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## Diversity of parasitic helminths of marine and freshwater fish from Turkey\*

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### Abstract

The aim of this work is to draw attention to the diversity and change of parasite number reported from marine and freshwater fish in Turkey. Comparisons were done among phlums Plathyhelminthes (Monogenea, Digenea, Cestoda), Nematelminthes, Acanthocephala, Annelida (Hirudinea) according to years. Especially, platyhelminth species number from marine and freshwater fish of Turkey increased seriously to nowadays.

**Keywords:** Diversity, parasite, marine, freshwater, fish, Turkey

### 1. Introduction

Fish-parasite checklist studies are important taxonomic documents obtaining the fish-parasite relationships, host selectivity and geographic distribution of fish parasites. They may contribute as baseline data in the disciplines of parasitology, zoology, medicine, environmental science in terms of determining biological diversity, treatment and control of parasites, identification of parasite, determining host selectivity and geographic distribution of fish zoonoses, compare of fish parasite fauna of local, regional and worldwide. Research about the helminth parasites of freshwater fish in the world has increased in recent years<sup>[1, 2, 11, 12, 18, 19, 20, 21]</sup>.

The examination of literature on marine and freshwater habitats (lake, river) of Turkey by Bilecenoğlu et al<sup>[4]</sup>, Frick et al.<sup>[7]</sup> has revealed the report of 512 marine fish species and 248 freshwater fish species (plus 13 introduced).

Articles in different journals, Msc and PhD thesis, symposium, conference proceedings and other reports have been published mentioning parasites of wild, farmed and imported fish by Turkish and foreign researchers between 1931 and 2014

## 2. Materials and Method

In the literature dealing with parasitic helminths of marine and freshwater fishes in Turkey, there appear many incorrect spellings of parasite names, host names and species author's names, and incorrect attributions of dates of species authorship. The scientific names, their synonyms of all parasites and their hosts were checked with main electronic sites concerning with the classification [6, 7, 8, 9, 10, 22]. Similarly, misspellings of host species names where these have been widely applied, have been corrected without comment using information. However, data regarding the parasitic helminths were generally focused on there view paper by Öktener [13, 14]. These checklists also contains incorrects, deficiencies. When they were published at that time, databases such as Worms, Fishbase weren't much more using in the scientific articles. Where erroneous spellings of parasite genus or species names have been consistently applied, these were noted using table by Öktener [16, 17].

## 3. Results and Discussion

All information about parasitic helminths of marine and freshwater fish has been compiled by Öktener [13, 14], based on parasite-host list and host-parasite list, respectively. Author compiled critical checklist of 99 parasitic helminths (73 named and 26 unnamed), 12 parasitic crustaceans, 1 molluca larvae of freshwater fish; and 114 parasitic helminths (95 named and 19 unnamed) of marine fish from Turkey.

Since publication of these checklists of parasitic helminths of marine and freshwater fish in Turkey over 11 years ago, several articles, thesis were published by Turkish and foreign scientists. These studies yielded some new distributional records and added new species.

Checklist of parasitic helminths of freshwater fish from Turkey was revised by Öktener [16]. This revision includes these additional records and allows for the correction of those errors and omissions that were present in the preceding version. It indicated the occurrence of 123 parasite species which included 60 monogeneans, 20 digeneans, 20 cestodes, 11 nematodes, 7 acanthocephalans, 5 hirudinids from 71 different wild fish (64 native, 4 transitional, 3 introduced fish) species from fresh waters of Turkey. Parasites not identified to species level are listed separately, and not included to comments of result, because of reporting different host species. Cyprinidae with 50 species is the dominant family among the examined fish with regard to species diversity.

After Öktener [13], 's checklist, parasites species number increased seriously to nowadays. Especially, platyhelminth species number reached from 57 to 100 Öktener [16] (Table 1).

**Table 1:** Change of number of parasitic helminth species reported from freshwater fish species after Öktener [13]

	Öktener [13]		Öktener [16]	
	Named Species	Unnamed species	Named Species	Unnamed species
Monogenea	28	5	60	8
Digenea	16	5	20	11
Cestoda	13	6	20	8
Nematoda	8	5	11	9
Acanthocephala	5	3	7	4
Hirudinea	3	2	5	2
	73	26	123	42
<b>Total</b>	99		165	

I showed in these articles (Öktener [13, 14]) that checklists are important database for the diversity, distribution according to regions of parasites, because this allows doubt and error records to be corrected relatively. For example, *Ligula intestinalis* was reported much more from several freshwater habitats, because of big structure, easy visibility. Consequently, parasite records can be repeated and presented from same host fish or same habitat as first report by different researchers [15].

Çınar [5], claimed that his article is aimed to give an up-to-date species list of the phyla reported from the coasts of Turkey and their distributions to four different seas surrounding Turkey. Although Çınar prepared up-to-date checklist about platyhelminths with hastily that I considered, he cannot draw a clear data that I read. He goes on to emphasize data regarding the parasitic flatworms specifically, extracted from the review paper by Öktener [14]. As an marine organisms (polchaeta) expert, Çınar [5] was obviously

aware some helminths were not from marine fishes. Çınar <sup>[5]</sup> wanted to bring new contribution citing other Turkish scientists's records in article.

This publication includes forgotten parasite notifications (for example, *Tristoma integrum*, *Haploporus benedeni*, *Callitetrarhynchus gracilis*, *Anguillicoloides crassus*), incorrect parasite (*Opechona bacillaris* not reported by Avşar <sup>[3]</sup>), synonyms and incorrect spellings of helminth and host species. Although new host records for parasites after 2005, Çınar <sup>[5]</sup> gave insufficient host notifications as "on various fish". For example, hosts of *Anisakis simplex* were reached from 10 to 21. More importantly, 16 monogenea, 8 digenea, 5 cestoda, 3 nematoda, 3 acanthocephala species and their host species were omitted in this article.

Checklist of parasitic helminths of marine fish from Turkey was updated by Öktener <sup>[17]</sup>. This updated

checklist indicate the occurrence of 164 helminth species which included 49 monogeneans, 64 digeneans, 19 cestodes, 17 nematodes, 12 acanthocephalans, 3 hirudinids from 90 different wild fish (88 native, 2 transitional fish) species from marine of Turkey. The checklist also presents 35 unnamed species (not identified to species level). Parasites not identified to species level are listed separately, and not included to comments of result, because of reporting different host species.

After checklist helminths of marine fishes from Turkey published by Öktener <sup>[14]</sup>, parasites species number increased seriously to nowadays. Especially, platyhelminth species number reached from 74 to 132 (Table 2).

**Table 2:** Change of number of parasitic helminth species reported from marine fish species after Öktener <sup>[14]</sup>

	Öktener <sup>[14]</sup>		Çınar <sup>[5]</sup>		Öktener <sup>[17]</sup>	
	Named Species	Unnamed species	Named Species	Unnamed species	Named Species	Unnamed species
Monogenea	28	2	33	None	49	7
Digenea	38	7	56	None	64	10
Cestoda	8	4	14	None	19	6
Nematoda	12	4	14	None	17	8
Acanthocephala	7	2	9	None	12	3
Hirudinea	2	0		None	3	1
	95	19	126	None	164	35
<b>Total</b>	114		126		198	

Finally, it is also planned to compare and update the parasite richness of fishes of Turkey. It was felt that a picture of the fish parasites known from Turkey to date would help to solve contradictions among researchers, and benefit veterinarians, parasitologists and zoologists, ecologists. It is hoped that this compilation will stimulate further parasitological investigations in fishes of Turkey.

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Ahmet Öktener. Diversity of parasitic helminths of marine and freshwater fish from Turkey. Journal of Zoology Studies. 2014; 1(4):12-15.

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