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Research Article

FISH PARASITES OF QATARI WATERS OF THE ARABIAN GULF: CURRENT STATUS WITH AN ANNOTATED CHECKLIST

Mahmoud M. Kardousha

Department of Biological and Environmental Sciences, Qatar University,
P.O. Box 2713, Doha, Qatar

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ABSTRACT

The present study is a recent attempt to survey all the parasitological investigations of the marine fish inhabiting Qatari waters. These investigations were first embarked upon in the eighteenth century with the first published work in 1986 and followed up to 2002. The studies revealed that a total of 51 fish species has been investigated from the 136 known species in Qatari waters. The studies also revealed a total of 46 species of fish parasites belonging to the 7 taxonomic groups. The encountered parasites included: one species of microsporidia, one species of myxosporea, 5 species of monogeneans, 33 species of digenetic trematodes, 3 species of cestodes, one species of nematodes and 2 species of acanthocephalans. No parasitic crustacea have been encountered in the studies. Seven new species were recorded among Qatari fish during this period. The anisakid nematode larvae is the only group that is found to be harmful to public health. Some groups like trypanorhynchian cestode were found to have a negative impact on the quality and marketing of the infected fish. Furthermore, monogeneans were found to have a severe inflammatory effects on the host fish and is likely to have a potential threat to future proposed aquaculture industry in the state of Qatar.

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INTRODUCTION

The fish fauna of the Arabian Gulf is highly enriched and nearly 500 species of bony as well as cartilaginous fish were recorded from different coasts (Krupp and Muller, 1994). The study of the Fish parasites in the Arabian Gulf waters in general and Qatar in particular, has been evoked recently for the last three decades. Since Al-Yamani and Nahhas, 1981, described some digenetic trematodes from Kuwait, many investigations have been triggered from other coasts of the Arabian Gulf including Emirates (El-Naffar, *et al*, 1992, Kardousha, 1992a and 1992b), Qatar (Saoud *et al*, 1986a and Al-Kawari *et al*, 1996), Saudi Arabia (Bayoumy *et al*, 2012), Iran (Haseli *et al*, 2010 and Hosseini *et al*, 2013), Oman (Machkevskiy *et al*, 2014) and Iraq (Bannai, 2008, Al-Salim and Ali, 2011).

Qatari waters which is located within the boundaries of the state, has an exclusive economic zone which is highly enriched in fish fauna. Fish from the Qatari waters belong to 136 species which are classified in 54 families of bony fishes and elasmobranchs (Sivasubramaniam and Ibrahim, 1982). A survey of the available literatures revealed that only 51 species of Qatari fish were investigated throughout the period of 1986

to 2002, while 70 species from Kuwait were investigated within the same period.

As literature revealed, the majority of fish parasite studies related to Qatari waters were addressed mainly to digenetic trematodes (Saoud *et al*, 1986b, 1987, 1988a, 1988b, 1988c and 2002) and cestodes which were mainly collected from elasmobranchs (Al-Kawari *et al*, 1994). Recently, a new additional record has been added to the digenetic parasites (Al-Kawari *et al*, 2001). The other groups have received little attention compared with Digenea. Monogenea are represented by 5 species (Wanas, 1993 and Kardousha *et al*, 2002), nematodes by one species (Al-Kawari *et al*, 2002 and Kardousha, 2007), Protozoa by 2 species (Kardousha and El-Tantawy, 2002) and Acanthocephala by 2 species (Amin, 2002). As far as literatures revealed, there is no record about parasitic crustacea among Qatari fish which represents a gap among marine parasite diversity of Qatari waters.

MATERIALS AND METHODS

Study area

The archipelago of the Qatar peninsula, south of the Arabian Gulf, is located between latitude 24° 27' and 26° 10' North and longitudes 50° 45' and 51° 40' East with an area of 11,521 km².

*Corresponding author: **Mahmoud M. Kardousha**

Department of Biological and Environmental Sciences, Qatar University, P.O. Box 2713, Doha, Qatar

The Qatari waters which is located within the boundaries of the state (Fig. 1) has an exclusive economic zone which is highly enriched in fish fauna.

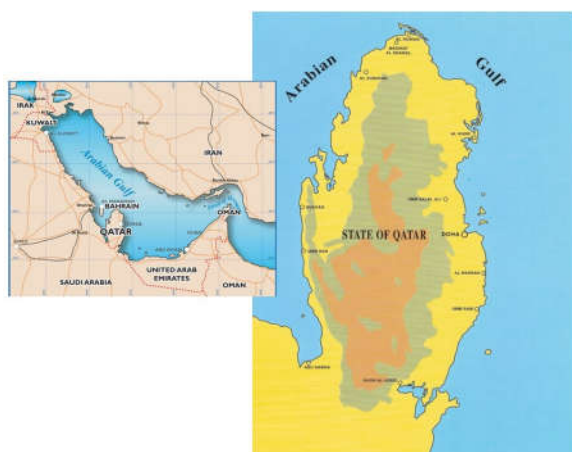


Figure 1 A map of state of Qatar and Arabian Gulf

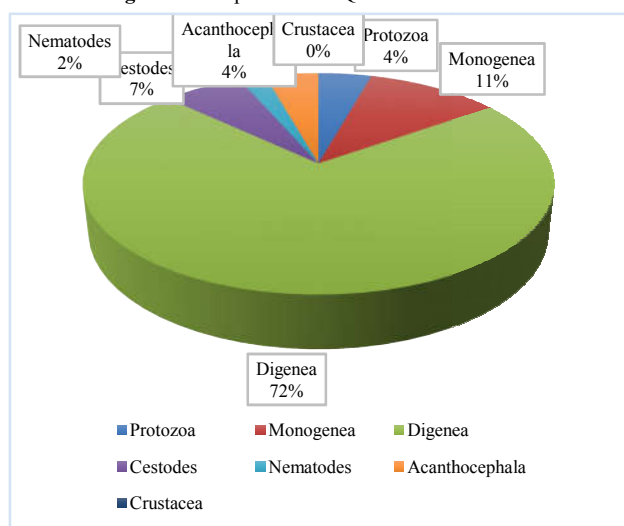


Figure 2 The percentage of different fish parasites taxa that investigated from period 1986 up to 2002 from Qatari waters

Marine diversity

According to Abushama and Abdel-Bari, 2003, Qatar's marine diversity includes more or less 955 of known marine species. These include 3 documented mammals, 15 reptiles, 136 fish species and 371 species of plants. The marine environment includes the coral communities, intertidal mud flats, algal beds, seagrass beds, pearl oyster beds, and mangroves. Generally, the most productive habitats are located in waters from the shoreline to only 10-12 meters deep, and are therefore closest to areas of human activities (Khalil and Abdul-Salam, 1988).

Fish sampling and examinations

Around 51 species of Qatari fish (Table 1) has been examined for parasites from the period of 1986 to 2002. All investigated fish species has been obtained from the fish markets of the main cities and from fishermen's boat landing at the fishing harbors. Most the examined Fish were in fresh state. The majority of helminth parasites such as monogenea, trematodes, cestodes, nematodes and acanthocephala was examined alive to determine the proper measurements of internal organs before processing. Usually, all helminth was washed in (0.7%) saline relaxed in fresh water, then fixed with neutral formal-

saline under light cover-glass pressure especially for monogenea and trematodes.

Worms, except nematodes and acanthocephala, usually transferred to a dish, left in fixative for several hours depending on the size of the worms. The worms are washed several times in water, and dehydrated with (70%) alcohol, then stained with aceto or Alum- Carmine, cleared in clove oil and xylene then mounted in Canada balsam. Nematodes and acanthocephala were fixed in hot (70%) alcohol, then cleared directly in lactophenol before investigation. Reference specimens of all identified parasites are deposited in the Helminthological collection of Qatar University.

RESULTS AND DISCUSSION

Composition of the studied parasite species

The present survey depends on the available literature covering the period from 1986 to 2002. About 51 out of 136 fish species known from Qatari waters were studied for the parasitological investigation (Table 1). The literature survey also revealed that 46 species of parasites have been investigated belonging to 7 taxonomic groups. Digenetic trematodes received the most intensive studies and are represented by 33 species out of 46 (71.7%), followed by monogenea represented by 5 species (18.86%), cestodes by 3 species (6.5%), Acanthocephala by 2 species (4.3%), Protozoa by 2 species (4.3%) and nematodes by one species (2.17%). Seven new species were recorded from the available studies, 5 of them belonging to digenetic trematodes, one species to cestodes; and one species to acanthocephala (Fig. 2).

Status of parasitic Protozoa

Very little information is known about parasitic protozoa in the various fish species in Qatar and the Arabian Gulf. Only one available study was known which reported on 2 protozoan parasites from Qatari waters: *Nosema sauridae* and *Kudoa sp.* and *Myxobolus arabicus* from the Emirati coasts (Kardousha and El-Tantawy, 2002). As far as literature revealed, one recent study reported on parasitic protozoa from Oman (Machkevskiy et al, 2014).

Status of monogenea

The first documented report concerning monogenea of Qatari fish was published by Wanas, 1993, who described *Pseudothoracocotyla scomberomori* from Tuna fish (Table 1). Afterward, in the year 2000, a comprehensive study was triggered and two specimens were added including *Ancyrocephalus sp.* and *Bivagina sp.* from *Lutjanus russelli* and *L. malabricus* (Al-Kawari et al, 2002). Recently, another 2 species of common monogeneans, *Encotyllabe spari* and *E. kuwaitensis* which was collected from *Carangoides bajad* and *Plectorhynchus shotaf* respectively (Kardousha et al, 2002). Monogenean parasites have received a considerable study of fish caught from other coasts of the Arabian Gulf, such as the Kuwaiti coasts (Khalil and Abdul-Salam, 1988), Saudi Arabian western coast (Bayoumy et al, 2012), Omani coasts (Machkevskiy et al, 2014) and UAE coasts (El-Naffar et al, 1992, and Kardousha, 2002).

Table 1 Annotated checklist of Fish parasites that investigated from Qatari waters (1986 – 2002)

PARASITE SPP.	FISH HOSTS	LOCATION	Prevalence (%)
PROTOZOA			
Nosematidae:			
- <i>Nosema sauridae</i>	- <i>Saurida undosquamis</i>	body cavity	56
Kudoidae:			
- <i>Kudoa sp</i>	- <i>Lutjanus fulviflamma</i>	body cavity	10
MONOGENEA			
Thoracocotylidae:			
- <i>Pseudothoracotyla scomberomari</i>	- <i>Scomberomoris comersoni</i>	gills	--*
Capsalidae:			
- <i>Encotyllabe spari</i>	- Carangoides bajad	tooth plate	--
- <i>Encotyllabe kuwaitensis</i>	- Plectorhynchus shotaf	tooth plate	--
Ancyrocephalidae:			
- <i>Ancyrocephalus sp.</i>	- <i>Lutjanus russelli</i>	gills	2
Microcotylidae			
- <i>Bivagina sp.</i>	- <i>Lutjanus russelli</i>	Gills	9
	- <i>L. malabricus</i>	gills	3
DIGENETIC TREMATODES			
Acanthocolpidae:			
- <i>Stephanostomum nagaty (n.sp)</i>	- <i>Epinephelus tauvina</i>	Intestine	--
	- <i>E. chlorostigma</i>	intestine	--
- S. triacanthi	- Pseudotriacanthus strigilifer	intestine	66.7
- S. qatarense (n.sp)	- Thunnus albacares	intestine	50
- Stephanostomoides sp.	- Chirocentrus dorab	intestine	10
- Tormopsolus sp.	- Alectis indicus	intestine	-
Bucephalidae:			
- <i>Bucephalus varicum</i>	- Gnathanodon spicurus	intestine	25
- <i>Prosorhynchus epinepheli</i>	- Epinephelus chlorostigma	intestine	25
- <i>Prosorhynchoides sp.</i>	- Epinephelus tauvina	intestine	4.8
	- E. chlorostigma	intestine	12.5
Cryptogonimidae:			
- <i>Paracryptogonimus sootai</i>	- <i>Lutjanus russelli</i>	gastric caeca	4.5
- <i>P. longitestic</i>	- <i>Lutjanus russelli</i>	Gastric caeca	39
- <i>Pseudoallacanthochasmas sp.</i>	- <i>Plectorhynchus cinctus</i>	intestine	-
- <i>Allacanthochasmas lutjani (n. sp)</i>	- <i>Lutjanus fulviflamma</i>		
	- <i>L. malabricus</i>		
	- <i>Lutjanus fulviflamma</i>		
- <i>Metadena leilae</i>			
Felodistomidae:			
- Tergestia pauca	- Caranx bajad	intestine	20
Hemiuridae:			
- Ectenurus trachuri	- Plectorhynchus sordidus	stomach	20
	- Caranx bajad	stomach	48
- Erilepturus hamati	- Lutjanus russelli	stomach	15
	- <i>Pseudorhombus arsius</i>	stomach	-
- <i>Lecithochirium macrorchis</i>	- Alectis indicus	Stomach	-
- <i>Lecithocladium angustiovum</i>	- <i>Chanos chanos</i>	Stomach	-
Lepocreadiidae:			
- <i>Preptetos impar</i>	- <i>Lutjanus russelli</i>	intestine	2
	- <i>Pinjalo pingalo</i>	intestine	12
- <i>Rhagorchis scari</i>	- <i>Scarus gobban</i>	intestine	15
- <i>Aephndiogenes major</i>	- <i>Plectorhynchus cinctus</i>	intestine	--
Monorchidae:			
- <i>Proctotrema plectorhynchi</i>	- <i>Plectorhynchus cinctus</i>	intestine	--
- <i>Paraproctotrema qatarensis (n. sp)</i>	- <i>Plectorhynchus pictus</i>		
Opecoelidae:			
- <i>Hamacreadium mutabile</i>	- <i>Lutjanus fulviflamma</i>	intestine	5
	- <i>L. russelli</i>		
- <i>Helicometrina qatarensis (n.sp)</i>	- Plectorhynchus cinctus	intestine	--
	- Lutjanus russelli	intestine	10
- <i>Pseudopecoeloides carangis</i>	- Alectis indicus	intestine	--
	- Lutjanus russelli	intestine	3
- <i>Opegaster ditrematis</i>	- <i>L. malabricus</i>	intestine	7
	- Pingalo pingalo	intestine	9
- <i>Dactylostomum sp.</i>	- Parupeneus pleurotaenia	intestine	5
	- Lethrinus nebulosus	Intestine	--
	- <i>Epinephelus tauvina</i>	Intestine	--
- <i>Cainocreadium epinepheli</i>	- <i>E. chlorostigma</i>	Intestine	--
	- <i>E. areolatus</i>	Intestine	--
	- E. summana	intestine	--
- <i>Pseudoplagioporus microrchis</i>	- Lethrinus nebulosus	Intestine	--
	- <i>L. lentjan</i>	intestine	--

Prosogonotrematidae:			
- <i>Prosogonotrema pritchardae</i>	- Lutjanus malabricus	stomach	5
<i>Treptodemidae:</i>	- <i>Penjalo penjalo</i>	stomach	53
- Treptodemus latus	- Hemirhamphus marginatus	intestine	66
<i>Waretrematidae:</i>			
- <i>Chauhanotnema spiniacetabulum</i>	- Hemirhamphus marginatus	intestine	60
CESTODES			
Lecanicephalidae:			
- <i>Eniochobothrium qatarensi (n.sp)</i>	- <i>Rhinptera adspersa</i>	intestine	--
- <i>Rhinobothrium sp</i>	- Aetomylaeus nichofi	intestine	--
Trypanorhyncha:			
	<i>Arius thalassinus, Alepes mate, Alectis indica, Caranx sexfasciatus, Chanos chanos, Chirocentrus dorab, Hemirhamphus marginatus, Gnathonodon spicuosus, Pomacanthus maculosus, Platax arabicularius, Epinephelus akkara, E. chlorostigma, Euthynnus affinis, Selar crumenophthalmus, Lethrinus nebulosus, Mylio bifasciatus, Plectorhynchus scotaf, P. sordidus, Carcharhinus seali, Lutjanus russelli, L. malabricus, Pseudorhombus arsius, Parupeneus pleurotenia, Platycephalus maculipinna and Sphyaena jello</i>	Body cavity	--
- Callitetrarhynchus gracilis			
NEMATODES			
<i>Anisakidae:</i>			
- <i>Anisakis sp. larvae</i>	<i>Tylosurus leiurus, Alepes mate, Argyrops spinifer, Caranx sexfasciatus, Crenidons crenidons, Chirocentrus dorab, Gnathonodon spicuosus, Epinephelus akkara, E. tauvina, Rachycentron canadus. Lethrinus lentjan, L. nebulosus, Nematolosa nasus, Plectorhynchus scotaf, P. sordidus, P. pictus, Carcharhinus seali, Lutjanus russelli, Pseudorhombus arsius, Parupeneus pleurotenia</i>	Body cavity	--
ACANTHOCEPHALA			
Neoechinorhynchidae:			
- <i>Neoechinorhynchus qatarensis (n.sp)</i>	- <i>Scarus ghobban</i>	intestine	26.6
Rhadinorhynchidae:			
- <i>Serrasentis sattigefer (larvae)</i>	- <i>Lutjanus russelli</i>	Body cavity	10
	- <i>L. malabricus</i>	Body cavity	5
	- <i>Rachycentron canadus</i>	Body cavity	--

Status of digenetic trematodes

Figure 2, illustrated that the digenetic trematode is the group that received the most intensive study in the Arabian Gulf waters, particularly the Qatari waters. Table 1, showing that 71.7% of the investigated parasites are digenetic trematodes with 5 newly proposed species: *Allacanthochoasmas lutjani, Helicometrina qatarensis, Paraproctotrema qatarensis, Stephanostomum nagatyi and S. qatarense* (Saoud *et al*, 1988a, 1988b, 1988c and 2002). Double and triple infections are very common among Qatari fish (Al-Kawari *et al*, 1996 and 2002). Literature also revealed that a considerable number of digenean species have been described from different coasts of the Arabian Gulf. From Kuwaiti coasts a wide variety of species were described (Al-Yamani and Nahhas, 1981, Nahhas *et al*, 1998 and 2006). El-Naffar *et al.*, 1992 and Kardousha, 2003, have reported more than 20 species of Digenetic trematodes from the Emirati coasts. Some scattered studies were also recorded from other coasts, including Saudi Arabia (Bayoumy *et al*, 2012, and Oman (Machkevskiy *et al*, 2014). Infact, it was established that the digenean species of Qatar are quite similar to what were recorded from Emirati coasts.

Status of Cestodes

Table 1, showing that only 3 species of cestodes were recorded from the Qatari waters. Except trypanorhynchian *Callitetrarhynchus gracilis*, the remaining two species were extracted from cartilage fish (Al-Kawari *et al*, 1993, 1996 and 2002).

Some Adult cestodes were also recorded from the Arabian Gulf waters (El-Naffar *et al.*, 1992 and Khalil and Abu-Hakima 1985). Trypanorhynchian larvae are unique in having a wide range of infected hosts and a high distributional rate among the Arabian Gulf fish species (El-Naffar *et al*, 1992, Kardousha M. M., 1999, and Hassan *et al*, 2002). It is important to mention that trypanorhynchian larvae have negative impacts on the marketing values of the infected fish. One new species of adult cestodes; *Eniochobothrium qatarensi* that was collected from ray *Rhinptera adspersa* caught from the Qatari waters was proposed by Al-Kuwari *et al* (Al-Kawari *et al*, 1994).

Status of Nematodes

In spite of the fact that nematode parasites has received considerable studies from different localities of the Arabian Gulf, it is been represented only by one type, *Anisakis sp* (Al-Kawari *et al*, 2002 and Kardousha, 2007) which was described from a wide range of the Qatari fish species (Table 1). Anisakids larvae have been receiving a good attention due to its potential hazards to human health. They were described from Emirati fish by El-Naffar *et al.*, 1992, and Kardousha, 1992, Saudi Arabia fish by Bayoumy *et al*, 2012, Omani fish by Machkevskiy *et al*, 2014, Irani fish by Hosseini *et al*, 2013, and the Iraqi coast fish species by Al-Zubaidy, 2009. Other nematode parasites were also described from the Arabian Gulf waters (Kardousha, 1999, Moravec and Ali 2013).

Status of Acanthocephala

Only 2 species of acanthocephalan parasites have been recorded from the Qatari fish, one of them was established as a new species (Al-Kawari *et al*, 2002, Amin *et al*, 2002).

Acanthocephala, as well as protozoa are neglected groups, not only in Qatar but also in other coasts of the Arabian Gulf (Amin, and Sey, 1996, Maghami, et al., 2008). *Neoechinorhynchus qatarensis* is a new species that was established by Amin, et al, (2002).

Status of crustacea parasites

No records have been established yet about crustacea parasites in Qatar. However, some studies are currently ongoing to investigate this missed group. Crustacea have been investigated intensively from the Kuwaiti coasts (Ju-shey and Sey 1997, Ju-shey and Hoi-Kim, 2000) and other coasts of the Arabian Gulf (Bayoumy et al, 2012, Machkevskiy et al, 2014).

CONCLUSION

The present study is an overview of thirty years of research on parasitological investigation of marine fish of Qatari waters with reference to Arabian Gulf. The different published parasite taxa and species were recorded and an annotated checklist was given. The present study could be concluded that there is no continuity of investigations since year 2002. Furthermore, the study revealed that some taxa, for instance crustaceans, is completely absent and never been investigated before, others like protozoans, monogeneans and acanthocephalans have been receiving little attention and need more investigations. Studies on fish parasites from Qatari waters is a major challenging task as we try to cope with the aquaculture industry in Qatar.

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