

Parasitic fauna of sprat (*Sprattus sprattus phalericus* RISSO, 1826) from the Turkish Black Sea coast

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*This study was performed to identify the parasites of sprat (*Sprattus sprattus phalericus* RISSO, 1826) collected from the Turkish Black Sea coast during September 1990 to January 1992. Ectoparasites were not found. The nematodes, *Hysterothylacium aduncum* and *Cucullanus minutus* were observed on the visceral organs of sprat.*

*The prevalence of these parasites was related to sex and sizes of fish and season. *H. aduncum* was more abundant in female fish, and the prevalence was higher in September than in December and January. Fishes were more infested in old ages than the young ones.*

INTRODUCTION

Sprat is one of the most common pelagic fish in the Atlanto Mediterranean water system. There are three sub species inhabiting this system (SLASTENENKO, 1956; TORTONESE, 1970; WHITEHEAD, 1984, 1985; FISCHER *et al.*, 1987). Ectoparasites of the Atlantic sprat (*Sprattus sprattus sprattus*) were studied by LÉBOUR (1918a, 1919a: c.f. RUSSELL, 1976), SPROSTON and HARTLEY (1941), HARDING and WHEELER (1958), VAN DEN BROEK (1979) and POTTER and CLARIDGE (1985). Parasites of the Baltic form of sprat *S. sprattus balticus* are not investigated, and only one study was carried out on the ectoparasites of the Black Sea form *S. sprattus phalericus* (TORTONESE, 1970). The results of the present study provide new information because this is the first report on endoparasites of the Black Sea sprat.

MATERIAL AND METHODS

The material for the present study was collected from 46 sampling stations located along the continental shelf of the Turkish Black Sea coast (Fig. 1). The samplings with bottom trawl were made in September 1990 and in September 1991. Mid-water trawl surveys were carried out in December 1990 and January 1992.

Aboard ship, specimens of sprat were sorted out and examined externally. In poor hauls, the total catch was considered as the sample size for further analyses. In large hauls, procedures of sub sampling followed those described by HOLDEN and RAITT (1974). By using this way, a total of 1349 fishes were sampled and preserved in solutions of 10 % formalin buffered with borax (FERREIRO and LABARTA, 1988a; 1988b).

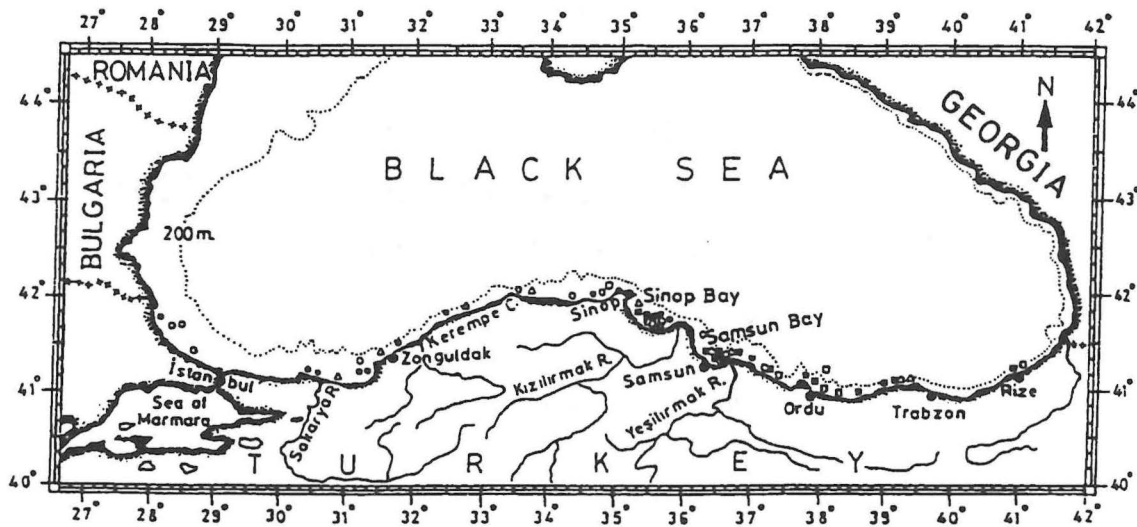


Fig.1. Location of the sampling stations along the Turkish Black Sea coast (Circles: SEPTEMBER 1990, Squares: DECEMBER 1990, Solid rectangular boxes: SEPTEMBER 1991 and Triangles: JANUARY 1992)

Table 1. Total length (mm) and number (n) of sprat specimens in each sex group and sampling period

SAMPLING PERIOD	M A L E		F E M A L E		EXAMINED FISH
	MIN - MAX	(n)	MIN - MAX	(n)	
SEPTEMBER 1990	71 - 119	76	65 - 125	228	304
DECEMBER 1990	38 - 105	62	38 - 112	133	195
SEPTEMBER 1991	67 - 130	47	65 - 141	295	342
JANUARY 1992	55 - 108	156	59 - 137	352	508
TOTAL	38 - 130	341	38 - 141	1008	1349

In the laboratory, total length of fish was measured to the nearest millimeter. Ranges of the total lengths and number of fish specimens analysed for each sex group and sampling period are shown in Table 1.

Fish were separated into sex groups. Sex determination was made from gonads. In young individuals, sex differentiation was made under a binocular microscope. In adult specimens, this was confirmed macroscopically. Fish were aged using sagittal otoliths and right cleithra under a binocular microscope directly by immersing the otolith or cleithra in glycerine for enumeration of increments.

Visceral organs were removed by cutting the alimentary tract between the oral cavity and the anus. Viscera of individual fish were examined externally and the number and position of endoparasites recorded.

The parasites, like dietary components of their host species, change with the host's size and sex (HOLDEN and RAITT, 1974). Therefore, the dominancy method described by HOLDEN and RAITT (1974) and HYSLOP (1980) was performed separately in each sex and age group of fish. This method has been used to estimate the number of fish in which the parasite was contained as the dominant parasite:

$$D\% = 100 \times S_i / \Sigma S$$

where:

S_i : the number of fish individuals with i 'th parasite categories.

ΣS : the total number of individuals with no parasite

RESULTS AND DISCUSSION

A total of 1349 Black Sea sprats (*S. sprattus phalericus*) was examined. None of the fish specimens were infested by ectoparasites. This is striking because the Atlantic and Baltic sprat are reported as hosts of at least four species of ectoparasites. These are the trematodes *Pharyngora bacillaris* and *Gasterostomum* sp. on sprat postlarvae (LEBOUR, 1918a, 1919a: c.f. RUSSELL, 1976) and the ectoparasitic copepods *Bomolochus nutus*, *Lernaeenicus enrasicola* (TURTON) and *Lernaeenicus sprattae* (SOWERBY) on adult sprats (SPROSTON and HARTLEY, 1941; HARDING and WHEELER, 1958; TORTONESE, 1970; POTTER and CLARIDGE, 1985).

Endoparasites in the Black Sea sprat were represented by the nematodes *Hysterothylacium aduncum* (Anisakidae) and *Cucullanus minutus* (Cucullanidae). The prevalence of *H. aduncum* was 42% in female and 19% in male sprats compared to 3% and 2% of *C. minutus* (Table 2). All nematodes were unencapsulated and found to be attached to the visceral organs e.g. in the lobe of liver, gonads, stomach or intestine wall and they were adults. This indicates that the Black Sea sprat is the final host of both nematode species.

There is no information in the literature about the infestation of Black Sea sprat by endoparasites. However, the present results of the prevalence of nematodes in Black Sea sprat can be compared with those from other

teleostean fishes. If the results obtained from present study and the results given by GORDON (1977) for whiting (*Merlangius merlangus*) from the west coast of Scotland are compared, then it is seen that the prevalence of *H. aduncum* given in Table 2 (for male = 19%, female = 42% and for pooled data = 36%) is near the upper limit; and the prevalence of *C. minutus* (3% and 2% for females and males) is near the lower limit of the range (2% - 38%) given by GORDON (1977).

The prevalence of *H. aduncum* in both sexes predominated in both September samples while no nematodes were recorded in December (Table 2). The prevalence of both nematode species was lower in January 1992 than in September of 1990 and 1991. Then, it can be reasonably stated that the percentage occurrence of nematodes in cold months is relatively smaller than that in warm periods.

Earlier studies were carried out by DOGIEL and BUCHOWSKY (1938) and RADULESCU (1952) on the parasites of the Caspian fishes and on the parasites of the horse mackerel (*Trachurus* sp.) from the Black Sea respectively. These study areas draw much attention for Black Sea sprat due to the Caspian fishes and horse mackerel inhabit the same region. These authors identified the same species (*Contracoecum adeuncum* and *Cucullanelus minutus*) on Caspian fishes and horse mackerel, which are the synonymous of *H. aduncum* and *C. minutus* respectively (KINNE, 1984).

The absence of nematodes in the December samples was related to the size of examined

Table 2. Prevalence (%) of nematodes in each sex group of sprat and sampling period ((1): Prevalence of *Hysterothylacium aduncum*; (2): Prevalence of *Cucullanus minutus*; (n): Number of fish)

SAMPLING PERIOD	M A L E			F E M A L E			P O O L E D D A T A		
	(1)	(2)	(n)	(1)	(2)	(n)	(1)	(2)	(n)
SEPTEMBER 1990	32	4	76	56	3	228	50	3	304
DECEMBER 1990	0	0	62	0	0	133	0	0	195
SEPTEMBER 1991	40	2	47	62	3	295	59	3	342
JANUARY 1992	14	1	156	32	2	352	26	2	508
TOTAL	19	2	341	42	3	1008	36	3	1349

fishes. In this month the mean age (=mean length) of sprats was very small and generally comprised age group 0 and I, with the former being dominant in number (AVŞAR, 1995).

The prevalence of nematodes in each age group of each sex is given in Table 3.

There were neither *H. aduncum* nor *C. minutus* in age group 0 of both sexes (Table 3). Percentage occurrence of *H. aduncum* increased generally with increasing age in males till age group III and in females till age group IV. After the males exceeded age III and females age IV, the prevalence of nematodes decreased in both sexes. However, this may be related to the small sample sizes of these age groups. Therefore, the results should be used with caution and need further checking by using more samples.

CONCLUSIONS

According to the available information from the literature, there was no comprehensive study on parasites of the clupeid species inhabiting the coastal shelf of the Turkish Black Sea. Aiming at the solution of this Problem, one of these species phal *S. sprattus phalericus* which has an economical potential (IVANOV and BEVERTON, 1985; AVŞAR, 1994) was studied.

Two nematode species *H. aduncum* and *C. minutus* were found, but no ectoparasites. *H. aduncum* was present on all visceral organs of this fish and *C. minutus* attached in general on the stomach or intestinal wall of them. The intensity of both parasites in sprat were related to sex, size and seasons of the year. Their prevalence was higher in female and in warm months (September) than in male and in cold months (December and January) (Table 2). The increase was also observed in the prevalence of nematodes in older fish of both sexes (Table 3).

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Table 3. Prevalence (%) of nematodes in each age group of each sex of Black Sea sprat ((1): Prevalence of *Hysterothylacium aduncum*; (2): Prevalence of *Cucullanus minutus*; (n): Number of fish)

AGE	M A L E			F E M A L E			P O O L E D D A T A		
	(1)	(2)	(n)	(1)	(2)	(n)	(1)	(2)	(n)
O	0	0	62	0	0	116	0	0	178
I	14	1	170	22	1	377	19	1	547
II	31	3	87	51	3	293	47	3	380
III	67	6	15	79	3	149	78	4	164
IV	60	0	5	98	9	58	95	8	63
V	100	0	2	93	7	15	94	6	17
TOTAL	19	2	341	42	3	1008	36	3	1349

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REFERENCES

- AVŞAR, D. 1994. Türkiye'nin Karadeniz'deki potansiyel besin kaynaklarından cacca balığı. I. Ulusal Ekoloji ve Çevre Kongresi, 5-7 Ekim 1993, Atatürk Kültür Merkezi, İzmir. Ege Univ. Fen Fak. Dergisi. Seri B, Ek Cilt: 16-1, 981-992. (in Turkish). Sprat (*Sprattus sprattus phalericus* RISSO, 1826) as the potential food resource of Turkey from Black Sea). 1st. National Congress on Ecology and Environment, 5-7 Oct. 1993, Atatürk Cultural Center, İzmir. Ege Univ. Fen Fak. Dergisi. Series B, Suppl., Vol:16-1, 981-992).
- AVŞAR, D. 1995. Sex and age composition of the sprat (*Sprattus sprattus phalericus* RISSO, 1826) along the Turkish Black Sea Coast. Doga-Tr. J. of Zoology, 19: 157-163.
- DOGIEL, V. and V.E. BUCHOWSKY. 1938. Parasites of the Caspian Fishes. Acad. SSSR, Moscow, 143 pp.
- FERREIRO, M. J. and U. LABARTA. 1988a. Distribution and abundance of sardine eggs in the Ria of Vigo (NW Spain), 1979-1984. J. of Plankton Res., 10 (3): 403-412.
- FERREIRO, M. J. and U. LABARTA. 1988b. Distribution and abundance of teleostean eggs and larvae on the NW coast of Spain. Mar. Ecol. Prog., Ser. 43: 189-199.
- FISCHER, W., M. L. BAUCHOT and M. SCHNEIDER (Editors). 1987. Fiches FAO d'identification des espèces pour les besoins de la pêche. (Rev. 1). Méditerranée et Mer Noire. Zone de pêche 37. Vol. II. Vertébrés. FAO & E.C; project. GCP/INT/422/EEC. Rome, FAO, 2: 761-1530.
- GORDON, J. D. M., 1977. The fish populations in inshore waters of the West coast of Scotland. The food and feeding of the whiting (*Merlangius merlangus* L.). J. Fish. Biol., 11: 513-529.
- HARDING, J. P. and A.C. WHEELER. 1958. Heavy infestation by the parasitic copepod *Lernaenicus* of sprats in the River Crouch. Nature, 182: 542-543.
- HYSLOP, E. J., 1980. Stomach content analysis - a review of methods and their application. J. Fish. Biol., 17: 411-429.
- HOLDEN, M. J. and D.F.S. RAITT (Editors). 1974. Manual of fisheries science. Part 2-Methods of resource investigation and their application. FAO Fish. Tech. Rep. 115: Rev. 1, 214.
- IVANOV, L. and R.J.H. BEVERTON. 1985. The fisheries resources of the Mediterranean. Part two: Black Sea. Stud. Rev. GFCM., 60: 135 pp.
- KINNE, O. (Editor). 1984. Diseases of marine animals. Vol. IV, part 1, Introduction, pisces. Westholsteinische Verlagsdruckerei Boyens & Co., F.R.G., 541 pp.
- POTTER, I. C. and P.N. CLARIDGE. 1985. Seasonal catches, size and meristic data for sprat, *Sprattus sprattus* in the Severn Estuary. J. Mar. Biol. Ass. U.K., 65 (3): 667-675.
- RADULESCU, V. 1952. Parazitii stavridului din M. N. Bul. Inst. Cerc. Pisc., 4 (11): 71-81.
- RUSELL, F. S. 1976. The eggs and planktonic stages of British Marine Fishes. Academic Press. New York, USA, 524 pp.
- SLASTENENKO, E. 1956. Karadeniz havzasi Baliklari (The fishes of the Black Sea Basin). Translated from the Russian by Altan, H., E.B.K. Umum Mud. Yay., Istanbul, Turkey, 711 pp.
- SPORSTON, N. G. and P.H.T. HARTLEY. 1941. The ecology of some parasitic cope-

- pods of gadoids and other fishes. J. Mar. Biol. Ass. U.K., 25: 361-392.
- TORTONESE, E. 1970. Fauna d' Italia. Vol. X, Osteichthyes. Bologna. Italy, 565 pp.
- VAN DEN BROEK, W. L. F. 1979. Aspects of the biology of *Sprattus sprattus* (L.) in the Medway Estuary. J. Fish. Biol., 15 (4): 437-447.
- WHITEHEAD, P. J. P. 1984. Clupeidae. In: Fishes of the North-eastern Atlantic and the Mediterranean. P.J.P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen, E. Tortonese (Editors). Printed by Richard Clay Ltd. U.K., 510 pp.
- WHITEHEAD, P. J. P. 1985. FAO species catalogue. Vol. 7. Clupeoid fishes of the world. An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, anchovies and wolfherrings. Part 1-Chirocentridae, Clupeidae and Pristigasteridae. FAO Fish. Synop., 125. No. 7, Pt. 1: 303.

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**Parazitska fauna papaline
(*Sprattus sprattus phalericus* RISSO, 1826)
iz područja turske crnomorske obale**

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KRATKI SADRŽAJ

Ova je studija provedena da bi se identificirali paraziti na papalini (*Sprattus sprattus phalericus* RISSO, 1826) ulovljenoj na turskoj crnomorskoj obali od rujna 1990. do siječnja 1992. godine. Ektoparaziti nisu nađeni. Nematodi *Hysterothylacium aduncum* i *Cucullanus minutus* su nađeni na unutarnjim organima.

Brojnost ovih parazita povezana je sa spolom, veličinom ribe i sezonom. *H. aduncum* je brojniji na ženkama, a zastupljeniji je u rujnu nego u prosincu i siječnju. Starije ribe imaju više parazita od mlađih.