Kafkas Univ Vet Fak Derg
18 (Suppl-A): A23-A28, 2012
DOI:10.9775/kvfd.2011.5239

RESEARCH ARTICLE

Monogenean Parasites of White Bream (*Blicca bjoerkna* Linnaeus, 1758) in Lake Sapanca, Turkey

Erhan SOYLU *

* Fisheries Department, Vocational School of Technical Sciences, Marmara University, Göztepe, TR-34722 Kadıköy, Istanbul - TÜRKİYE

Makale Kodu (Article Code): KVFD-2011-5239

Summary

A survey was made of monogenean parasites on 123 *Blicca bjoerkna* caught from Lake Sapanca between December 2007 and November 2008. Nine monogenean species were found: *Dactylogyrus sphyrna* Linstow, 1878, *D. falcatus* (Wedl, 1857), *D. difformoides* Glaser and Gussev, 1971, *D. wunderi* Bykhovskii, 1931, *D. cornu* Linstow, 1878, *D. cornoides* Glaser and Gussev, 1971, *D. distinguendus* Nybelin, 1937, *Gyrodactylus* sp. and *Paradiplozoon* sp. Of these monogeneans, *D. sphyrna, D. cornu* and *D. cornoides* were numerically dominant in all the host specimens examined, each having a prevalence of 100% in some spring and summer months. These were followed in numerical dominance and prevalence by *D. distinguendus* and *Gyrodactylus* sp. The other parasite species were found infrequently, four or five species groups predominated particularly during the spring and summer months. *D. wunderi* and *D. falcatus*, found only in June and July on just three host specimens, are new records for Turkey.

Keywords: *Monogenean, Parasite, White bream, Lake Sapanca*

Sapanca Gölü'nde Tahta Balığı (*Blicca bjoerkna* Linnaeus, 1758)'nın Monogenean Parazitleri

Özet

Araştırma Aralık 2007 ile Kasım 2008 tarihleri arasında Sapanca Gölü'nden yakalanan 123 *Blicca bjoerkna*'nın monogenean parazitleri ile yapıldı. Dokuz monogenean türü bulundu; *Dactylogyrus sphyrna* Linstow, 1878, *D. falcatus* (Wedl, 1857), *D. difformoides* Glaser and Gussev, 1971, *D. wunderi* Bykhovskii, 1931, *D. cornu* Linstow, 1878, *D. cornoides* Glaser and Gussev, 1971, *D. distinguendus* Nybelin, 1937, *Gyrodactylus* sp. ve *Paradiplozoon* sp. Bu monogenean'lardan *D. sphyrna, D. cornu* ve *D. cornoides* çalışılan konakların hepsinde sayısal olarak baskın bulundu, herbiri bazı ilkbahar ve yaz aylarında %100 lük yaygınlığa sahipti. Bu türleri sayısal baskınlık ve yaygınlık bakımından *D. distinguendus* ve *Gyrodactylus* sp. takip etti. Diğer parazit türleri nadir olarak bulundu, özellikle ilkbahar ve yaz aylarında dört veya beş parazit tür grubu hakimdi. Haziran ve Temmuzda sadece üç konakta bulunan *D. wunderi* ve *D. falcatus* Türkiye için yeni kayıttır.

Anahtar sözcükler: *Monogenean, Parazit, Tahta balığı, Sapanca Gölü*

INTRODUCTION

Monogenea are platyhelminthes with a direct life cycle. Most species when adults live on the skin or the gills of freshwater and marine fish, although some species infect amphibians, reptiles and mammals [1]. Monogeneans are of major importance in the pathology of fish and are accepted as one of characteristic indicators of the health status of biotopes. In the natural environment, monogeneans generally expand in limited number and are in apparent equilibrium with the host fish [2].

However epizootics of monogeneans can cause mortality when fish population densities exceed those in natural environments. This occurs in fish cultivated in net cages in lakes or in dammed lakes, where parasite proliferation is excessive.

Monogeneans feed on epithelial cells, mucus and blood, and can cause damage including hemorrhage and ulceration of host epithelium, epithelial outgrowth

İletişim (Correspondence)
+90 216 4182506/629
esoylu@marmara.edu.tr

development and excessive mucus production which can disturb the respiratory function of the gills and ionic exchange [3]. Dactylogyrids, which are common monogenean parasites on the gills of cyprinid fish, are highly host specific [4]. Lake Sapanca, surface area 47 km^2 and a maximum depth 51 m, is located northeast of the Marmara Sea and is one of the most important lakes in the region. It is an important source of drinking and process water and an important recreation area. It is oligotrophic [5], and there are 21 fish species inhabiting in the lake [6]. Some researchers have previously recorded the following monogeneans on fish in the lake: *Dactylogyrus sphyrna, D. vistulae, D. phoxini, D. difformis, D. difformoides, D. distinguendus, D. bicornis, D. crucifer, D. cornu, D. cornoides, D. extensus, D. macracanthus, Silurodiscoides siluri, S. vistulensis, Tetraonchus monenteron*, *Gyrodactylus* sp, *Paradiplozoon* sp.[7-12].

The aim of this research is to study population data of monogenean infestations on *Blicca bjoerkna* in Lake Sapanca

MATERIAL and METHODS

A total of 123 *Blicca bjoerkna* were obtained from local fishermen at Lake Sapanca between December 2007 and November 2008. The fish were necropsied as soon as possible after capture and the gills cut out and examined for monogenean parasites under a stereomicroscope. The parasites were removed and placed on a slide with ammonium picrate-glycerin or lactophenol, covered with a cover-glass and flat mounts were prepared [13,14]. Slides were studied with a Nicon Diaphot 300 microscope at 40x and 100x. Identification of the *Dactylogyrus* species was made on external morphology, attachment organs, the chitineous parts of the haptor, male copulatory organ and vaginal armament of unstained specimens [15]. Image of the microscope slides were recorded to a CD by a Sony CCD Color Video Camera. Drawings of the specimens were made from a computer screen and measurements, unless otherwise indicated, are presented in micrometers.

RESULTS

The following nine monogenean species were identified on the gills of *B. bjoerkna*: *Dactylogyrus sphyrna* Linstow, 1878, *Fig. 2*, *D. falcatus* (Wedl, 1857), *Fig. 3*, *D. difformoides* Glaser and Gussev, 1971, *Fig. 4*, *D. wunderi* Bykhovskii, 1931, *Fig. 5*, *D. cornu* Linstow, 1878, *Fig. 6*, *D. cornoides* Glaser and Gussev, 1971, *Fig. 7*, *D. distinguendus* Nybelin, 1937, *Fig. 8*, *Gyrodactylus* sp. *Fig. 9* and *Paradiplozoon* sp. *Fig.10*. This is the first report of *Dactylogyrus wunderi and D. falcatus* in Turkey.

Of these monogeneans, seven species were belonged to Genus *Dactylogyrus*, one to *Gyrodactylus* and the other to *Paradiplozoon*. The number of infected fish and the prevalence, minimum-maximum and mean number of the parasites are shown in the *Table 1*. Monthly changes in the infection of four dominant monogenean parasites are shown in the *Fig 1*. Chitineous parts of the haptor, male copulatory organ and vaginal armament of monogeneans are shown in the *Figs. 2-10*. Drawings of these sclerotized elements are shown in the *Fig. 11*.

Of these monogeneans, *D. sphyrna, D. cornu* and *D. cornoides* were numerically dominant in all of the host specimens examined, each having a prevalence of 100% in some spring and summer months. These were followed in numerical dominance and prevalence by *D. distinguendus and Gyrodactylus* sp. The other parasite species were found infrequently. Infection with *Dactylogyrus* was generally found higher in the spring and summer and lower in the autumn and winter. *D. wunderi* and *D. falcatus* were found only in June and July on just three host specimens. *D. difformoides* was also found only on two host specimens in May as a few individuals.

DISCUSSION

Monogenean parasites of the fish in Lake Sapanca have been investigated by several authors [7-10,12]. These previous

Table 1. *Infection Parameters of White Bream (Blicca bjoerkna) with monogenean parasites in Lake Sapanca*
Tablo 1. *Sapanca Gölünde Tahta Balığı (Blicca bjoerkna) nın Monogenean Parazitlerle Enfeksiyon Parametreleri*

Infected Fish Number	Prevalence %	Identified Monogeneans	Min-Max	X±SD
82	66.6	*Dactylogyrus cornu*	18-235	86.48±60.35
58	47.1	*D. cornoides*	13-118	53.21±28.23
55	44.7	*D. sphyrna*	3-97	47.32±40.12
16	13.0	*D. distinguendus*	2-35	19.06±11.44
5	4.0	*D. difformoides*	1-5	2.60±1.52
3	2.4	*D. wunderi*	3-8	5.00±2.65
3	2.4	*D. falcatus*	2-11	6.00±4.58
9	7.3	*Gyrodactylus* sp.	15-53	36.33±13.87
2	1.6	*Paradiplozoon* sp.	1-2	1.50±0.71

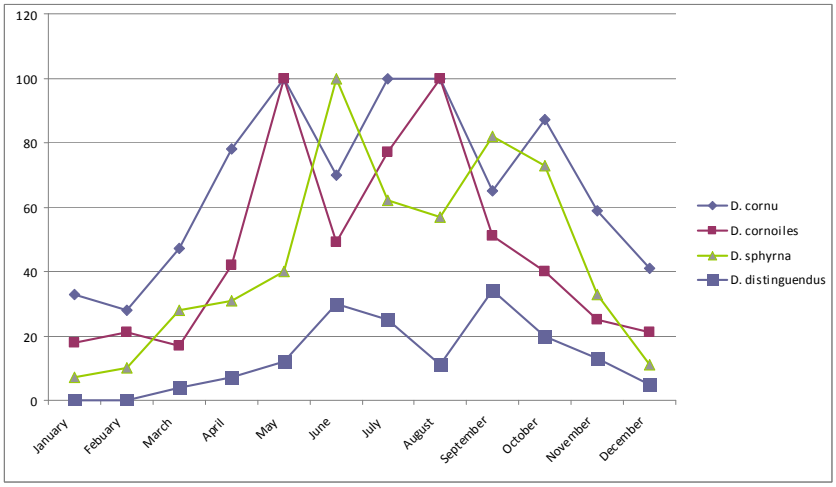

Fig 1. Monthly changes in prevalence of *Dactylogyrus cornu, D. cornoides, D. sphyrna* and *D. distinguendus* on the gills of white bream *(Blicca bjoerkna)* in Lake Sapanca

Şekil 1. Sapanca Gölünde tahta balığı *(Blicca bjoerkna)*'nın solungaçlarında *Dactylogyrus cornu, D. cornoides, D. sphyrna* ve *D. distinguendus*'un yüzdelerindeki aylık değişimler

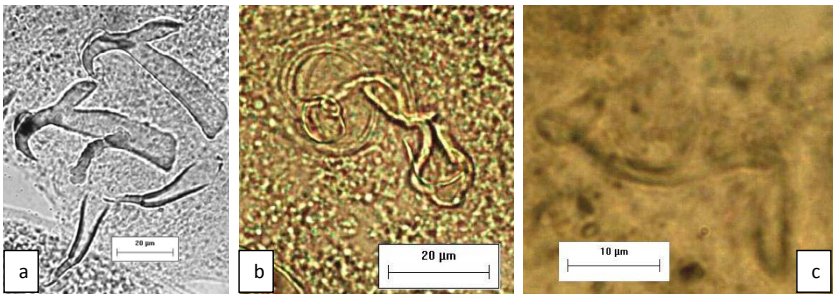

Fig 2. *D. sphyrna,* **a:** anchors, marginal hooks, **b:** copulatory organ, **c:** vaginal tube

Şekil 2. *D. sphyrna,* **a:** median kancalar, marjinal çengeller, **b:** kopülatör organ, **c:** vajinal tüp

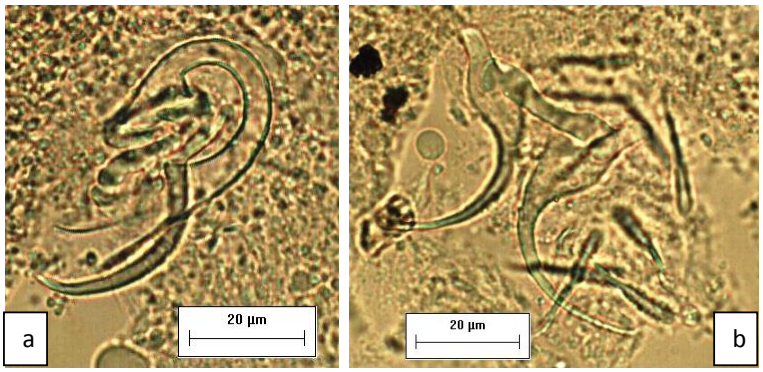

Fig 3. *D. falcatus,* **a:** copulatory organ, **b:** dorsal bar, anchors and marginal hooks

Şekil 3. *D. falcatus,* **a:** kopülatör organ, **b:** dorsal çubuk, median kancalar ve marjinal çengeller

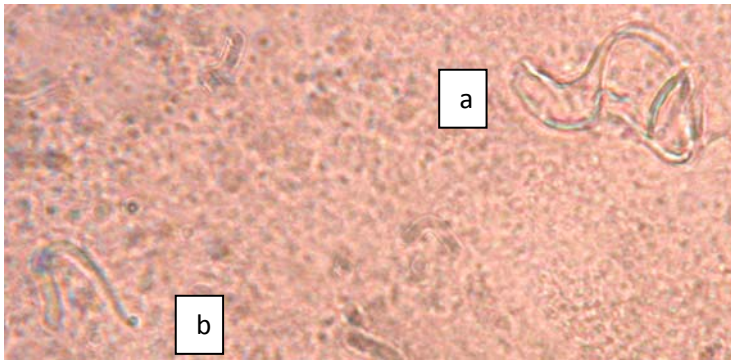

Fig 4. *D. difformoides,* **a:** copulatory organ, **b:** vaginal tube

Şekil 4. *D. difformoides,* **a:** kopülatör organ, **b:** vajinal tüp

studies in this lake have reported the following numbers of monogenean species on different fish hosts: *Scardinius erythrophthalmus* two; *D. difformis*, *D. difformoides*, *Rutilus rutilus* three; *D. crucifer*, *D. sphyrna*, *D. vistulae*, *Cyprinus carpio* three; *D. extensus*, *D. phoxini*, *Gyrodactylus* sp., *Vimba vimba* three; *D. sphyrna*, *D. cornu*, *D. cornoides*, *Tinca tinca* one; *D. macracanthus*, *Esox lucius* one; *Teteraonchus monenteron*, *Rhodeus amarus* one; *D. bicornis*, *Silurus glanis* two; *Siluridiscoides siluri*, *S. vistulensis*. The present study found *Blicca bjoerkna* to have a rich monogenean biodiversity in Lake Sapanca. It identified a total of 9 species of monogeneans on them.

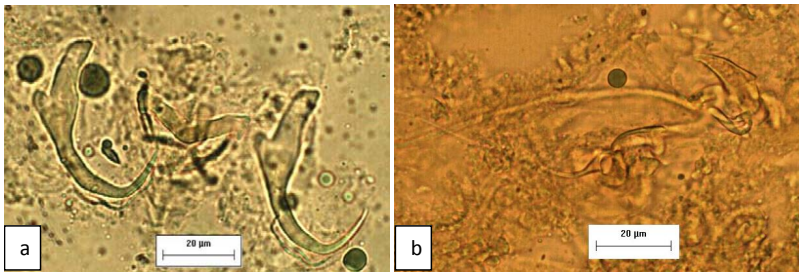

Fig 5. *D. wunderi,* **a:** dorsal bar, ventral bar, anchors, **b:** copulatory organ

Şekil 5. *D. wunderi,* **a:** dorsal çubuk, ventral çubuk, median kancalar, **b:** kopülatör organ

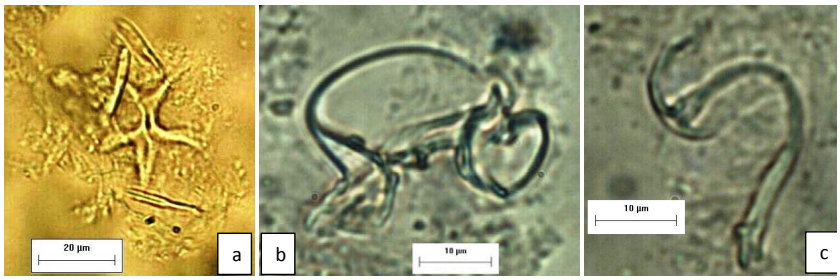

Fig 6. *D. cornu,* **a:** ventral bar and marginal hooks, **b:** copulatory organ, **c:** vaginal tube

Şekil 6. *D. cornu,* **a:** ventral çubuk ve marjinal çengeller, **b:** kopülatör organ, **c:** vajinal tüp

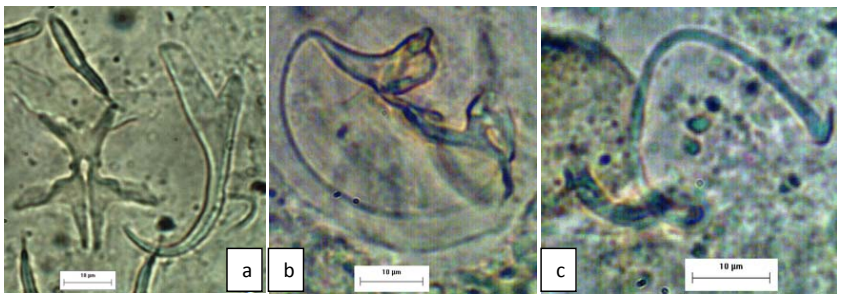

Fig 7. *D. cornoides,* **a:** ventral bar, anchor and marginal hook **b:** copulatory organ, **c:** vaginal tube

Şekil 7. *D. cornoides,* **a:** ventral çubuk, median kanca ve marjinal çengeller, **b:** kopülatör organ, **c:** vajinal tüp

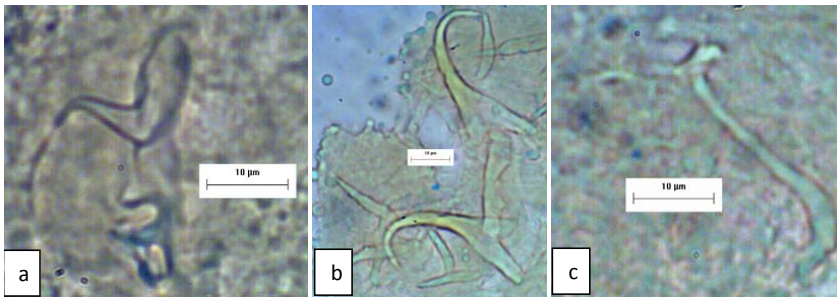

Fig 8. *D. distinguendus,* **a:** copulatory organ, **b:** anchors, marginal hooks, **c:** vaginal tube

Şekil 8. *D. distinguendus,* **a:** kopülatör organ, **b:** median kancalar, marjinal çengeller, **c:** vajinal tüp

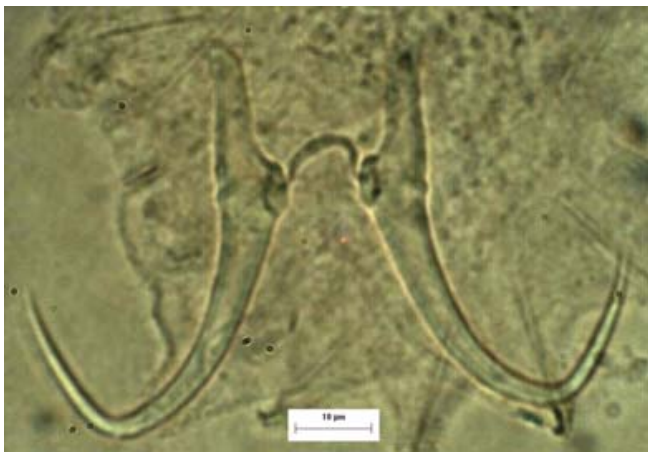

Fig 9. *Gyrodactylus* sp. anchors and marginal hooks

Şekil 9. *Gyrodactylus* sp. Median kancalar ve marjinal çengeller

D. sphyrna, *D. cornu*, *D. cornoides*, *D. distinguendus*, *D. fallax*, *Gyrodactylus elegans*, *G. laevis*, *Diplozoon gussevi* and *D. paradoxum* have been reported on the gills of *B. bjoerkna* from Lake Dabie [16]. Four of these Dactylogyrid species with the exception of *D. fallax* are those found in the present study. Of these monogeneans, *D. sphyrna* only has been recorded on *Vimba vimba* and *Rutilus rutilus* and *D. cornu* and *D. cornoides* on *V. vimba* in Lake Sapanca [9,10]. *D. distinguendus* was recorded on *Abramis brama* from Lake Durusu [17].

Most monogenean species infect only a specific host species, genus or family. That is, most monogenean are specific to one or a few closely related host species [18]. The present study found *D. wunderi* and *D. falcatus* on *B. bjoerkna* although they are usually found on *Abramis brama*. However *D. falcatus* and *D. wunderi* recorded on

Fig 10. *Paradiplozoon* sp. **a:** egg, **b:** central hook and sickle, **c:** attachment clamp
Şekil 10. *Paradiplozoon* sp. **a:** yumurta, **b:** merkezi orak çengel, **c:** tutunma kıskacı

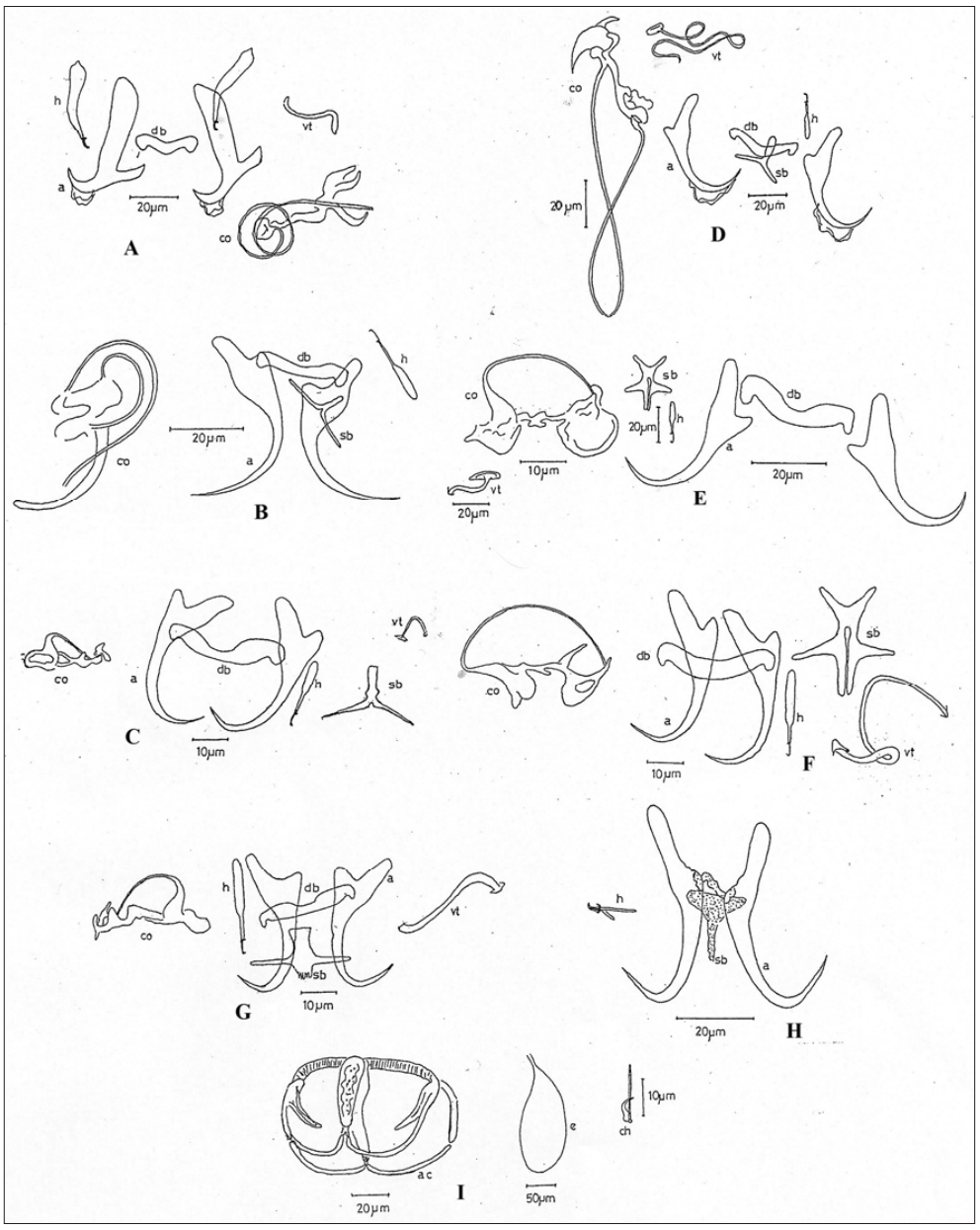

Fig 11. Chitinous parts of haptor and reproductive organs, **A-** *Dactylogyrus sphyrna,* **B-** *Dactylogyrus falcatus,* **C-** *Dactylogyrus difformoides,* **D-** *Dactylogyrus wunderi,* **E-** *Dactylogyrus cornu,* **F-** *Dactylogyrus cornoides,* **G-** *Dactylogyrus distinguendus,* **H-** *Gyrodactylus* sp., **I-** *Paradiplozoon* sp.
a: anchor, h: hook, **db:** dorsal connecting bar, **sb:** supplementary bar, **co:** male copulatory organ, vt: vaginal tube

Şekil 11. Tutunma ve üreme organlarının kitinsi parçaları, **a:** kanca, **h:** çengel, **db:** dorsal bağlayıcı çubuk, **sb:** destekleyici çubuk, **co:** erkek kopulatör organı, **vt:** vajinal tüp

the gills of both *A. brama* and *B. bjoerkna* [19,20]. *D.wunderi* was also found on the gills of *B. bjoerkna* [21,22]. Another monogenean parasite *D. difformoides* was found in the present study on the gills of white bream. *D. difformoides* was remarked both on the gills of *Abramis bjoerkna* and *S. erythrophthalmus* as generalist monogenean [22].

As a result it is found that *B. bjoerkna* has a richer monogenean diversity than those of other fish species in Lake Sapanca. Occurrence of *D. wunderi*, *D. falcatus* and *D. difformoides* on the gills of *B. bjoerkna* seems to be accidental.

REFERENCES

1. Whittington ID, Kearn GC: Hatching strategies in monogenean (Platyhelminth) parasites that facilitate host infection. *Integ Comp Biol,* 51(1), 91-99, 2011.

2. Buchmann K, Lindenstrom T: Interaction between monogenean parasites and their fish hosts. *Int J Parasitol,* 32 (3): 309-319, 2002.

3. Chapman LJ, Lanciani CA, Chapman CA: Ecology of a diplozoon parasite on the gills of the African cyprinid *Barbus neumayeri. Afr J Ecol,* 38, 312-320, 2000.

4. Whittington ID, Cribb BW, Hamwood TE, Halliday JA: Host-specificity of monogenean (platyhelminth) parasites: A role for anterior adhesive areas? *Int J Parasitol,* 30 (3): 305-320, 2000.

5. Albay M, Akcaalan R, Tufekci H, Metcalf JS, Beattie KA, Codd GA: Depth profiles of cyanobacterial hepatotoxins (microcystins) in three Turkish freshwater lakes. *Hydrobiologia,* 505, 89-95, 2003.

6. Okgerman H, Elp M, Dorak Z, Yardımcı HC, Yılmaz N, Yiğit S: Changes on the fish fauna of Lake Sapanca. *II National Workshop for Limnology*. 6-8 September, Sinop, 2006.

7. Soylu E: Monogeneans of some fishes from Lake Sapanca. *Istanbul University Mar Sci Geogr Bull*, 8, 145-156, 1991.

8. Soylu E: Monogenean parasites on the gills of some fish species from Lakes Sapanca and Durusu, Turkey. *Ege University Tr JFAS,* 26 (4): 247-251, 2009.

9. Uzunay E, Soylu E: Metazoan parasites of Carp (*Cyprinus carpio* L. 1758) and Vimba (*Vimba vimba* L. 1758) in the Lake Sapanca. *Act Parasitol Tr*, 30 (2): 141-150, 2006.

10. Karabiber FT: Metazoan parasites of Roach (*Rutilus rutilus* L, 1758) in Lake Sapanca. *MSc Thesis,* Marmara University, Institute of Pure and Applied Sciences, 2006.

11. Akmirza A: The effect of *Ligula intestinalis* L. Pleurocercoid on the growth of Bitterling (*Rhodeus amarus* Bloch, 1782). *J Black Sea/ Mediterr Environ,* 13 (2): 155-160, 2007.

12. Akbeniz E, Soylu E: Metazoan parasites of Tench (*Tinca tinca* L, 1758) in Lake Sapanca. *Istanbul University J Fish Aquat Sci,* 23 (2): 13-18, 2010.

13. Bylund G, Fagerhol HP, Calenius G, Wikgren BJ, Wikstöm M: Parasites of fish in Finland II. Methods for studying parasite fauna in fish. *Act Acad Ab. Ser. B,* 40 (2): 23, 1980.

14. Fernando CH, Furdato JI, Gussev AV, Hanek GSA, Kakonge SA: Methods for the study of fish parasites. Biol. Series Univ. Waterloo, 76 p, 1972.

15. Pugachev ON, Gerasev PI, Gussev AV, Ergens R, Khotenowsky I: Guide to Monogenoidea of Freshwater Fish of Palaeartic and Amur Regions. 567 p, Ledizioni-Ledipublishing, Milano, 2010.

16. Wierzbicka J: Monogenoidea of gills of certain Cyprinidae fish species. *Acta Parasitol Pol*, 22 (13): 149-163, 1974.

17. Karatoy E, Soylu E: Metazoan parasites of bream (*Abramis brama* Linnaeus, 1758) in Lake Durusu (Terkos). *Acta Parasitol Tr*, 30 (3): 233-238, 2006.

18. Rohde K: Latidunial differences in host-specificity of marine Monogenea and Digenea. *Mar Biol*, 47, 125-134, 1978.

19. Markevic AP: Parasitic fauna of freshwater fish of the Ukrainian SSR. Oldbourne Press. 121, Fleet Street, London, 388 p, 1951.

20. Bykhovskaya-Pavlovskaya IE, Gussev AV, Dubinina MN, Izyumova NA, Simirnova TS, Sokolovskaya I, Shtein GA, Shulman SS, Epshtein VM: Key to parasites of freshwater fish of the USSR. Izdatelsvi Akademi Nauk SSSR. Moskva Leningrad (Translated from Russian, Israel Program for Scientific Translation, Jerusalem), 919 p. 1962.

21. Kirjusina M, Vismanis K: Checklist of the Parasites of Fishes of Latvia. FAO Fisheries Technical Paper No: 369/3, Rome, FAO, 106 p, 2007.

22. Jarkovski J, Morand S, Simkova A, Gelnar M: Reproductive barriers between congeneric monogenean parasites (*Dactylogyrus:* Monogenea): Attachment apparatus morphology or copulatory organ incompatibility? *Parasitol Res*, 92, 95-105, 2004.