Iranian Journal of Veterinary Research, Shiraz University, Vol. 12, No. 3, Ser. No. 36, 2011

Scientific Report

Metazoan parasite community of *Capoeta damascina* (Valenciennes in Cuvier and Valenciennes, 1842), Tigris Basin, Mesopotamian region- a checklist

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(Received 4 Aug 2010; revised version 13 Feb 2011; accepted 1 Mar 2011)

Summary

In this paper, the metazoan parasite community system of *Capoeta damascina* in the Tigris basin (Mesopotamian region) in the Middle-East is presented. Overall, 54 species have been identified. Between 2005 and 2008, Iranian surveys of *Capoeta damascina* found a total of 47 metazoan parasites species, most identified to species level. In addition, 6 parasite species from Iraq and 1 species from occupied Palestine have been reported. Among these, 16 species belong to Monogenea (30%), including *Dactylogyrus* 9, *Gyrodactylus* 4, *Paradiplozoon* 1 and *Dogielius* 2 species. The remaining 70% belong to: Cestoda (7.4%) including *Ligula*, spp Caryophyllaeus and *Coelobothrium* 1 species each; Crustacea (5.55%) comprising *Lernaea*, *Argulus Ergasilus* 1 species each; *Digenea* (11.11%) containing *Allocreadium* spp, *Diplostomum*, *Clinostomum tylodelphis*, 1 species each; Acanthocephala (5.55%) 3 species; *Nematoda* (14%) 8 species; Myxozoa (18%) including *Myxobolus* with 9 species, Myxidium with 1 species and, *Hirudinea* 3 species; and at last, *Bivalva*, *Unio* as 1 species.

Key words: *Dactylogyrus*, Metazoan, Parasites, *Capoeta damascina*

Introduction

Capoeta damascina is found in Turkey, Syria, Lebanon and from occupied Palestine to Iran. In Iran it is reported from the Tigris river and its headwaters in Kurdestan and Kermanshah provinces, from the Karun basin rivers (Dez, Karkheh), Zayandeh-Rood river (Esfahan basin) and waters in Kavir-Namak-Ghom and Maharlu basins (8 basins) (Fig. 1). Parasitological investigation of *Capoeta damascina* in Iran is recent, as it was first started by Dollfus (1970) who described a new cestode, *Coelobothrium monodi*, from this species at "Nasratabad", possibly from the Lut basin. After many years, Jalali *et al*. (1995) described two new species of monogeneans - *Dactylogyrus rohdeianus* and *D. capoetae* - from fish caught in the "Chaghalnandi" river, a Karkheh river tributary north of Ahwaz. Gonzáles-Solies *et al*. (1997) reported the nematodes *Rhabdochona denudata* and *Rhabdochona fortunatowi* from this species in the Mand river, Fars. Amin *et al*. (2003) identified the acanthocephalan *Acanthocephalorhynchoides cholodkowskyi* from specimens collected in the Mand river west of Shiraz, Fars. Jalali *et al*. (2005) and Jalali and Barzegar (2006) recorded *Trichodina pediculus*, *Dogielius molnari*, *Gyrodactylus* sp., *Dactylogyrus carassobabrbi* and *D. lenkorani* from this species in Lake Zarivar. Barzegar *et al*. (2008) found *Dactylogyrus lenkorani*, *Gyrodactylus* sp., *Dactyolgyrus pulcher*, *Allocreadium isoporum* and *Myxobolus molnari* from the Beheshtabad river. Mehdipoor *et al*. (2004) recorded the monogeneans *Dactylogyrus*

lenkorani and *D. pulcher* in Zayandeh-Rood river fish. Barzegar and Jalali (2006) reported parasitic from Kaftar Lake as *Dactylogyrus lenkorani*. Masoumian *et al*. (2007) recorded the myxosporean parasites *Myxobolus samgoricus* and *M. varicorhini* from this species in the Zayandeh-Rood river.

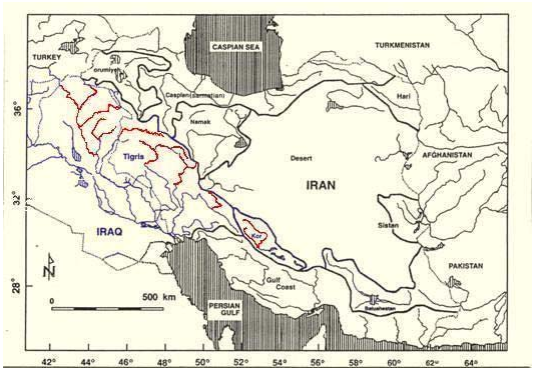

Fig. 1: Blue colors indicate riverine basin and red colors indicate main area (Basins) where *Capoeta damascina* is found, (Abduli, 1999)

Ali *et al*. (1987) investigated the parasite fauna of this species (as *Barbus belayewi*) in the lower Diyala river and found *Dactylogyrus cornu* on the gills and *Neoechinorhynchus rutili* in the intestine. Amin *et al*. (2003) summarized the monogenetic trematode *Dactylogyrus* species of Iraqi fish and reported *D. cornu* on this fish species (as *B. belayewi*). Balasem *et al*. (1995) surveyed fish parasites from the Tigris river at Za'faraniyah, south of Baghdad, and found the myxozoan *Myxobolus pfeifferi* on this species (as *B. belayewi*). Amin *et al*. (2003) describe a new species of Acanthocephalan, *Neoechinorhynchus zabensis*, from the intestine of fish from the Lesser and Greater Zab river. Recently, Amin *et al*. (2003), Bilal (2006), and Bilal and Abdullah (2008) identified and reported several nematodes, acanthocephalan and pleistophora species in *C. damascina*. According to data collected by various authors so far, 53 metazoan parasites species belonging to 9 classes were found and appear in scientific journals.

Materials and Methods

Collection of data for preparation of the present review primarily originated from fish health studies in different natural and man-made lakes during comprehensive studies of freshwater bodies. Further data was gathered from related papers published in reliable scientific research journals and credible research work of fisheries research organizations or universities in Iran. Metazoan parasites from our research work (see Table 1) are referred to as present work. Those not yet published were collected recently from various locations on examined fish including skin, fins, gill and bucal cavity. Samples were stained and mounted according to Fernando *et al*. (1972).

Identification of parasites specimens was carried out in accordance with the keys given by Gussev (1983), Moravec (1994), and Jalali (1998).

The identification of fish host was carried out by an Iranian Ichthyologist in accordance with Coad (1992), Abduli (1999) and then the results were confirmed with the help of Dr. S. Holoik.

Data concerning species from Iraq was collected from published papers in reliable scientific journals.

Results

Table 1 shows the 46 metazoan parasites reported during the present study in Iran and 6 species in Iraq, with no overlap. In addition, Paperna (1961) described *Dogielius planatus* in Galilee Lake in occupied Palestine, for the first time. Overall, 54 metazoan parasites species have been shown to occur in these study countries (Fig. 2). These metazoan parasites represent different systematic groups including 16 monogenean, 9 Myxozoa, 6 digenean, 8 nematoda, 4 Cestoda, 3 Acanthocephala, 3 crustacean, 3 hirudinean, and 1 bivalvida (Fig. 3).

The community of monogenean parasites, with 16 species, constituted the most common metazoan parasite group, accounting for (30%).

Capoeta damascina was found to be infected by 4 zoonotic metazoan parasite larvae species, serving as an intermediate host. These larvae include 2 digenean (metacercaria) and 2 Cestoda (plerocercoid) which are commonly found parasitizing cyprinid fish.

The community of ectoparasites includes23 species, all with complete life

Table 1: List of metazoan parasite species found in *Capoeta damascina* in Iran, Iraq, and occupied Palestine

Monogenea	*Digenea*	*Cestoda*	*Nematoda+*	*Acanthocephala+*	*Myxozoa*	*Crustacea*	*Hirudinian+*	*Bivalve*
D. capoetae (Jalali et al., 1995)	*Diplostomum spataceom (metacercaria) (Barzegar et al., 2008)*	*Coelobothrium monody*	*Rabdochona denudate*	*Acanthorhychoides choldchowski*	*Myxobolus samgoricus (Masoumian et al., 2007)*	*Lernaea cyprinicea (Jalali et al., 1995)*	*Cystobranchus respirans*	*Unio sp.*
D. carasobarb	*Allocreadium isoporum*	*Kawia armenica*	*R. fortunatowi*	*Neoechinorhinchus rutili (Bilal and Abdullah, 2008)*	*M. varicorhini (Masoumian et al., 2007)*	*Argulus foliaceus*	*Hellobdella sp.*	
D. cornu	*A. laymani*	*L. intestinalis*	*Rhabdochona gnedini*	*Neoechinorhynchus zabensis (Amin et al., 2003)*	*M. pfefferi (Bilal and Abdullah, 2008)*	*Ergasilus sp.*	*Trachobdella sp.*	
D. lenkorani (Jalali et al., 2000)	*A. trandversasli*	*Ligula sp.*	*Rabdochona sp.*		*M. molnari*			
D. linstowi	*Tylodelphis sp. (metacercaria) (Barzegar et al., 2008)*		*R. macrostoma*		*M. musajevi (Jalali et al., 2000)*			
D. pulcher	*Clinostomum complanatum (metcercaria)*		*Hepaticola petruschewkii*		*M. cristatus (Masoumian et al., 2007)*			
D. rohdeianus (Jalali et al., 1995)			*Contracaecum micropapilatum*		*M. karelicus (Masoumian et al., 2007)*			
Dactylogyrus sp1			*Rhabdochona tigrae (Bilal, 2006)*		*M. buckei (Masoumian et al., 2007)*			
Dactylogyrus sp2					*M. suturalis (Masoumian et al., 2007)*			
Do. Molnari (Jalali and Barzegar, 2006)					*Myxidium rhodei (Jalali et al., 2000)*			
Do. Planates (Paperna, 1961)								
Paradiplozoon sp. (Jalali et al., 2005)								
Gyrodactylus spp4 (Jalali and Barzegar, 2006)								

+: Parasites found in riverine habitat

spans; 16 mongenean, 3 hirudinean, 3 crustacean and 1 bivalvida. Endoparasite communities were composed of 9 myxzoa, 8 nematode, 6 digenean, 3 Acanthocephalan and 4 Cestoda; in total 30 species, all with indirect life spans.

Additionally, several protozoan parasites were also identified in gills, muscles and skin which were not taken into account. Parasite fauna of *Capoeta damascina*, species with wide host ranges are not common (*Diplostomum* sp., *Allocreadium* spp, *Kawia* and *ligula* sp.), but host specific monogeneans which included around 30% of metazoan parasites species are numerous.

Among various parasites species found, 34.4% of species occur in gills, (Monogenea, crustacean, bivalvida). A few species attach to skin and fins, (9.40%)(Hirudinian, crustacean). Histozoic metazoans constitute 22.6% (Myxozoa, Digenean metacercaria) and these species inhabit the intestinal lumen where they reach maturity (30.10%) (includes adult digenea, adult Cestoda and nematode). The remainders are two coelozoic species from genus *Ligula* spp.

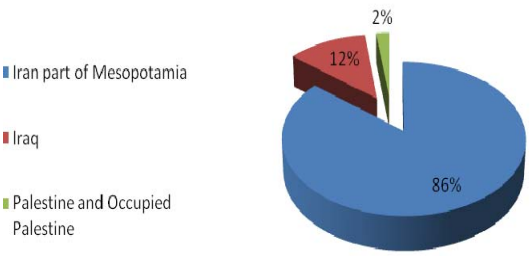

Fig. 2: Proportion of metazoan parasites reported from Mesopotamian region countries

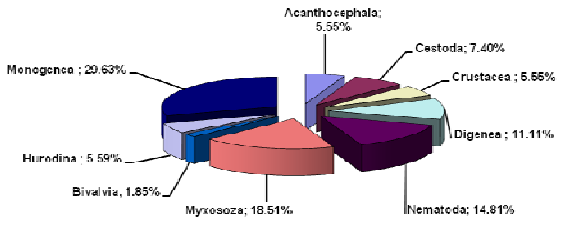

Fig. 3: Percentages of systematic groups of metazoan parasites found in *C. damascina*

Discussion

The metazoan parasite community of *C. damascina* from two ecologically different systems-lotics in mountains and lentics on plains- was studied. The structure of the metazoan community where monogeneans are the dominant component indicates a high eutrophication of water bodies down streams in the Tigris region. In these parts of the region, 16 Monogenean, 6 digenan, 4 Cestods, 3 Crustacean and 3 Hirdinian species were found in examined fish (also confirmed by Dzika *et al*., 2007). The community of parasites up stream, situated in the highlands of the region, is mainly composed of 3 acanthocephalan, 10 Myxozoa and 1 Nematoda which are mostly rheophilic species. Such a phenomenon can be interpreted from the biology and feeding behavior of *C. damascina*, which is mainly classified as a phytobenthophagus fish. A variety of insects are also found in its long intestine; for instance Chironomidae, Formicidae, Epididae and Simulidae (Coad, 1992). Furthermore, other zoobenthic fauna, like mollusks and a few suspended copepods, are also eaten by *C. damascina*, some of which serve as an intermediate host of the mentioned parasites with incomplete life cycle (Myxozoa, Acanthocephala).

When comparing metazoan parasite richness in *C. damascina* in two different environments, it becomes evident that the prevalence of fauna found in some parasitic groups, specifically those tropically transmitted, such as the digenean parasites (3 adults and 3 larva) and cestodes (2 larvae and 2 adults), may be due to the presence of mollusks and cyclops in the down stream, lentic habitat of *C. damascina*, in rather polluted part of the Tigris region. Conversely, the parasitic community in *C. damascina* up stream and in cleaner waters, is mainly populated by Acanthocephalan and some Nematoda.

Three crustacean specimens (in low intensity) were found on the examined fish. They were *Lernaea cyprinidea* on the fins, *Argulus foliaceus* on skin, and *Ergasilus* sp. in gills. All of them are *Limnophilic* species, which is not the environment preferred by *C. damascina*.

More attention should be paid to Monogenean parasites found on the gills, fins and skin of the examined specimens. Among the identified Monogenean species found, 3 *Dactylogyrus* species (*D. rohdianus*, *D. Capoeta*, and *D. carassobarbi*) and 2 *Dogielius*

species (*Do. molnari* and *Do. planatus*) are native to Mesopotamia and are highly specific to *C. damascina.*

Morphological peculiarities of *Dactylogyrus* spp fauna of *C. damascina* clearly prove its Mesopotamian origin. Endemic Monogenean species of this sub region possess the elements of both Palaearctic fauna and African fauna at the same time, having undergone an independent evolution (Gussev, 1983).

These monospecific parasite species, which only infect single host species, can be interpreted as a situation in that the host and parasites have evolved and specified together (Kennedy, 1975). This type of monospecificity is therefore generally held to indicate a long-term association between *Dactylogyrus* spp as parasites and *C. damascina* as host, reflecting the phylogeny of both host and parasites.

In conclusion, on the basis of the present data, we suggest that species composition and species richness of metazoan parasite communities of *C. damascina* appear to vary significantly on a large geographical scale (Mesopotamian fauna region). The extent to which these differences are truly geographical or reflect concentrating degrees of environmental alteration between basins is an open question.

It is obvious that a clearer picture of metazoan parasite diversity and species composition, especially in monogenean species in *C. damascina*, must await a better understanding of all parasite fauna from specimens inhabiting the Tigris basin in Iran and additionally in Iraq, Syria, Turkey and Occupied Palestine. Current studies suggest this basin is the ancestral home of *C. damascina*.

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