SEASONAL DYNAMICS AND SPATIAL DISTRIBUTION OF *DACTYLOGYRUS CRUCIFER* WAGENER, 1857 ON THE GILLS OF ROACH (*RUTILUS RUTILUS* L.) FROM LAKE SAPANCA, TURKEY

Erhan Soylu*, Bahadtin Rüzgar**, Meral Soylu*
*MARMARA UNIVERSITY, VOCATIONAL SCHOOL OF TECHNICAL SCIENCES, FISHERIES DEPARTMENT
** MARMARA UNIVERSITY, SCHOOL OF BANKING AND INSURANCE,ACTUERIA DEPARTMENT

ABSTRACT. Seasonal dynamics and spatial distribution of monogenoid species *Dactylogyrus crucifer* on the gills of *R.rutilus* were determined. A total of 183 specimens of roach were examined monthly,during January through November 2005 for seasonal occurence of *D. crucifer*. High mean intensity level of *D.crucifer* was reached in March (227.1 ± 87.14)and the lowest values recorded in November (13.3 ± 8.2).
In March 2006, fifty three *R. rutilus* were investigated for spatial distribution of *D. crucifer*. There were no any significant differences between the number of the parasites found on the left and right side of gill arches p= 0.149 > 0.05, but *D. crucifer* preferred left side gill arches. No significant differences in the number of *D. crucifer* between the gill arches p= 0.177 > 0.05 but *D. crucifer* was more abundant on the III, II and I gill arches than on the VI. *D.crucifer* showed preference for the proximal and median parts of the gill. Anterior side of the hemibrach was preferred by *D. crucifer*.

INTRODUCTION. The spatial distribution of the gill parasites has been investigated by different authors,(El Hafidi et. al., 1998, Dzika, 1999., Chapmann et. al., 2000, Matejusova et al., 2002, Simkova et al.,2002, Gutierez and Martorelli 1999). Microhabitats and coexistence of *Dactylogyrus* species of *R. Rutilus* has been also investigated by some authors (Koskivaara et al.,1991, Koskivaara and Valtonen 1992,Bagge and Valtonen 1999, Simkova et al., 2000, 2002).The occurence of parasite population on the host gills has been explained by different ways.In the preset study monogenoid parasite *Dactylogyrus crucifer* were observed on the gills of *Rutilus rutilus* from Lake Sapanca. The goal of the study is to determine seasonal occurence and spatial distribution of *D. crucifer* on the gills of *R. Rutilus* in monospecific infections.

MATERIALS AND METHODS. *Rutilus rutilus* was collected from fisherman monthly from oligotrophic Lake Sapanca. A total of 183 *R. rutilus* with total body length from 17.0 cm to 36.0 cm (mean 23. 42 ± 3. 60)were examined for seasonal occurence of *D. crucifer* from January until November 2005. The gill arches were removed
from left and right side, all the soft part of a gill arch were isolated and all Dactylogyrid specimens were counted and identified using sclerotised parts of the parasites and reproductive organs from fresh material .
In March 2006 a total of fifty three *R. rutilus* between 19.0 cm and 28.0 cm in total lenght were examined for spatial distribution of *D. crucifer*. The parasites from the left and right side of the gill arches was collected from each sector after fixation of the arches in 4 % formalin solution. Each gill arch was placed in petri dish with distilled water, left and right gill arches were numbered I to IV, gill arch I nearest to operculum, and two hemibranchs of each gill arch were designated as anterior and posterior. Each hemibranch was devided into six sectors as proximal and distal parts. The gill filaments were also devided into dorsal, medial and ventral portion (Figure 1). Parasite were collected from each sector seperately and then identified to species on the basis of chitinized parts (haptor, copulatory organ).The distribution of *D. crucifer* on the gill arches and parts of the gill apparatus of *R. rutilus* was analysed by nonparametric statistics tests: Kruskal Wallis ANOVA Test.

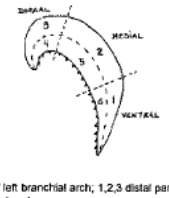

Figure 1.Division of left branchial arch; 1,2,3 distal part 4,5,6 proximal part

RESULTS. A total of 183 roach were examined for seasonal dynamics of *Dactylogyrus crucifer*, and 149 (prevalence 81.4 %) were infected with *D. crucifer*. During the sampling period 14549 specimens of *D. crucifer* were recorded, mean intensity and abundance of *D. crucifer* found 95.8 ± 62.7 and 90.0± 66.2 respectively. Mean intensity and prevalence values of *D. crucifer* during investigation period was given in fig 2 and fig 3 . Although *D. crucifer* have been found dominant parasite and evaluated as single species infection, *D. sphyrna* and *D. vistulae* were recorded only in May, June and July but not into account because of limited numbers.

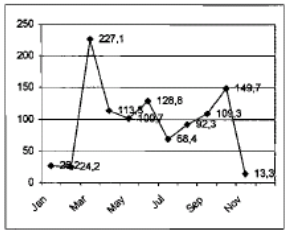

Figure 2. Mean intensity of *D.crucifer* on the gills of *R.rutilus*

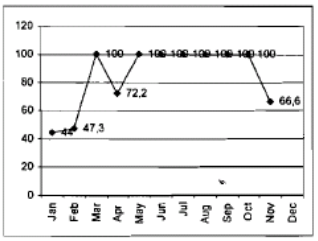

Figure 3. Prevalence of *Dactylogyrus crucifer* on the gills of *Rutilus rutilus*

Sector of Branchial Arch

ARCH		1	2	3	4	5	6	TOTAL
I	L	45*	156	83	144	151	91	670
	R	38	91	58	129	121	83	900
II	L	105	98	106	76	151	128	664
	R	128	153	91	38	133	90	633
III	L	91	136	83	153	212	98	773
	R	53	106	76	99	144	66	544
IV	L	106	114	53	41	83	30	427
	R	61	66	28	23	98	38	356
TOTAL		627	923	568	697	1075	626	4514

Table 1. Distribution of *Dactylogyrus crucifer* in Sectors Distinguished on the gill arches of *Rutilus rutilus*

	Kruskal-Wallis	*D.crucifer*	*D.crucifer*
Left side	P=0.149>0.05	2039	562
Right side		1975	438
Gill arch I	P=0.177>0.05	1175	269
Gill arch II		1275	282
Gill arch III		1369	290
Gill arch IV		717	168
Dorsal segment	P=0.084>0.05	1255	280
Medial segment		1996	442
Ventral segment		1293	278
Proximal part	P=0.586>0.05	2396	551
Distal part		2118	469
Sector 1	P=0.013>0.05	627	139
Sector 2		923	204
Sector 3		568	126
Sector 4		697	154
Sector 5		1075	238
Sector 6		626	139
Anterior hemibranch	P=0.194>0.05	2546	562
Posterior hemibranch		1975	438

*Number of D.crucifer found in given sector in all fish examined
Table 2. Distribution of *Dactylogyrus crucifer* on the Gill of Apparatus of *Rutilus rutilus* in Single Species Infection

In March 2006 fifty three roach were investigated for spatial distribution of *D. crucifer*, in monospecific infections. A total of 4514 individuals of *D. crucifer* were recorded, parasites in sectors distinguished on the gill arches. Distribution of *D. crucifer* on the left and right side gill arches and on the six sectors of branchial arch was given in Table 1. There were not significant differences in the number of *D. crucifer* between the gill arches p= 0.177 >0.05 , but *D. crucifer* was slightly more abundant on the III, II and I gill arches than IV. Detailed information on the distribution of *D. crucifer* on the gill arches was given in Table 2.

DISCUSSION. In the present study three *Dactylogyrus* species; *D. crucifer*. *D. sphyrna* and *D. vistulae* were recorded from roach in oligothrophic Lake Sapanca. Only *D. crucifer* was very common throughout the year. Kogteva (1957) found *D. crucifer* on the gills of *Scardinius erythrophthalmus*, *R. rutilus*, and *Blicca bjoerkna* from USSR. Beside *R. rutilus* both *S. erythrophthalmus* and *B. Bjoerkna* present in Lake Sapanca, but *D. crucifer* was recorded only on the gills of *R. rutilus* (Soylu, 1991). *D. sphyrna* and *D. vistulae* were found in limited number in June and July. Koskivaara and Valtonen, (1992) found *D. crucifer*, *D. nanus*, *D. suecicus*, *D. microcanthus*, *D. similis*, *D. cabollario*, *D. fallax*, *D. sphyrna* and *D.vistulae* from roach in central Finland. Ten dactylogyrid species from roach in Morava river basin was recorded by Kadlec et. al. (2003) in Czech Republic. Simkova et. al. (2001) found six dactylogyrid species on the same host individual and *D. crucifer*, *D. nanus*, *D. rutilli* and *D. suecicus* were recorded common dactylogyrids on the gills of roach. Whereas roach in Lake Sapanca was not exhibited such a rich dactylogyrid diversity. Maximum mean intensity value of *D. crucifer* on the gills of *R. rutilus* in Lake Sapanca was recorded in March for this reason fifty three roach were studied for spatial distribution of *D. crucifer* in this month.
In conclusion, *D. crucifer* on the gills of *Rutilus rutilus* in the present study preferred first second and third gill arches and anterior hemibranch. *D. crucifer* mostly occupied medial segment and proximal parts of gill arches, *D. crucifer* preferred left side of the gills. But *D. crucifer* settled on almost all the sectors, *D. crucifer* was found dominant parasite throught the year this means there is no interspecific interactions.
According to Ramasamy et. al. 1985 the microhabitat extension was probably a result of increased parasite density and intraspecific competition for space. Findings of the present study is agreement with this opinion namely, to spread of *D. crucifer* on almost the all gill surface is considered to presence of intraspecific competition.

REFERENCES

Bagge, A. M., and Valtonen, E. T. 1999. Development of monogenean communities on the gills of roach fry (*Rutilus rutilus*). *Parasitology*, 118: 479-487.
Chapman, L. J., Lanciani, C. A. and Chapman C. A., 2000. Ecology of a diplozoon parasite on the gills of the African cyprinid *Barbus neumayeri*. *African Journal of Ecology*, 38: 312-320.
Dzika, E., 1999. Microhabitat of *Pseudodactylogyrus anguillae* and *P. Bini* (Monogenea: dactylogyridae) on the gills of large-size European eel, *Anguilla anguilla* from Lake Gaj, Poland. *Acta Parasitologica*, 46: 33-367.
El Hafidi, F., Berrada-Rkhami, O., Benazzou, T., Gabrion, C. 1998. Microhabitat distribution and coexistence of Microcotylidae (Monogenea) on the gills of striped mullet *Mugil cephalus*: change or competition? *Parasitological Research*: 84: 315-320.
Gutierrez, P. and Martorelli, S. R., 1999. Niche preferences and spatial distribution of Monogenea on the gills of *Prolebias maculatus* in Rio de la Plata (Argentina), *Parasitology*, 119: 183-188.
Kogteva, E. P. 1957. Fish parasites from Pskov-Chud' water reserve. In: Parasites and Diseases of Fish. Bulletin of the All-union Scientific Research Institute of Lake and River Fisheries. Ed. G.K. Petrushevskii. (English).
Kadlec, D., Simkova, A., Jarkovsky, J., and Gelnar, M. 2003. Parasite communities of freshwater fish under flood conditions. *Parasitology Research*, 89: 272-283.
Koskivaara, M., Valtonen, E. T., and Prost, M. 1991. Dactylogyrids on the gills of roach in central Finland features of infection and species composition. *International Journal for Parasitology*, 21: 565-572.
Koskivaara, M., Valtonen, E. T. 1992. *Dactylogyrus* (Monogenea) communities on the gills of roach in three lakes in Central Finland. *Parasitology*, 104: 263-272.
Koskivaara, M., Valtonen, E. T., and Vouri, K. M., 1992. Microhabitat distribution and coexistence of *Dactylogyrus* species (Monogenea) on the gills of roach. *Parasitology*, 104: 273-281.
Matejusova, I., Simkova, A., Sasal, P., and Gelnar, M. Microhabitat distribution of *Pseudodactylogyrus anguillae* and *P.Bini* among and within gill arches of the European eel (*Anguilla anguilla* L.). *Parasitology Research*, 89: 290-296.
Ramasamy, P., Ramalingam, K., Hana, R. B. E.,and Hatton, D. W. 1985. Microhabitats of gill parasites (Monogenea and Copepoda) of Teleost (*Scomberoides* spp.) *International Journal for Parasitology*, 15: 385-397.
Simkova, A., Desdevises, Y., Gelnar, M. and Morand, S., 2000. Co-existence of nine gill ectoparasites (*Dactylogyrus*:Monogenea) parasitizing the roach (*Rutilus rutilus* L.) history and present ecology. *International Journal of Parasitology*, 30: 1077-1088.
Simkova, A., Gelnar, M., and Sasal, P. 2001. Aggregation of congeneric parasites (Monogenea *Dactylogyrus*) among gill microhabitats within one host species (*Rutilus rutilus*). *Parasitology*, 123: 599-607.
Simkova, A., Ondrackova, M., Gelnar, M., and Morand, S., 2002. Morphology and coexistence of congeneric ectoparasite species: reinforcement of reproductive isolation? *Biological Journal of the Linneans Society*, 76: 125-135.
Soylu, E. 1991. Monogeneans of some fishes from Lake Sapanca (Sakarya). *University Institute of Marine Sciences and Geography Bulletin*, 6: 143-155.