

Parasitic invasions on fish stocks from the N-E area of Moldavia

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Works for this study were done to fish stocks belonging from Tigănași, Vlădeni, FRAP farms and Stâncea Costești lake. Water supplies for this farms are different, and for the Stâncea Costești lake it is about one big reservoir from the river Prut.

The research results are showed in the species parasites list (totally 87), related with the infested organ and taxonomical interpretation. Studies belong to author's doctor degree's.

The ihtopathology, as a science, is gaining more credit each day, partly because of the company aspect of the aquarium fish, as well as from the economical point of view, through the particular administration of numerous farms of different dimensions. In this context, the high knowledge of the fish pathology is necessary, as well as the instruction of the new farmers in what concerns the actual simptomatology and the therapy of the disease's status.

The studies made by the author bring into front data showing the diagnosis of the parasitary invasions and the making up of the parasitofauna on the researched spaces.

Material and methods

The research was made through the years 1992 and 2001, on stocks and aquatic populations that

appear in the following farms or aquatic spaces: The Tiganasi Farm, The aquatic complex Vladeni-Larga Jijia, the artificial reproduction farm (F.R.A.P.) of the aquatic research station Iasi, The Stanca Costesti lake (accumulation on the river Prut), The Parcovaci lake, other aquatic spaces or natural water courses, in which case the fish examination was made rarely

Inside the aquatic farms there were examined the following fish species: common carp *Cyprinus carpio*, silver carp *Hypophthalmichthys molitrix*, bighead *Aristichthys nobilis*, grass-carp *Ctenopharyngodon idella*, crucian carp *Carassius auratus gibelio* and other species.

In other lakes, various species of fishes were examined.

The parasitological exam was made for the identification of the ecto and endoparasites, after the usual methods, generally accepted in ihtoparasitology.

Results

The results of our research are showed in a totally list of species parasites.

The list of the identified parasites on the studied fish in farms and in the natural spaces

Nr. crt.	The Parasite	The infected organ	The host fish species	The aquatic space
Protozoa				
Coccidia				
1.	<i>Goussia carpelli</i>	intestine	common carp, crucian carp, <i>Alburnus alburnus</i>	Tigănași, Vlădeni, L. Stâncea, L. Pârcovaci
2.	<i>Goussia sinensis</i>	intestine	silver carp	Tigănași, Vlădeni
3.	<i>Goussia alburni</i>	kidney	<i>Alburnus alburnus</i>	Stâncea
4.	<i>Goussia siliculiformis</i>	kidney	<i>Alburnus alburnus</i>	Stâncea
5.	<i>Goussia subepitelialis</i>	intestine	common carp	Tigănași, Havârna
6.	<i>Eimeria scardinii</i>	kidney	crucian carp, roach	Stâncea
7.	<i>Eimeria rutili</i>	kidney	different ciprinides	Stâncea
8.	<i>Eimeria sp.</i>	intestine	<i>Alburnus alburnus</i>	Stâncea
9.	<i>Eimeria sp.</i>	kidney	silver carp	Tigănași
Myxozoa				
10.	<i>Sphaerospora molnari</i>	skin, gills	common carp	Tigănași, Vlădeni
11.	<i>Sphaerospora renicola</i>	kidney	common carp	Tigănași
12.	<i>Sphaerospora sp.</i>	kidney	pike-perch, roach	Stâncea
13.	<i>Myxobolus basilamellaris</i>	gills	common carp	Tigănași, Vlădeni, FRAP
14.	<i>Myxobolus dispar</i>	gills, kidney	common carp, <i>Alburnus</i>	Tigănași, Stâncea
15.	<i>Myxobolus pavlovskii</i>	gills	silver carp, bighead	Tigănași, Vlădeni, Stâncea
16.	<i>Myxobolus muelleri</i>	gills, kidney	common carp, different ciprinides	Stâncea
17.	<i>Myxobolus obesus</i>	gills	<i>Alburnus alburnus</i>	Stâncea
18.	<i>Myxobolus intimus</i>	gills	<i>Alburnus alburnus</i> , bream	Stâncea
19.	<i>Myxobolus shulmani</i>	gills	<i>Alburnus alburnus</i>	Stâncea
20.	<i>Myxobolus cyprini</i>	kidney, intestine, branhii	common carp, crucian carp, different ciprinides	Tigănași, Vlădeni, Stâncea, Pârcovaci
21.	<i>Myxobolus pseudodispar</i>	intestine	bream	Stâncea
22.	<i>Myxobolus cycloides</i>	kidney	roach, bream	Stâncea
23.	<i>Myxobolus ellipsoides</i>	kidney	<i>Alburnus alburnus</i>	Stâncea
24.	<i>Myxobolus encephalicus</i>	brain	common carp	Tigănași
25.	<i>Myxobolus sp.</i>	kidney	<i>Alburnus</i> , pike-perch, perch	Stâncea
26.	<i>Thelohanellus nikolskii</i>	fins	common carp	Tigănași, Vlădeni, FRAP
27.	<i>Thelohanellus hovorkai</i>	skin,	common carp,	Tigănași, Stâncea
28.	<i>Myxidium pfeifferi</i>	gall blader	<i>Alburnus alburnus</i>	Stâncea
Microsporidia				
29.	<i>Dermocystidium erschowi</i>	skin	common carp, <i>Alburnus</i>	Tigănași, Stâncea
Mastigophora				
30.	<i>Ichtyobodo necator</i>	skin, gill	common carp, silver carp, bighead, pike-perch	Tigănași, Vlădeni, FRAP, Stâncea
31.	<i>Cryptobia branchialis</i>	gill	common carp, grass carp, silver carp	Tigănași, Vlădeni, Stâncea
32.	<i>Trypanosoma sp.</i>	blood	common carp, crucian carp	Tigănași
Ciliophora				
33.	<i>Chilodonella piscicola</i>	skin, gill	common carp, silver carp, bighead, grass carp, trout	Tigănași, Vlădeni, FRAP, Pârcovaci
34.	<i>Chilodonella hexastica</i>	skin	common carp, grss carp, trout	Tigănași, Pârcovaci
35.	<i>Ambiphrva ameiuri</i>	skin	common carp	Tigănași
36.	<i>Epistylis lwoffi</i>	skin	common carp	Tigănași, Vlădeni

37.	<i>Apiosoma carpelli</i>	skin, gills, fins	common carp	Tigănași, Vlădeni
38.	<i>Apiosoma piscicola</i>	skin, gill	common carp, silver carp, bighead, grass carp, different ciprinides, trout	Tigănași, Vlădeni, FRAP, Stânca, Pârcovaci
39.	<i>Ichthyophthyrus multifiliis</i>	skin, gills, fins	common carp, silver carp, european catfish	Tigănași, Vlădeni, FRAP, Stânca
40.	<i>Amphileptus branchiarum</i>	gill	common carp	Tigănași
41.	<i>Amphileptus disciformis</i>	skin, nose	silver carp	Tigănași
42.	<i>Capriniana piscium</i>	gill	pike-perch, perch	Stânca
43.	<i>Trichodina mutabilis</i>	skin, gill	common carp	Tigănași
44.	<i>Trichodina nobilis</i>	skin, gill	silver carp, bighead, common carp	Tigănași, Vlădeni, FRAP, Stânca
45.	<i>Trichodina nigra</i>	skin, gill	common carp, crucian carp, bream, trout	Tigănași, Vlădeni, FRAP, Stânca, Pârcovaci
46.	<i>Trichodina acuta</i>	skin, gill	common carp, silver carp, grass carp, pike-perch	Tigănași, Stânca
47.	<i>Trichodina pediculus</i>	skin, gill	common carp, silver carp, trout	Tigănași, Pârcovaci
48.	<i>Trichodina reticulata</i>	gill	common carp, crucian carp	Tigănași
49.	<i>Trichodina lucioperca</i>	skin	pike-perch	Stânca
50.	<i>Trichodina esocis</i>	skin	pike-perch	Stânca
51.	<i>Trichodina tissae</i>	skin	pike-perch	Stânca
52.	<i>Trichodina rectangli</i>	nose	common carp	Tigănași
53.	<i>Trichodina urinaria</i>	ureteres	<i>Alburnus</i> , perch	Stânca
54.	<i>Trichodina polycirra</i>	ureteres	<i>Alburnus</i> , roach	Stânca
55.	<i>Paratrichodina alburni</i>	ureteres	<i>Alburnus</i>	Stânca
56.	<i>Paratrichodina corlissi</i>	branhii	<i>Alburnus</i>	Stânca
57.	<i>Tripartiella copiosa</i>	gills	common carp, difewrent ciprinides	Tigănași, Stânca
58.	<i>Trichodinella epizootica</i>	gills	common carp, silver carp, grass carp, other ciprinides	Tigănași, Vlădeni, Stânca
Metazoa				
Dactylogyridae				
59.	<i>Dactylogyrus sp.</i>	skin, gill	common carp, crucian carp, <i>Alburnus</i>	Tigănași, Vlădeni, Stânca
60.	<i>Dactylogyrus extensus</i>	gills	common carp	Stânca
61.	<i>Gyrodactylus sp.</i>	skin, gills	common carp	Tigănași, Vlădeni, Stânca
62.	<i>Diplozoon paradoxum</i>	gills	common carp, roach	Tigănași, Stânca
63.	<i>Paradiplozoon alburni</i>	gills	<i>Alburnus</i>	Stânca
Sanguinicolidae				
64.	<i>Sanguinicola inermis</i>	gills	common carp, crucian carp, bream	Tigănași, Stânca
Diplostomatidae				
65.	<i>Diplostomum spathaceum</i>	eyes	silver carp, bighead, common carp,	Tigănași, Vlădeni, FRAP
66.	<i>Posthodiplostomum cuticola</i>	skin, fins	silver carp, bighead, crucian carp, roach, <i>Alburnus</i>	Vlădeni, Tigănași, FRAP, Stânca, Ciorbești
Tetracotylidae				
67.	<i>Ichthyocotylurus sp.</i>	abdominal cavity	grass carp, perch, pike-perch	Vlădeni, Stânca
Ligulidae				
68.	<i>Ligula intestinalis</i>	abdominal cavity	silver carp, bighead, <i>Alburnus</i> , roach	Vlădeni, Stânca
69.	<i>Digramma interrupta</i>	abdominal cavity	silver carp, bighead, <i>Alburnus</i>	Vlădeni, Stânca
70.	<i>Schistocephalus solidus</i>	abdomin. cavity	bighead	Vlădeni

Caryophyllidae				
71.	<i>Caryophyllaeus sp.</i>	intestine	<i>Alburnus alburnus</i>	Stânca
72.	<i>Khawia sinensis</i>	intestine	common carp	Vlădeni
Bothriocephalidae				
73.	<i>Bothriocephalus gowkongensis</i>	intestine	common carp, grass carp	Tigănași, Vlădeni, Stânca
Cucullanidae				
74.	<i>Cucullanus sp.</i>	intestine	<i>Gymnocephalus sp.</i>	Stânca
Capillariidae				
75.	<i>Capillaria petrushewskii</i>	liver	common carp	Tigănași
76.	<i>Capillaria sp.</i>	intestine	common carp, <i>Alburnus</i>	Tigănași, FRAP, Stânca
Anisakidae				
77.	<i>Raphidascaris sp.</i>	intestine	<i>Alburnus</i>	Stânca
Eustrongylidae				
78.	<i>Eustrongylides sp.</i>	celomic cavity, muscle	pike-perch, european catfish	FRAP, Tigănași, Cârja-Vaslui, Canal 5 Dunăre, Trifești
Philometridae				
79.	<i>Philometroides lusiana</i>	skin	common carp	Tigănași
80.	<i>Philometra carassi</i>	skin, fins	crucian carp	Tigănași, Vlădeni
Echinorhynchidae				
81.	<i>Acantocephalus sp.</i>	intestine	different ciprinides	Stânca
Pomphorhynchidae				
82.	<i>Pomphorhynchus sp.</i>	intestine	different ciprinides	Stânca
Ergasilidae				
83.	<i>Sinergasillus lieni</i>	gills	silver carp, bighead	Tigănași, Vlădeni
84.	<i>Sinergasillus major</i>	gills	grass carp, european catfish	Tigănași
Lernaeidae				
85.	<i>Lernaea cyprinacea</i>	skin, fin	common carp, silver carp, grass carp	Tigănași, Vlădeni, FRAP
86.	<i>Argulus foliaceus</i>	skin, fin	common carp, grass carp	Tigănași, Vlădeni
87.	<i>Piscicola geometra</i>	skin, fins	common carp	FRAP, Stânca

Discussions

Analyzing the upper tab, you can easily see that, following the research made along 11 years, 87 species of parasites were found, with a different distribution on the fish species of host and on the aquatic farms.

The ectoparasitary and endoparasitary fauna identified in the three studied aquatic spaces (or as necessity samples) studied rarely is rich, but within the biological limits underlined by numerous authors of the specialized literature.

From a taxonomical point of view, this list is composed of 58 species of protozoars (66,66%) and 29 species of metazoars (33,33%).

The protozoars are represented by 9 species (15,52%) of coccidia, 19 species (32,75%) of

mixosporidia, (1,72%) 3 species of flagelates (5,15%) and 26 species of ciliates (44,82%).

In comparison with the specialized data, the obtained results show that the ciliates group is the most desvolted as a number of species, situation explicable because of the facultative parasitism of numerous ciliates and of the possibilities for rapid multiplication in the conditions of the water eutrophisation degree. The identified mixosporidies during the research also touched a high number of species, a sustained fact by the specialized literature that closures that now, there can be approximately 700 species of mixozoars parasites on fish and other aquatical animals. The coccidies were also identified in a high number of species, only that they were, often, found rarely, at numerous species of fish from the natural water courses.

The metazoans were represented by 9 species (31,55%) of trematodes, 6 species (21%) of cestodes, 7 species (25,55%) of nematodes, 4 species (14 %) of crustaceans, 2 species (6,80%) of acantocefalians and just one (0,10%) of hirudinea.

The studies also underline the higher number of trematodes parasites on fish through the existence of the links of the vital cycle, a fact sustained by the specialized literature, but accentuated by us through the intervention much smaller of the technologist in the destruction of the intermediary hosts. The cestodes and the nematodes are identified at the studied effective had an invasional prevalence usual and into the dates from the literature, except for the infestations with ligulides, that reached dangerous values in the Vladeni farm, where, actually, the intermediary chain of the cycle is much more developed, being represented by birds. The crustaceans determined moderate infestations of the skin and of the gills, but reached high values in some pools of the Vladeni farm, yet values met in the aquaculture, confirming in the same time the special importance of the parasitosis because of the reducing of the growth rhythm.

Conclusions

1. The parasitological exams have led to the identification of 87 parasites, of which 58 (66,66%) were protozoans and 29 (33,33%) were metazoans.
2. The protozoans were represented by 9 species (15,52%) of coccidies, 19 species (32,72%) of mixosporidies (1,72%), 3 species (5,15%) of flagelates, and 26 species of ciliates (44,82%).
3. The metazoans were represented by 9 species (31,55%) of trematodes, 6 species (21%) of cestodes, 7 species (25,55%) of nematodes, 4 species (14%) of crustaceans, 2 species (6,80%) of acantocefaleans and just one (0,10%) of hirudinea.
4. In what concerns the organical localization of the parasites, in the general effective studied, the skin was infected by 25 species (40,32%) of parasites, the *inotatoare* by 9

species (10,34%), the gills by 34 species (54,85%), the nasal cavities by 2 species (3,22%) and the eye globes only by one species (1,61%).

5. The studies made for the discovery of the endoparasitary invasions have led to the identification of 5 species (12,25%) of parasites of the abdominal cavity, 13 species (32,75%) of the intestine, two species of the liver and the *vezica biliara* (5%), 16 species of the urinary system (40%), 2 species of the muscles (5%) and one species found in the brain (2,50%) and the peripheral blood.
6. The aquatic effective of the Tiganasi farm were infested the most, respectively 49 species of parasites, followed by the effective of the Vladeni farm, with 30 species of parasites and of the FRAP farm, with 14 species. In the Stanca lake, the aquatic populations were infested by 52 species of parasites.
7. The common carp *Cyprinus carpio* was the species of fish the most affected, with 40 species of parasites, followed by silver carp *Hypophthalmichthys molitrix* with 16 species, bighead *Aristichthys nobilis* with 11 species and grass carp *Ctenopharyngodon idella* with 10 species of parasites.

REZUMAT

Invazii parazitare ale populațiilor piscicole din zona de N-E a Moldovei

Cercetările s-au efectuat pe efectivele a mai multor amenajări piscicole situate în nord-estul țării, dintre care patru au fost cele mai studiate: fermele Tigănași, Vlădeni, FRAP și lacul Stâncă Costești. Alimentarea fermelor este diferită (râul Prut, râul Jijia și iazul Ezăreni), iar amenajarea piscicolă Stâncă este de fapt un lac de acumulare de mare suprafață, pe râul Prut (până la granița de nord a țării), cu folosințe multiple.

Rezultatele cercetărilor sunt ilustrate în lista de specii parazitare identificate (număr total de 87), cu menționarea organului parazitat și interpretarea statistică taxonomică. Studiile au făcut parte din tema de cercetare a tezei de doctorat a autorului.

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