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Variation in potential fish habitats and fish community in a mountain river subjected to variable human impact

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Over a few past decades, some sections of the mountain Czarny Dunajec River, southern Poland, have been considerably modified by channelization or channel incision induced by gravel extraction. Thus, the contemporary river represents a variety of morphologies ranging from single-thread, incised or regulated channel to unmanaged, multi-thread channel. For 12 river cross-sections with 1-4 flow threads, low-flow channel width and the variation in depth, mean velocity and bed material size measured at 1 m intervals were determined and compared with the abundance and diversity of fish fauna surveyed by electrofishing. Aggregated low-flow channel width and coefficients of variation for the three physical parameters increased linearly with increasing number of low-flow channels in a cross-section. This indicates the increase in morphological complexity of the flow pattern in the river to be reflected in the enlargement of potential fish habitats and in the increasing variation of their substrate and hydraulic characteristics. Only 2 fish species and 4-22 specimens were stated in the surveyed single-thread cross-sections, whereas the cross-sections with four low-flow channels hosted 3-4 species and 36-119 specimens. The variation in the number of species and specimens was best explained by the number of low-flow channels and the variation in depth in a cross-section, while none of the fish community parameters was significantly related to flow width. Thus, it is the increase in variability of habitat conditions rather than simple habitat enlargement, that led to the increased abundance and diversity of fish fauna in the multi-thread cross-sections. This study shows that the simplification of flow pattern in some sections of the Czarny Dunajec, caused by human disturbances, resulted in remarkable impoverishment of fish communities and their

restoration would require the renewed increase in morphological river complexity.