

Intestinal Digenetic Trematodes of Some Fishes From the Gulf of Aqaba, Red Sea

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Abstract.- During the period of February to September 2001 a total of 363 fish specimens belonging to 54 different species that represented 26 families were collected from the gulf of Aqaba, and examined for their intestinal digenetic trematodes. No digeans were found in 39 species of the collected fishes. A total of 13 species of digenetic trematodes were retrieved from the remaining 15 fish species. *Cainocreadium* sp., *Enenterum kyphosi*, *Hamacreadium khalili*, *Helicometra fasciata*, *Hexangium sigani*, *Monorchiid* sp., *Paracryptogonimus* sp., *Paradiscogaster chaetodontis*, *Parasteganoderma* sp., *Podocotyloides stenometra*, *Proctoeces maculatus*, *Prosorhynchus* sp. and *Tormopsolus* sp. Nine fish species were found infected with one digean species, three with two, one with three, one with four, and one with five. A species belonging to the genus *Tormopsolus* was retrieved from three fish species *Dactyloptena peterseni*, *Parupeneus macronemus*, and *Priacanthus hamrur*. None of the *Tormopsolus* species have been reported earlier from these hosts. Thus, these are considered as new host records. Moreover, the occurrence of species belonging to the family Cryptogonimidae is reported here from *Variola louti* fishes for the first time. The overall infection rate among fishes harboring digeans was 38%. The prevalence of digean species from which enough specimens (more than 20) have been examined, was 18.7% for *Siganus rivulatus*, 30% for *Cheilinus abudjubbe*, and 50% for *V. louti*.

Key words: Digenetic trematodes, Gulf of Aqaba, Red Sea, Jordan, fish trematodes.

INTRODUCTION

Digenetic trematodes of marine fishes from the Red Sea received great attention from several workers. Nagaty and his group reported on these digeans as of 1930 until 1972 (Nagaty, 1930, 1937, 1941, 1942, 1948, 1954, 1956, 1957; Nagaty and abdel-Aal, 1961, 1962a,b,c, 1964, 1972). Recently, Ramadan continued working on digeans of Red Sea fishes, where he described several new species and revised the taxonomy of others (Ramadan 1982, 1983, 1984, 1985, 1986, 1988; Saoud and Ramadan, 1985).

The digeans of fishes from the Gulf of Aqaba, which is the northeastern branch of the Red Sea, have been completely neglected, except for a recent study by Diamant *et al.* (1999), where several species of digeans have been reported from the rabbitfish, *Siganus rivulatus*, and Dzikowski *et al.* (2003) on the multi-annual changes in the parasite communities of the same species. El-Said-Hassanine (2000) reported on two digenetic trematodes from some fishes in the Gulf of Aqaba.

This study deals with preliminary survey of digeans of marine fishes from the Gulf of Aqaba.

MATERIALS AND METHODS

The Gulf of Aqaba is the northeastern branch of the Red Sea. The Jordanian coastline runs for about 27 km. Despite the restriction of water exchange between the Gulf of Aqaba and the Red Sea proper due to the shallowness of the strait of Tiran (250-300 meters deep), the Gulf fish fauna is relatively rich. Khalaf and Disi (1997) reported about 400 fish species.

A total 363 fishes belonging to 54 different species that represent 26 families were collected during the period of February -September, 2001 from the Gulf of Aqaba. Fishes were bought fresh from the local fish market on daily basis most of the time.

Fishes were brought back to the laboratory, dissected immediately, and the intestine of each fish was separated and placed in saline solution after being longitudinally opened. Free digeans usually liberated themselves via movement. Embedded worms were loosened by scrapping the mucosal wall of the intestine. The gut contents were

examined as described by Schmidt (1988), using a dissecting microscope, to collect digeans. Worms were washed thoroughly using saline solution, placed between two slides, fixed in hot A.F.A., and stained using Semichons acetic-carmin (Schrllidt, 1988). Mounted worms were measured, photographed and drawn.

Identification of worms was confirmed by Dr. Rodney Bray at the Natural History Museum, London, UK.

RESULTS

A total of 13 species of digenetic trematodes have been retrieved from 363 fishes examined from the Gulf of Aqaba during the period from February to September, 2001. Of the 54 fish species examined, digeans were found in 15 species. The overall infection rate among fishes harboring digeans was 38% .

Pristipomoides sieboldii and *Variola louti* fish species were infected with four and five species of digeans, respectively (Table I). All *P. sieboldii* fishes examined were infected. Digeans found were *Hamacreadium khalili*, *Prosorhynchus* sp., *Paracryptogonimus* sp. and *Cainocreadim* sp. Half of the 28 *V. louti* fishes were infected with *H. khalili*, *Paradiscogaster chaetodontis*, *Prosorhynchus* sp., *Paracryptogonimus* sp. and *Cainocreadium* sp. Six out of the 20 *Cheilinus abudjubbe* fishes were infected with three digean species. These were *Proctoeces maculatus*, *Helicometrafasciata*, and *Monorchiid* sp.

Three species of fishes were infected with two species of digeans. The *Chaetodon semilarvatus* fish examined was infected with *Podocotyloides stenometra* and *P. chaetodontis*. Similarly the *Epinephelus areolatus* examined was infected with *Prosorhynchus* sp. and *P. maculatus*. Five of the *C. lunulatus* fishes examined were infected with *H. fasciata* and *P. maculatus*.

The remaining nine fish species were infected with one digeans species each (Table I). Nine out of 48 *Siganus rivulatus* fishes were infected with *Hexangium sigani* and the only *Kyphosus vaigiensis* fish examined was infected with *Enenterum kyphosi*.

The average number of worms retrieved from

a fish (worm load) ranged from 1.0 to 18.7. The highest worm load was for the digean *Parasteganoderma* sp. from the fish *Pristegenys nipponia*. This was followed by *Paracryptogonimus* sp. (12.3) and *Prosorhynchus* sp. (11.0) from *P. sieboldii* fishes.

DISCUSSION

A total of 363 fishes belonging to 54 species were examined. Fifteen fish species were found infected with a total of 13 digean species. However, some of these results should be interpreted cautiously, because more specimens of each fish species should have been examined, since 20-30 individuals are required for a general parasite survey. This sample size of fishes permits detection of parasite species if the prevalence is 10% or more. Further specimens should be examined for better understanding of the prevalence and host-parasite relationships. Detection of rare parasite species requires greater sample size (Des-Clers, 1994). The numbers of specimens of some species, such as *C. abudjubbe*, *S. rivulatus* and *V. louti* were sufficient to draw conclusions. Similar findings have been reported by Al-Kawari *et al.* (1996), where 26 out of 100 fish species from the Arabian Gulf were found infected.

Host specificity

At the generic level the 13 reported digean species showed host specificity ranging from high host specificity to low host specificity. The genus, *Proctoeces*, for example showed the lowest host specificity among all digeans in this study, where it was retrieved from five fish species, namely *C. abudjubbe*, *Ariomma brevimanus*, *C. Lunulatus*, *Acanthopagrus bifasciatus* and *Epinephelus areolatus*. This genus is well known for its low host specificity where it was previously reported from over 50 fish species from all over the world (Bray, 1983). In the Red Sea area this genus was reported earlier from *A. bifasciatus*, *Thalassoma lunar* (Bray, 1983), *Chrysophorus bifasciata*, *Julis lunaris*, and *Calamus* spp. (Yamaguti, 1958).

The genus *Hamacreadium* represented by *H. khalili* is the second genus showing low host specificity during this study, where it was retrieved

Table I.- Number of fishes infected with digenic trematodes and the average number of worms retrieved from each fish (worm load).

Fish species	Number examined	Number infected	Digeans species	No. of fishes infected with each digean	Worm load
<i>Pristipomoides sieboldii</i>	5	5	<i>Hamacreadium khalili</i>	1	1.0
			<i>Prosorhynchus</i> sp.	1	11.0
			<i>Paracryptogonimus</i> sp.	3	12.3
			<i>Cainocreadium</i> sp.	4	7.0
<i>Variola louti</i>	28	14	<i>Hamacreadium kahlili</i>	1	1
			<i>Paradiscogaster chaetodontis</i>	1	1.0
			<i>Prosorhynchus</i> sp.	12	5.9
			<i>Paracryptogonimus</i> sp.	1	3.0
<i>Cheilinius abudjubbe</i>	20	6	<i>Monorchiid</i> sp.	2	4.5
			<i>Helicometra fasciata</i>	1	3.0
			<i>Proctoeces maculatus</i>	4	3.0
<i>Chaetodon semilarvatus</i>	1	1	<i>Podocotyloides stenometra</i>	1	3.0
			<i>Paradiscogaster chaetodontis</i>	1	6.0
<i>Epinephelus areolatus</i>	1	1	<i>Prosorhynchus</i> sp.	1	2.0
			<i>Proctoeces maculatus</i>	1	2.0
<i>Cheilinus lunulatus</i>	7	5	<i>Helicometra fasciata</i>	1	5.0
			<i>Proctoeces maculatus</i>	4	4.0
<i>Acanthopagrus bifasciatus</i>	11	3	<i>Proctoeces maculatus</i>	3	3.5
<i>Ariomma brevimanus</i>	3	1	<i>Proctoeces maculatus</i>	1	1.0
<i>Dactyloptena peterseni</i>	3	2	<i>Tormopsolus</i> sp.	2	7.5
<i>Kyphosus vaigiensis</i>	1	1	<i>Enenterum kyphosi</i>	1	4.0
<i>Parupeneus macronemus</i>	11	1	<i>Tormopsolus</i> sp.	1	2.0
<i>Priacanthus hamrur</i>	7	4	<i>Tormopsolus</i> sp.	4	3.5
<i>Pristegenys nivhonia</i>	3	3	<i>Parasteganoderma</i> sp.	3	18.7
<i>Siganus rivulatus</i>	48	9	<i>Hexangium sigani</i>	9	3.0
<i>Thalassoma klunzingeri</i>	1	1	<i>Helicometra fasciata</i>	1	4.2

from two fish species namely *V. louti* and *P. sieboldii*. In the Red Sea, this genus was reported earlier from *Teuthis* and *Diacope* fish species (Yamaguti, 1958). *Pterois volitans* (Nagaty *et al.*, 1961a,b), *Serranus moniatus*, *Diacope fulviflamma* and *L. nebulosus* (Nagaty *et al.*, 1962a,b,c), and later on from *Epinephelus chlorostigma*, *Anampses caeruleopunctatus*, *V. louti*, *L. mahsena*, and *L. nebulosus* by Ramadan (1983). The three digeans *Tormopsolus* sp., *Prosorhynchus* sp. and *Helicometra fasciata* are comparatively more host specific since they were retrieved out of three fish species during this study. The genus *Prosorhynchus*

was retrieved from *V. louti*, *E. areolatus* and *P. sieboldii*. The members of this genus are known to be very common in serranids that even a single host can harbor several species (Yamaguti, 1958). From the Red Sea locality the genus *Prosorhynchus* was reported by Nagaty (1937) from *Serranus guttatus* and from a *Caranax* sp. Interestingly the genus *Tormopsolus* was retrieved from three fish species: *Dactyloptena peterseni*, *Parupeneus macronemus*, and *Priacanthus hamrur*, where none of the *Tormopsolus* species are reported from these hosts earlier (Bray, personal communication) and thus these three fish species are considered as new host

records. Moreover, the genus *Helicometra* was retrieved from *Cheilinus abudjubbe*, *C. lunulatus* and *Thalassoma klunzingeri*. In general, this genus is known to be of low host specificity, where it was retrieved out from more than 20 fish species in Europe alone (Dawes, 1968). In the Red Sea, this genus was retrieved earlier from a *Serranus* sp., *Holocentrus samara* (Nagaty, 1956), *H. fasciatus*, *Teuthis marmorata* and *Nasa* sp. (Nagaty and Abdel-AI, 1962a,b). Among the 15 Digean species mentioned in the present study, the three genera *Paracryptogonimus*, *Paradiscogaster* and *Cainocreadium* are considered more host specific diageans than the previously mentioned ones, where they were retrieved out of only two fish species, *V. louti* and *P. sieboldii*.

According to Bray (Personal communication), no members of the family Cryptogonimida were previously reported from *V. louti* and this makes it as a new host record. On the other hand, Nagaty and Abdel-Aal (1961b) reported this genus for the first time in the Red Sea area, where they retrieved *P. rostratus* from *Lethrinus rostratus*.

The genus *Paradiscogaster* was retrieved from *V. louti* and *Chaetodon semilarvatus*. This genus is known to be more host specific than the previously mentioned digeans. It was previously reported from few *Chaetodon* fishes and from *Caranx kalli* (Yamaguti, 1958). The presence of this genus in *V. louti* is presumed to be accidental due to predation on a *Chaetodon* fish. The genus *Cainocreadium* was retrieved from both *V. louti* and *P. sieboldii*. Nagaty (1956b) reported this genus earlier from the Red Sea in a *Serranus* sp. fish.

Each of the remaining digeans included in this study were found only in one host. *Enenteurum kyphosi* from *Kyphosus vigensis*, *Podocotyloides stenometra* from *Chaetodon semilarvatus*, *Parasteganoderma* sp. from *P. nipponia*, *Hexangium sigani* from *Siganus rivulatus* and the *Monorchiid* sp. from *C. abudjubbe*.

The genus *Lasiotocus* was reported earlier in the Red Sea from *Anampses* sp. fish and from *C. lunulatus* along with other species (Nagaty, 1948). The genus *Enenterum* was first reported from the Red Sea in *Pimolopterus tahmel* by Nagaty (1942) and is known to occur in *Kyphosus* sp. fishes from

many location including, *K. sectatrix*, *K. incisor*, *K. cinerascens* and *K. lembus* (Saoud and Ramadan, 1985).

Podocotyloides stenometra digean was reported from *Chaetodon semilarvatus* during this study. It was previously reported from *Serranus miniatus* in the Red Sea (Nagaty and Abdel-Aal, 1962a). The *Hexangium* sp. reported here is known to be a common parasite chiefly among siganid and lutjanid fishes from Japan, the Philippines, Madagascar, New Caledonia, N. Borneo and the Red Sea (Kuntz, 1963). In the Red Sea, the genus *Hexangium* was reported from *Pseudoscaris harid* and *Teuthis oramen* (Nagaty, 1954) whereas in a more recent study Diamant *et al.* (1999) reported this genus from *Siganus rivulatus*.

Prevalence

The prevalence of digeans infecting fish species varied between 18.7% for *S. rivulatus*, 30.0% for *C. abudjubbe*, and 50.0% for *V. louti*. Geets and Oliver (1996) reported very high prevalence of digeans in *S. sutor* off the Kenyan coast. It ranged from 68.2% for the digean *Hexangium sigani* to 100% for *Gyuliauchen papillatus*. Al-Kawari *et al.* (1996) reported lower prevalence of digeans from *S. rivulatus* fishes from the Arabian Sea ranging from 15.6 to 50.0%. In the Gulf of Aqaba, Diamant *et al.* (1999) reported a prevalence of 34.6% for *H. sigani*, 9.3% for *Gyuliauchen volubilis* and 29.9% for *Opisthigonoporoides* sp. infecting *S. rivulatus*. For better understanding of large variations in prevalence of different digean species among host species or among different areas, many factors should be taken into consideration including environmental factors, life cycles, and host reactions.

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