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Short communication

DISTRIBUTION OF *POSTHODIPLOSTOMUM CUTICOLA* (NORDMANN, 1832) (DIGENEA; DIPLOSTOMIDAE) METACERCARIAE IN CYPRINIDS OF THE VISTULA LAGOON, POLAND

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ABSTRACT. The distribution of the digenean *Posthodiplostomum cuticola* in cyprinids caught in the Polish part of the Vistula Lagoon is described. The metacercariae were found to be present in carp bream (*Abramis brama*), roach (*Rutilus rutilus*), Prussian carp (*Carassius gibelio*), white bream (*Abramis bjoerkna*), ziege (*Pelecus cultratus*), and common dace (*Leuciscus leuciscus*). Of the 1287 metacercariae found, 1175 occurred on the body surface, including 780 in the fins, 232 on the scales, and 163 in the skin underneath the scales. The remaining metacercariae occurred in the mouth cavity, gills, and eye sockets. Most of the parasites (1033) were located on the surface of the body below the *longitudo caudalis*. As is shown by the study, the digenea attack primarily those parts on the fish body that are closest to the bottom. The fins, sites that are more amenable to attachment and subsequently to penetration into the host's tissues, turned out to be the preferred site of the parasite (60.6% of the metacercariae).

Key words: *POSTHODIPLOSTOMUM CUTICOLA*, DIGENEA, PARASITE, DISTRIBUTION, CYPRINIDAE, VISTULA LAGOON

Metacercariae of *Posthodiplostomum cuticola* (Nordmann, 1832) are common on numerous fish species, primarily cyprinids. Parthenogenetic generations parasitize the snails *Planorbis planorbis* and *P. carinatus*, the intermediate hosts in which abundant cercariae develop. The definitive hosts are birds, mainly representatives of the family Ardeidae. Although digeneans are occasionally found on members of other avian families, they seldom mature (Dönges 1964, Blair 1977, Combes 1980, Sonin 1986, Mikeš 2001).

Metacercariae present as black cysts located primarily on the skin, in the sub-epidermal tissue, and in the fins. They produce a condition known as "black spot", which is particularly harmful for fry. A strong invasion often results in fish weight reduction, pathological changes in the blood (increased erythrocyte sedimen-

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tation rate, increased leukocyte count, reduction in hemoglobin content and erythrocyte count), as well as kidney and liver dystrophy. The parasite's presence may also cause backbone deformation and degenerative changes in muscle fibers; the fish feed poorly, become emaciated, and frequently die (Berezantsev and Dobrovol'skij 1968, Williams and Jones 1994).

Numerous parasitic species show site preferences within a host's body. The process of colonization of various habitats in a host by parasites is termed topographic (topic) specificity and is observed both in external and internal parasites. Topographic specificity has been reported with regard to various parasitic taxa mainly from the monogeneans and copepods (e.g., Kozikowska et al. 1956, Kabata and Couses 1977, Starovojtov 1986, Kabata 1987, Piasecki 1995, Monni et al. 1999, Rolbiecki and Rokicki 2000, Rolbiecki 2001). However, apart from a single mention of the *Posthodiplostomum cuticola* location in fish (Shukhgalter and Chukalova 2002), there is a lack of detailed data concerning the topographic specificity of the species.

A total of 1307 cyprinid specimens representing 13 species were examined in the 1994-1997 period, as follows: roach, *Rutilus rutilus* (389 specimens); carp bream, *Abramis brama* (376); ziege, *Pelecus cultratus* (322); Prussian carp, *Carassius gibelio* (101); tench, *Tinca tinca* (39); white carp, *Abramis bjoerkna* (31); bleak, *Alburnus alburnus* (29); asp, *Aspius aspius* (7); Baltic vimba, *Vimba vimba* (5); rudd, *Scardinius erythrophthalmus* (4); common carp, *Cyprinus carpio* (2); common dace, *Leuciscus leuciscus* (1); ide, *Leuciscus idus* (1). The fish were caught in the Polish part of the Vistula Lagoon. The skin, mouth cavity, gills, and eye sockets were examined for digeneans.

In order to better visualize the parasite distribution and to improve statistical treatment, each fish was divided into five sectors (Fig. 1): SI – sector above the *longitudo caudalis* (line running from the mouth to the tips of middle rays of the caudal fin), without fins; SII – sector below the *longitudo caudalis*, without fins; SIII – fin sectors; SIV – abdominal sector; SV – the mouth and gill cavities as well as eye sockets. The differences between sectors were tested for statistical significance with analysis of variance (ANOVA).

Metacercariae were found in six cyprinid species: roach (689 parasites); carp bream (573); white bream (12); Prussian carp (5); one specimen each of ziege (2) and common dace (6) (Fig. 1).

Of the 1287 *Posthodiplostomum cuticola* metacercariae found, 1175 were located on the surface of the body, including 780 in the fins (SIII), 232 on scales, and 163 in the skin underneath the scales (S I – 63, S II – 132, S IV – 200). The remaining metacercariae

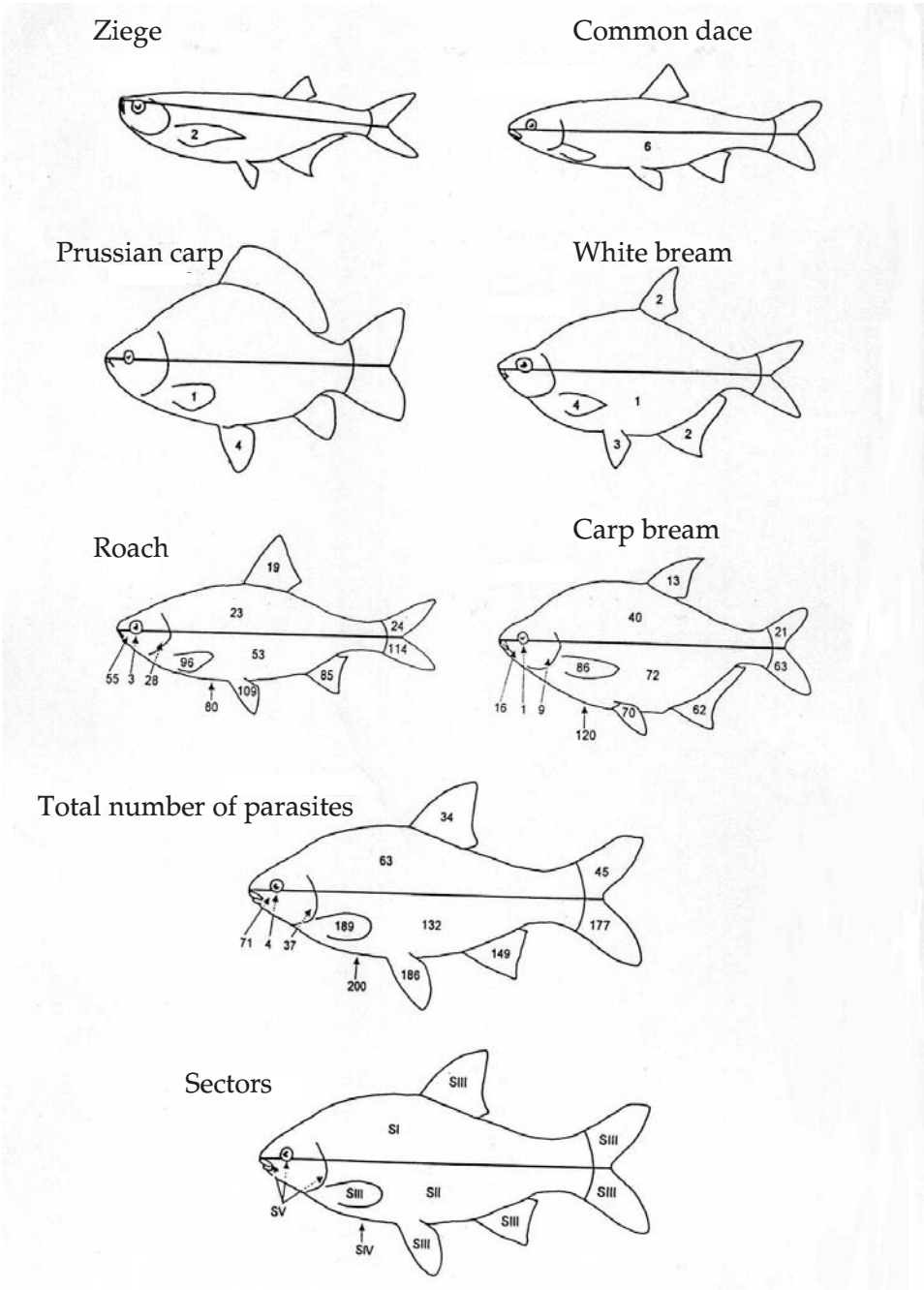

Fig. 1. Location of *Posthodiplostomum cuticola* metacercariae, including abundance, on the cyprinids caught in the Vistula Lagoon.

occurred in the mouth cavity (71 specimens), on the gills (37), and four in the eye sockets (SV) ($p < 0.001$). Most of the metacercariae (1033 specimens) were located on the surface of the body below the *longitudo caudalis* on the pectoral (189 specimens), ventral (186), anal (149), and lower half of the caudal (177) fins, on the abdomen (200), and on the lateral parts of the head, trunk, and tail (132) (Fig. 1).

Once out of the snail body, the invasive cercariae of *Posthodiplostomum cuticola*, the so-called furcocercariae (each with a tail part consisting of a trunk and a furca), actively seek new hosts. The search is greatly aided by certain locomotor behaviors known as taxes. Initially, negative geotaxis is displayed which counteracts the force of gravity, i.e., the parasites sink passively towards the bottom. Later, positive phototaxis manifests as movement towards a light stimulus, i.e., the water surface. Then, positive thigmotaxis, which is the maintenance of tactile contact with solid objects in the surroundings, for example a fish swimming by, takes over. Having found the host, they use their penetration glands and a cone-shaped mouth sucker to bore through the fish body surface or into the mouth and gill cavities and become encysted there as metacercariae (Dönges 1964).

As indicated by the present study, the parasites attack primarily those parts on the fish body that are closest to the bottom so that they can reach them in the shortest time. The parts of the body affected include the abdomen, the ventral, pectoral, and anal fins as well as the lower half of the caudal fin. To a lesser degree they attach to the lateral parts of the head, trunk, and tail below the *longitudo caudalis* line marked on the diagram (Fig. 1). The number of parasite-containing cysts above that line was lower. The fins were more prone to attack than were the remaining sectors. This is doubtless related to the fact that it is easier for the parasite to penetrate the soft fold of the skin on fins than a layer of scales. This conclusion is supported by the finding that, among the sectors above the *longitudo caudalis* line, a higher number of parasites was recorded on the dorsal fin and on the upper half of the caudal one. However, the lower number of metacercariae on scales is not necessarily related to scale hardness. The scales of bony fish, a category that includes cyprinids, are flexible. They are embedded in epidermal pockets and their posterior ends rest – roof tile-like – on other scales, thus forming the characteristic armor that protects the fish from external factors, including parasites. In addition, certain substances contained in the scales, isopedin and hyalodentin, the latter covering the external scale surface, render the scale both flexible and hard, whereby it is difficult for parasites to attach to them and to penetrate them, and – ultimately – to encyst in the underlying tissues.

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STRESZCZENIE

ROZMIESZCZENIE METACERKARII *POSTHODIPLOSTOMUM CUTICOLA* (DIGENEA; DIPLOSTOMIDAE) U RYB KARPIOWATYCH Z ZALEWU WIŚLANEGO, POLSKA

Metacerkarie *Posthoidiplostomum cuticola* (Nordmann, 1832) występują powszechnie na wielu gatunkach ryb, głównie karpiowatych Cyprinidae. W pracy opisano rozmieszczenie przywr u ryb karpiowatych odłowionych z Zalewu Wiślanego. Przebadano 1307 karpiowatych z 13 gatunków (płoć *Rutilus rutilus*, leszcz *Abramis brama*, ciosa *Pelecus cultratus*, karaś srebrzysty *Carassius gibelio*, lin *Tinca tinca*, krąp *Abramis bjoerkna*, ukleja *Alburnus alburnus*, boleń *Aspius aspius*, certa *Vimba vimba*, wzdręga *Scardinius erythrophthalmus*, karp *Cyprinus carpio*, jelec *Leuciscus leuciscus*, jaź *Leuciscus idus*). Pasożyty odnotowano u płoci (689

pasożytów), leszczy (573), krąpi (12), karasi srebrzystych (5), u jednej ciosy (2) i jednego jelca (6). Spośród 1287 metacerkarii, 1175 umiejscowionych było na powierzchni ciała ryby, z czego 780 na płetwach, 232 na łuskach, 163 w skórze pod łuskami. Pozostałe występowały sporadycznie w jamie gębowej (71), na skrzelach (37) i w oczodole (4). Większość przywr (1033) znaleziono poniżej linii *longitudo caudalis*. Cerkarie *P. cuticola* atakują przede wszystkim te części ciała ryby, które dzieli najmniejszy dystans od dna (miejsc wysypu pasożytów). Przy czym preferują płetwy stanowiące miękki fałd skóry, a więc miejsca, przez które pasożytowi łatwiej dokonać penetracji niż przez warstwę łusek.