Ontogeny of UV resistance in a gravel spawning (Phoxinus phoxinus) and a surface spawning (Rutilus rutilus) cyprinid

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With 4 figures and 3 tables in the text

Abstract: The vulnerability of early developmental stages of minnow (Phoxinus phoxinus) and roach (Rutilus rutilus) was studied. Despite the different spawning sites, eggs and hatched embryos of both species are sensitive to UV-B radiation, which causes high mortality or malformation. Older free embryos and swim-up larvae, however, develop complete UV resistance. The relative concentration of a substance with maximum absorption at 289–294 nm obtained from methanol extracts of both species was found to increase during larval development and to correlate with increasing UV-B tolerance. As the epidermis lacks any melanin pigmentation it is concluded that this substance is an effective sunscreen. UV-B radiation, in addition, leads to a significant dispersion of melanophores in the dermis of the skin.

Introduction

The epidermis of fish is a delicate tissue highly vulnerable to physical, chemical and biotic impacts. Due to its lack of any visible pigmentation it can also be damaged by UV-B radiation. The sensitivity to ultraviolet radiation is species-specific and depends on the developmental stage of the fish. The most sensitive stages are eggs and fish larvae (EISLER 1961; HUNTER et al. 1979; DEY & DAMKAER 1990). It has been suggested that an UV-B-absorbing substance found in methanol extracts of the skin is a potential and probably the only effective sunscreen in the epidermis of fish (KARENTZ et al. 1991; FABACHER & LITTLE 1995, 1998).

The aim of our study was to investigate the ontogenetic development of this substance in correlation to the UV-B sensitivity of life stages of two common European cyprinid species with different spawning habits. The roach (Rutilus rutilus) preferably spawns on submerged vegetation in shallow water, and after

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