INSTITUTE OF BIOLOGY,
USSR ACADEMY OF SCIENCE'S,
KARELIAN BRANCH

ZOOLOGICAL INSTITUTE,
USSR ACADEMY OF SCIENCES

PARASITES OF FRESHWATER FISHES OF NORTH-WEST EUROPE

Materials of the International Symposium within the Program of the Soviet-Finnish Cooperation
10—14 January 1988

PETROZAVODSK 1989

MONOGENEA OF FISH IN FINLAND (DACTYLOGYRIDAE, ANCYROCEPHALIDAE, TETRAONCHIDAE)

G. Bylund, O.N. Pugachev
Åbo Akademi, Finland, Zoological Institute of the USSR Ac.Sci., Leningrad

In connection with a survey of the total parasite fauna of common fish species from brackish and freshwater localities in Finland in 1973 -1979 a total of 1742 specimens of fish (34 species including one cyclostome species) were studied by Åbo Akademi staffs (Bylund et al., 1980). These fish species were studied, in natural waterbodies and in fish farms. The fish samples were taken from two brackish water areas (see Fig. 1 in Fagerholm, 1982): Aland, BI (salinity 3-7,3%) and Hailuoto, B2 (salinity less than 3%) and five freshwater areas: lake Pyhäjärvi; FI; lake Pyhäselkä, F2; river Isojoki, F3; Kuusamo, F4; lake Inarijarvi, F5. But the sampling was extensive only at one brackishwater (BI) and one freshwater site (FI).

Cultivated fishes were studies in one brackishwater fish farm (Gustavs, CBI, salinity 5%) and five freshwater farms (Aland, CFI; Köyliö, GF2; Vanhakylä, CF3; Nilakka, CF4 and Inari, CF5) (Fig.I). More detailed information on localities and on the fauna of investigated areas is given in the paper of Bylund et al. (1980) and that of Fagerholm (1982).

Twenty seven species and forms representing three monogenean families were identified as a result of investigation of the Abo Akademi parasite collections. Only the gyrodactylid group was not investigated by the authors. Twenty two species of Dactylogyridae, two species of Ancyrocephalidae and two of Tetraonchidae were found.

Fam. Dactylogyridae Bychowsky, 1933.

1. Dactylogyrus alatus Linstow, 1878 f. typica. Host: Alburnus alburnus; Localization: gills; Localities: FI; PC.

Fig. 1. Both wild and cultivated (C) fishes were studied. The fish material was sampled both from brackish (B) and fresh water (F) areas in Finland.
Bl - Aland, B2 - Hailuoto, FI - Lake Pyhäjärvi, F2 - Lake Pyhäselkä, F3 - Isojoki (running water), F4 - Kuusamo (Yli-Kitka, Räväsjärvi and Ohtajärvi), F5 - Lake Inari, CF1 - Kustavi, CF2 - Köyliö, CF3 - Isojoki, CF4 - Nilakka, CF5 - Inari

It is the usual parasite of the bleak probably.[1]

2. D. amphibothrium Wagener, 1857. H.: Gymnocephalus cernua; Lz.: gills; L : BI, B2, FI, F2, F3; BL. This is a specific parasite to ruff which was found in Finland by Alarotu (1944).
3. D. auriculatus (Nordmann, 1832). H.: Abramis brama; Lz.: gills; L.: Fl, F2; PC. It is an ordinary parasite of bream which was found in Finish waterbodies by Alarotu

[1] Further we use such abbreviations: H. - host, Lz. - localization, L. - locality, BL - boreal lowland complex, PC - ponto-caspian group of the boreal lowland complex, BS - boreal subrmountain complex, AF - arctic freshwater complex.

(1944).

4. D. caballeroi Prost, I960. H.: Rutilus rutilus; Lz.: gills; L.: Bl, FI; PC. It is a specific parasite of roach probably.
5. D. cordus Nybelin, 1937. H.: Leuciscus leuciscus, Alburnus alburnus; Lz.: gills; L.: F2; PC. It is a wide dispersed parasite of dace.
6. D. cornu Linstow, 1878. H.: Blicca bjoerkna; Lz.: gills; L.: F2; PC. It is an ordinary parasite of bream (main host) and vimba which was found in Finland by Alarotu (1944).
7. D. cornoides Glaser et Gussev, 1971. H.: Blicca bjoerkna; Lz.: gills; L.: F2; PC. It is an ordinary parasite of vimba and bream.
8. D. crucifer, Wagener, 1878. H.: Rutilus rutilus; Lz.: gills; L.: BI, FI, F3; BL. It is an ordinary wide dispersed parasite of roach which was found in Finland by Alarotu (1944).
9. D. difformis Wagener, 1857. H.: Scardinius erythrophthalmus; Lz.: gills; L.: Bl; PC. It is a specific parasite of rudd which was found in Finland by Alarotu(1944).
10. D. difformoides Glaser et Gussev, 1971. H.: Scardinius erythrophthalmus; Lz.: gills; L.: Bl; PC. It is a specific parasite of rudd.
11. D. falcatus (Wedl, 1857). H.: Abramis brama; Lz.: gills; L.: Bl, Fl; PC. It is an ordinary parasite of bream which was found in Finland by Alarotu (1944).
12. D. fallax Wagener, 1857. H.: Rutilus rutilus; Lz.: gills; L.: Fl; PC. It is an ordinary parasite of different fish species of subfamily Leuciscinae.
13. D. fraternus Wegener, 1910. H.: Alburnus alburnus; Lz.: gills; L.: Fl, F2; PC. It is an ordinary parasite of fishes of the genus Alburnus.
14. B. hemiamphibothrium Ergens, 1956. H.: Gymnocephalus cernua; Lz.: gills; L.: Fl; BL(?). It is a specific parasite of ruff.
15. D. micracanthus Nybelin, 1937. H.: Scardinius erythroph-

thalmus, Rutilus rutilus, Alburnus alburnus; Lz.: gills; L.: Bl, Fl; PC. It is a wide dispersed parasite of Cyprinids.

16. D. minor Wagener, 1857. H.: Alburnus alburnus; Lz.: gills; L.: Fl, F2; PC. It is an ordinary parasite of fishes from the genus Alburnus.
17. D.minutus Kulwiec, 1927. H.: Abramis brama; Lz.: gills; L.: Bl. This thermofilic ordinary parasite of carp occur raore often in the southern zone of the carp culture (Gussev, 1985). Perhaps it is the result of the attempts to acclimatize carp on the Aland Islands 10-15 years ago.
18. D. nanus Dogiel et Bychowsky, 1934. H.: Rutilus rutilus; Lz.: gills; L.: Fl, F3; BL. This species is specific to roach and was described in Finland by Alarotu (1944) from roach and rudd as D. gemellus Alarotu, 1944. The last is to be looked at as a synonym of D. nanus.
19. D. similis Wegener, 1910. H.: Scardinius erythrophthalmus, Rutilus rutilus; Lz.: gills; L.: Bl, Fl, F3; BL. The main host of this wide dispersed parasite is roach probably.
20. D. sphyrna Linstow, 1878. H.: Blicca bjoerkna, Scardinius erythrophthalmus, Rutilus rutilus, Alburnus alburnus; Lz.: gills; L.: Bl, F2, Fl; BL. This wide dispersed parasite of different cyprinids was found on gills of breamflat in Finland by Alarotu (1944).
21. D.suecicus Nybelin, 1937. H.: Rutilus rutilus; Lz.: gills; L.: Fl; PC. This specific parasite to roach was found in Finland by Alarotu (1944).
22. D. wunderi Bychowsky, 1931. H.: Abramis brama; Lz.: gills; L.: Bl, Fl, F2; PC. This wide dispersed ordinary parasite of bream was found previously in Finland by Alarotu (1944).

Fam. Ancyrocephalidae Bychowsky, 1937.

23. Ancyrocephalus paradoxus Creplin, 1838. H.: Stizostedion

lucioperca; Lz.: gills; L.: Bl; PC. It is a specific parasite to pike-perch.

24. A. percae Ergens, 1966. H.: Perca fluviatilis; Lz.: gills; L.: Bl, F3, F4, F5; BL. It is a specific parasite to perch.

Fam. Tetraonchidae Bychowsky, 1937.

25. Tetraonchus borealis (Olsson) f. typica. H.: Thymallus thymallus; Lz.: gills; L.: F5; BS.
26. T. borealis (Olsson) f. rauschi. H.: Thymallus thymallus; Lz.: gills; L.: F5; BS. It is a specific parasite to graylings.
27. T. monenteron (Wagener, 1857). H.: Esox lucius; Lz.: gills; L.: Bl, B2, Fl, F2, F3, F4, F5; BL. It is a wide dispersed parasite specific to pike.

We have to mention also species which have been found by Alarotu (1944) but were not found in the Åbo Akademi collections; I. Dactylogyrus anchoratus (Dujardin, 1845). H.: Carassius carassius; Lz.: gills; L.: Baltic sea waterbasin. 2. D. formosus Kulwiec, 1927. H.: "gold fish"; Lz.: gills; L.: aquarium (Helsinki). These two species can't be classified as members of Finland monogeneans fauna strictly speaking. 3. D. distinguendus Nybelin, 1937. H.: Blicca bjoerkna, Rutilus rutilus, Leuciscus leuciscus; Lz.: gills; L.: Baltic sea waterbasin. Some species which were described by Alarotu (1944) are to be looked as synonyms of other species: D. graciliumcinatus Alarotu, 1944 = D. falcatus(?); D. grislaginis Alarotu, 1944 = D. crucifer (Gussev, 1985).

According to L.S. Berg (1949) zoogeographical zoning the localities under investigation Bl, B2, Fl, F2, F3, CF1, CF3, CF4, CB1 belong to Neva district of Baltic province of the Mediterranean subregion and F5, CF5 belong to European district of the Glacial province of the Circumpolar subregion (Fig.2). As the material from West European district waterbodies isn't extensive, we used for comparision of the data the monogenean fauna of Kola peninsula (Mitenev, Schulman 1975, 1977), of the river Shuja (Schulman et al., 1974) and river Kamennaja (Ieschko et al., 1982).

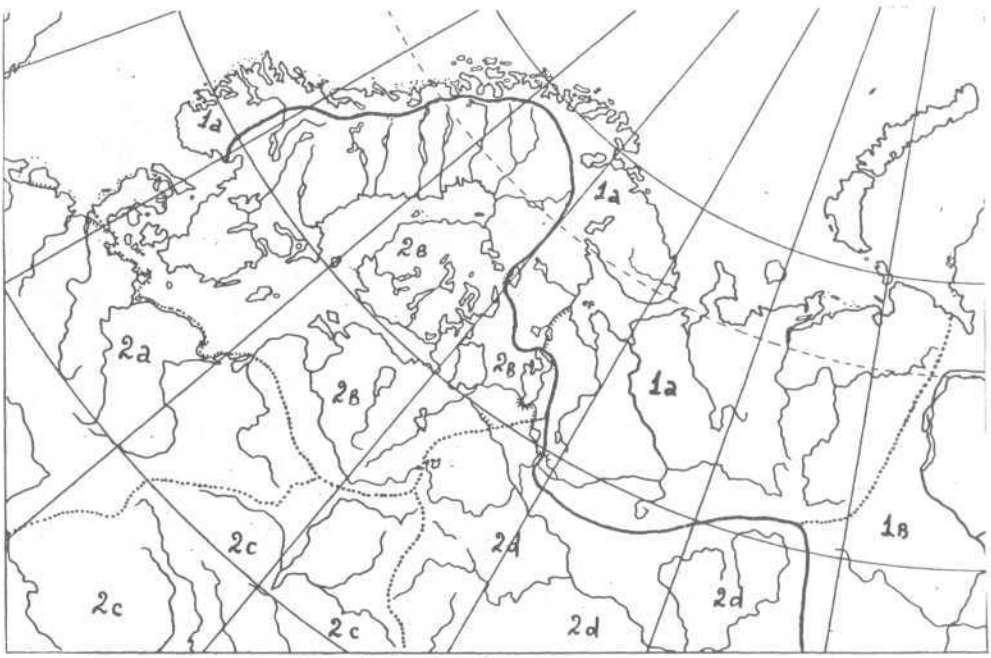

Fig. 2. Zoogeographical zoning of north-west Europe (according to Berg, 1949).
la - European district of Glacial province; lb - Siberian district of Glacial province; 2a - Rhain district of Baltic province; 2b - Neva district of Baltic province; 2c - Black sea district of Ponto-caspian province; 2d - Caspian district of Ponto-caspian province

The main approach to the analysis of freshwater fish parasite fauna zoogeography is the faunistic complex doctrine of G.V. Nikolskii (1953). According to our analysis of the zoogeographical peculiarities of the Glacial province freshwater fish parasite fauna, the faunistic complex is a species group with common historical fate and (or) prolonged coexisting at the same geographical zone. As consequence they have similar ecological features. In this respect the faunistic complex is the sum of faunistic elements which formed another ecological associations in the Past; so it includes the species which origin is connected with the formation of certain geographical zone. The distin-

guishing of these elements within faunistic complex will make it possible to trace the formation of complexes in time only and as a result of the fauna of certain territories. Therefore the central point of this analysis, especially analysis of monogenean fauna, is the distinguishing of faunistic elements. The faunistic complex has a complicated history of its formation from one side. From the other side faunistic elements which formed the faunistic complex are the result of complicated history formation too. It seems that boreal lowland complex has a more complicated history among all palaearctic faunistic complexes.

G.V. Nikolskii (1953) groups the fish species with a discontinuous European and East Asian distribution in a Tertiary lowland complex, the homeland of which was evidently Siberia (including, perhaps, the Amur basin too). The formation of this complex was connected with broad-leaved forest zone. But Siberia was the homeland of the boreal lowland complex too (eurithermal species with Euro-Siberian distribution) the formation of which was connected with taige zone. Nikolskii also distinguishes the ponto-caspian freshwater complex that includes the fish species with European distribution, having a maximum concentration in the northern part of the Ponto-Caspian basin. But some of these species have fossil records in the lower Pliocene in West Siberia, Tuva and West Mongolia. That is why P. Banarescu (1962) has lumped these three complexes under the name Euro-Siberian complex, distinguishing within it an euribiotic group (species that survived the Quaternary cooling), surviving in Siberia, and a thermophilic group (that during the Quaternary became extinct in Siberia), surviving in several parts of Europe and in the Amur drainage or in other parts of East Asia. V.V. Jakovlev (1964) has lumped these complexes under the name boreal lowland, because the landscape zones corresponding to these three complexes, according to Nikolskii doctrine, didn't exist in the Tertiary period. But he didn't distinguish the groups within it.

The arctic freshwater and boreal lowland species are wide dispersed in the Glacial province waterbodies just as the ponto-caspian element of the boreal lowland complex takes an insignificant place in the fish parasite fauna of this province. The main difference between boreal lowland and ponto-caspian species is the wide distribution of boreal lowland one in the Circumpolar subregion waterbodies especially in East Siberia as the waterbodies of the Glacial province (European district) and West Siberian one had the contacts with the Mediterranean waterbodies in the Past. The parasite fauna formation of these two big regions (European district and West Siberia) has depended on the fish parasite fauna of the Mediterranean subregion. That is why the finds of ponto-caspian species in northern waterbodies of the European district and in the river Ob are not the ground for classifying such as typical boreal lowland elements (Tabl.). Boreal lowland and ponto-caspian elements composition of monogenean fauna is: Kola peninsula (rivers of Barents sea basin) BL - 100%, PC - 0%; Kola peninsula (rivers of the White sea basin) BL - 53%, PC - 47%; river Kamennaja (White sea basin) BL - 35%, PC - 65%; river Shuja (Onega lake basin) BL - 39%, PC - 61%; Finnish waterbodies (Baltic sea basin) BL - 31%, PC - 69% (Fig.3).

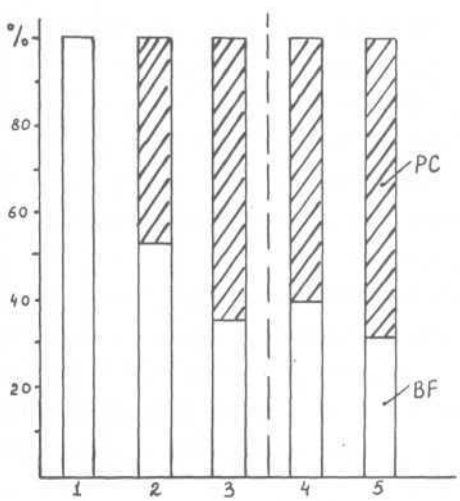

Fig.3. Composition of the faunistic elements in the boreal flat complex (some monogeneans)
I - Kola peninsula (Barents sea basin); 2 - Kola peninsula (White sea basin); 3 - river Kamennaja (White sea basin); 4 - river Shuja (Onega lake basin); 5 - Finland waterbodies (Baltic sea basin)

Distribution of monogenea species which were found in Finland

Species	BSB	WSBK	WSB	BLSB	ES	FC
Dactylogyrus alatus f. typica	-	-	+	+	-	PC
D. amphibothrium	+	+	+	+	-?	BL?
D. anchoratus	-	-	?	+	+	BL
D. auriculatus	-	-	?	+	+	BL
D. caballeroi	-	+	+	-?	-	PC
D. cordus	-	-	+	+	-	PC
D. cornu	-	-	-	+	-	PC
D. cornoides	-	-	-	+	-	PC
D. crucifer	-	+	+	+	+	BL
D. difformis	-	-	-	+	-	PC
D. difformoides	-	-	-	+	-	PC
D. distinguendus	-	-	+	+	-	PC
D. falcatus	-	+	+	+	-	PC
D. fallax	-	+	+	+	-	PC
D. fraternus	-	-	+	+	-	PC
D. hemiamphibothrium	-	+	+	+	—?	BL?
D. micracanthus	-	+	+	+	-	PC
D. minor	-	-	+	+	-	PC
D. nanus	-	+	+	+	+	BL
D. similis	-	+	+	+	+	BL
D. sphyrna	-	+	+	+	+	BL
D. suecicus	-	+	+	+	-	PC
D. wunderi	-	+	+	+	-	PC
Ancyrocephalus paradoxus	-	-	-	+	-?	PC
A. percae	+	+	+	+	+?	BL
Tetraonchus borealis	+	+	+	-	+	BS
T. monenteron	+	+	+	+	+	BL

Abbreviations: BSB - Barents sea basin; WSBK - White sea basin (Kola peninsula); WSB - White sea basin; BLSB - Baltic sea basin; ES - East Siberia; FC - faunistic complex.

Thus the Baltic sea basin is characterized by prevalence of the ponto-caspian elements. The river Kamennaja, which is situated on the border of the Baltic and Glacial provinces, is an exception. But it is not extraordinarily bearing in mind the complicated geological history of the north-west European territories. Ponto-caspian species have penetrated into the north waterbodies after glaciers retreat that leads to "eroding" of the zoogeographical borders.

References

Alarotu H. Untersuchungen über die an Fischen in Finland lebenden monogenetischen Trematoden. H-ki, 1944* 1.52 S.

Banarescu P. Faunistic complexes of freshwater fishes fauna of the R.P.Rumania. Anal. st. Univ. Iasi. 1962. Vol. 6, N 3. P. 775 - 780. (Roum.)

Berg L.S. Freshwater fishes of the USSR and neighbouring countries. M.; L.: Acad. press, 1949. Vol. 3. 444 pp. Russ.

Bylund G., Fagerholm H.-P., Calenius G. et al.Parasites of fish in Finland. Abo, 1980. Vol. 40. N I. Introduction. 14 p.

Fagerholm. H.-P. Parasites of fish in Finland. Abo, 1982. Vol.40. N 6. Nematodes. 128 p.

Gusev A.V. Class Monogenea. Subclass Polyonchoinea // Key to the parasites of freshwater fishes of the USSR. Nauka, 1985. Vol.2. P. 15-269. Russ.

Ieshko E.P., Malakhova R.P.,Golitzina N.B. Ecological peculiarities of fish parasite fauna formation in lakes of river Kamennaja basin // Ecologia parasitizscheskih organismov v biogeocenozah Severa. Petrozavodsk, 1982. P.5 - 26.

Jakovlev V.N. History of the freshwater fishes faunistic complexes formation // Voprosy ichthyologii. 1964. Vol. 4, N1. P. 10-22. Russ.

Mitenev V.K., Schulman B.S. Monogenea from some Kola peninsula waterbodies // Parasitologya. 1975. Vol.9, N 3. P. 220-226. Russ.

Mitenev V.K., Schulman B.S. Monogenea from fishes of Kola peninsula // Issledovanija monogeney v SSSR. Leningrad, 1977. P. 93-98. Russ.

Nikolskii G.V. On biological specificity of the faunistic complexes and its importance for zoogeographical analysis // Ocherki po obzschim voprosam ichthyologii. M.; L.: Acad. press, 1953. P. 65-76. Russ.

Schulman S.S.,Malachova R.P., Rybak V.F. Ecological analysis of fish parasite fauna of Karelian lakes. Leningrad: Nauka, 1974. 107 pp. Russ.