

SOLAR PHOTODAMAGE OF RPE IN GREEN FROGS

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The lifestyle of european "green" frogs (*Rana ridibunda*, *R. esculenta* and *R. lessonae*) is more aquatic than that of the "brown" frogs *R. arvalis*, *R. temporaria*, or of the toads *Bufo bufo* and *B. viridis*. They all are exposed to bright daytime illumination during the breeding/spawning season at the beginning of the warm season, spending much time at the water surface. But after that, brown frogs and toads adopt terrestrial lifestyle and predominantly nocturnal or crepuscular activity, while green frogs continue to be active during daytime, spending it at the water surface or close to it. Representing the true live traps ever ready to make the leap for a flying prey, they spend motionless tens of minutes, even hours, with eyes exposed to bright sky and sun illumination, many days during several midsummer months.

Photodamage of the frog retina and retinal pigment epithelium due to natural irradiation bound to this lifestyle had been described in *Rana catesbiana* [1] and *R. cascadae* [2]. In first of them, RPE of large (supposedly old) frogs demonstrated several kinds of cell damage, even in the form of long stripes of depigmented cells in the ventral RPE, which reasonably were interpreted as the traces, literally burned out by the sun upon black eye fundus due to long motionless episodes.

Frog RPE is not uniform across the space of the eye fundus. Besides the general difference between darker ventral part and less pigmented dorsal one, it bears a distinct horizontal dark band, marking the visual streak, position of which is adjusted to observe the horizon (the water surface). This dark band above the optic disk enables localization of things upon RPE space. Investigation of the joint retina+RPE flatmount preparations of the *R. lessonae*'s eye fundus, obtained from big (old) specimen, reveals two separate areas of massive RPE damage: one ventral, another dorsal to the visual streak. Their location may be bound to sun images on the eye fundus, the dorsal band being due to solar images reflected from the clear water surface.

Damaged RPE cells contain black masses of irregular shape and size, and are less pigmented due to decreased number of melanosomes, or even devoid of them at all. Smaller (hence younger) frogs have no signs of such severe RPE damage. RPE of the *R. temporaria* contains only separate cells with such black inclusions.

Abrupt exposition to bright spring sunshine for a week or two, after hibernation in almost full darkness, means a kind of illumination shock for spawning anurans, especially for the nocturnal toads. Short-term effects of light shock upon the different types of retinal photoreceptors, but not the RPE, were addressed in [2] on the *R. pipiens* (surprisingly, the least destructive effect was observed in the most light-sensitive red rods). In order to find any immediate RPE response to extreme illumination, urethane immobilized *R. lessonae* was exposed for two hours to bright sunlight in conditions, exactly corresponding to natural ones. In result, two massive changes were observed in the oil drops, so typical to the anuran RPE cells: first, the loss of their bright yellow colouration, and second, the change of their shape. Many drops became, or turned to get close to, the sickle-shaped optically distinct formations, resembling myeloid bodies described in electron-microscopic frog RPE studies. It should not be excluded that green frogs might be useful model animals for investigation of RPE photodamage in the area of ophthalmopathology.

References:

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- [2] K.V. Fite, A. Blaustein, L. Bengston, H.E. Hewitt (1998) Evidence of retinal light damage in *Rana cascadae*: a declining amphibian species. *Copeia* #4, pp. 906-914.