (Humes 1994). They are also prevalent parasites among marine animals, fish, invertebrates and many evolutionary lineages live to varying degrees of association with invertebrates (Hardy 1970, Huys and Boxshall 1991). However, the coexistence

of copepod species haven't been studied enough throughout the years (Bashirullah 2000).

The aim of the present investigation is to determine the varying types of parasites infesting gills of two different genus of fish *i.e. dsx Melanopterus* and *Scarus* fish (Family Scaridae) obtained from a fish market known as "Bangala" in the Red Sea coast of Jeddah, Saudi Arabia.

MATERIALS AND METHODS

Within this study, 33 *Carcharhinus melanopterus* and 30 *Scarus* fish were collected from Jeddah, western coast of the Saudi Arabian Red Sea. 14 male and 19 female shark fish, 20 male and 10 female *Scarus* fish were acquired.

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 Petri 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.

RESULTS

Parasitological examination revealed that *Carcharhinus melanopterus* under this study was contaminated with two different species of Monogenea (*Erpocotyletiburonis* and *Dactylogyrus sp.*) and two different species of Copepod (*Pandarus sinuatus* and *Anchistrotos tangi*) on their gills. *Scarus* fish represented one species of Isopod (*Gnathisa sp.*) and one species of Copepod (*Hatshekia sp.*) parasites on their gills (Table 1).

Of all examined sharks, 30 sharks (91%) were infected by at least one parasite. Two Monogeneans (*Erpocotyletiburonis* and *Dactylogyrus sp.*) and two copepods (*Pandarus sinuatus*, *Anchistrotos tangi*) were identified. The hemorrhagic areas on gills were examined in infected sharks resulting in a prevalence rate of infection in sharks reaching 12.12% and 9.1%, respectively by only one specimen of Monogenea

and Copepod. 6.1% of sharks were infected by two specimens of Monogeneans and 3.03% of sharks were infected by two specimens of copepod. 9.1 % of sharks were infected by three different specimens; two Monogenea’s specimens and one Copepod’s specimen (Table 2). On the other hand, 13 *Scarus* fish (43.33%) were infected by only one parasite. One Copepod (*Hatshekia sp.*) and one Isopod (Praniza larva of *Gnathiasp*) were identified (Table 2). Only 3 female sharks (9%) have shown any infection. However, all female *Scarus* fish of Jeddah were not infested. Both male sharks (100%) and male *Scarus* fish (65%) represent parasite infection. The two different genuses of fish were infected by copepod parasites, but with different specimens.

DISCUSSION

The present study, up to our knowledge, is the first done in Jeddah, Saudi Arabia in the Red Sea coast, to show the parasitic behavior

in two different genuses of fish; *Carcharhinus melanopterus* and *Scarus* fish.

Distinct variation in composition of the parasites was recorded in the two different fish species. In this study, the examined *Carcharhinus Melanopterus* were infested by Monogenea which was found on the gills of their host (Suriano 1981). Monogeneans are generally known to be found on the gills but they can also inhabit the nasal cavities and, in rare cases, other body parts of the host which can cause deterioration in the fish’s health. (Zanolo and Hissashi Yamamura 2006). In this context, Bullard proved the presence of an infection among sharks by *E. tiburonis* that was intense and caused gill lesions (Bullard et al. 2001). However, this study showed that *Scarus* fish were not infested with parasitic crustaceans on their gills. Morsy et al. (2014) found *Diplectanum* arid (Monogenea) on the gills of the examined parrot fish *Scarus* harid from the Red Sea in Egypt (Morsy et al. 2014). These result may be explained by the fact that most of the Monogenean gill parasites

Table 1. Distribution of different parasites in gills of *Carcharhinus Melanopterus* and *Scarus* fish

Parasite sp.	<i>Carcharhinus Melanopterus</i>	<i>Scarus</i> fish
Monogenea	<i>Erpocotyletiburonis</i> <i>Dactylogyrus sp.</i>	-
Isopod	-	<i>Praniza larva of Gnathisa sp.</i>
Copepod	<i>Pandarus sinuatus</i> <i>Anchistrotostangi</i>	<i>Hatshekia sp.</i>

Table 2. Comparison of different parasites infecting female and male examined *Carcharhinus Melanopterus* and *Scarus* fish in Jeddah

Parasite sp.	<i>Carcharhinus Melanopterus</i>			<i>Scarus</i> fish		
	Male -14	Female -19	Infected fish (%)	Male -20	Female -10	Infected fish (%)
Monogenea						
- <i>Erpocotyletiburonis</i>	4	0	12.12	0	0	0
- <i>E.tiburonis</i> and <i>D. sp.</i>	1	1	6.1	0	0	0
Isopod						
- <i>Praniza larva of Gnathisa sp.</i>	0	0	0	12	0	40
Copepod						
- <i>Pandarus sinuatus</i>	0	3	9.1	0	0	0
- <i>P. sinuatus</i> and <i>A. tangi</i>	0	1	3.03	0	0	0
- <i>Hatshekia sp.</i>	0	0	0	1	0	3.33
Monogenea and copepod						
- <i>D. sp.</i> and <i>P.sinuatus</i>	1	1	6.1	0	0	0
- <i>E.tiburonis</i> and <i>A. tangi</i>	7	8	45.45	0	0	0
- <i>E.tiburonis</i> , <i>D.sp</i> and <i>A.tangi</i>	1	2	9.1	0	0	0

are known to be strictly specific to a particular host and that there was an accurate topographical relationship between the parasite and its host and this was probably an important factor in the mechanism of host specificity (Llewellyn 1956, Rohde 1977, Whittington et al. 2000).

Our study proved the presence of infections with Isopods in sharks during our experimental period. However, *Scarus* fish were infected by Praniza larva of *Gnathia* sp. According to our result, the parasitic crustacean praniza larva of *Gnathia* sp. was found in *Scarus ferrugineus* from the Red Sea coast in Jeddah, Saudi Arabia. In fact, common hosts of Isopods can be determined as surfperch, parrot fish and especially bottom fish such as lingcod, cabezon and flatfish (Kabata 1970). Knowledge of the Isopods' life cycle and their host interactions is essential to understand the factors that influence their transmission which may include vector-derived factors such as density, prevalence, duration of attachment to the host and the reproductive characteristics.

Marine fishes are usually the common hosts of Copepods, although, the copepod specimens found in sharks and *Scarus* fishes were different. Gills of sharks were infected by *P. sinuatus* and *A. tangi*. Many studies have been conducted over the years to study the effect of copepods that infect the gills (Benz and Dupre, 1987, Benz and Adamson, 1990, Dippenaar *et al.*, 2008). Previous studies suggested that the parasitic copepod *Anchistrotos tangi* was detected on the gill of numerous and different fish (Venmathi Maran *et al.*, 2014). The genus *Pandarus* comprises ectoparasites which are known to contaminate the skin surface and gills of sharks (Benz and Adamson, 1990). The parasitic crustacean *Hastchekia manea* (Copepoda) was found in gills of male *Scarus* fish which agreed with the results of Jones and Cabral (1990), where he found *Hastchekia manea* (Copepoda) on the gills of *Scarus gibbus* from the Southern Pacific Ocean.

CONCLUSION

In the present study, our results showed that gills of different species of fishes were infected by different parasites. Each parasite presented an aggregated distribution pattern, which is a characteristic of parasitic systems.

Parasite prevalence is influenced by many factors, including the biological and ecological traits of the parasite (Kennedy 1977, Lewis et al. 2002), the parasite's life cycle, its reproduction as well as the ecological and hydrobiological conditions of the water. In addition, although there is evidence of monogeneans and copepods with a broad spectrum of host species, most of them show high specificity for the host, occurring on single species or on closely related fish. The species found in this study have appeared only on the gills of their host.

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