

Morphological malformations in *Glanitaenia osculata* (Goeze, 1782) (Onchoproteocephalidea) from polluted environment

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Developmental malformation of anatomical structures may occur to some extent in all living organisms including tapeworms. These morphological malformations are misleading for alpha taxonomy and at the same time represent an interesting biological phenomenon, especially when the changes result from unfavorable environmental conditions. In this situation, an increased frequency of malformations in a population from a polluted area could be informative for assessing the health of the ecosystem and such organisms could serve as so-called bioindicators. Our aim was to test the hypothesis that the onchoproteocephalidean fish tapeworm, *Glanitaenia osculata* (Goeze, 1782), has increased development of morphological malformations in an environment polluted by polychlorinated biphenyls (PCBs) which are known to have teratogenic and cytotoxic effects. For this purpose, newly collected tapeworms isolated from Wels catfish (*Silurus glanis* L.) from polluted water reservoirs in Eastern Slovakia and permanent slides from helminthological collections at the Institute of Parasitology in České Budějovice (Czechia) and the Natural History Museum in London were examined. Morphological malformations in

G. osculata from the Zemplínska Šírava water reservoir heavily polluted with PCBs, occurred in 2.8% of the proglottids examined, compared to 0.9% in the control group (Orlík water reservoir in the Czech Republic). Doubled cirrus-sac was the most frequent malformation (0.9%), followed by doubled ovary (0.4%) and development of an extra ovarian lobe (0.4%). The number of incomplete strobilations was significantly lower than the summation of all structural abnormalities (31:191, ratio 0.16). All structural abnormalities occurred significantly less frequently in the control group than in *G. osculata* from polluted locality, but incomplete strobilations occurred slightly more frequently in the control group (0.6% vs. 0.4%). The data suggest that morphological malformations could be used as an indicator of contamination in monitoring the health of the aquatic environment. Moreover, examination of permanent slides in helminthological collections can provide retrospective information on environmental health at a given locality and time period. However, further studies are needed to thoroughly understand the links between the development of the malformations and the type of environmental stressors that cause them.

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