

学 位 論 文 要 旨	
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題 目	Analysis of the photoreceptive and physiological changes in fish by irradiation of specific light wavelength 魚類の光受容能の解析と単色光照射による生理学的な変化に関する研究
<p>Light is one of the important environmental factors affecting the physiological states of fish. The application of physiological effects of light to aquaculture could be an important technology in the future. This study focused on the retina, which is a typical photoreceptor organ, to determine the visual sensitivity and thresholds. Based on this information, it was evaluated how the irradiance at each wavelength of light affected the physiological status of fish. The effects of specific light wavelength irradiation on the gonads were analyzed based on visual information. Also, this study examined the possibility of developing a new technology about sex manipulation by irradiation of specific light wavelengths in aquaculture fish.</p> <p>【Evaluate of visual sensitivity and threshold in medaka】</p> <p>The electroretinogram recording was performed under the scotopic and photopic conditions to reveal visual characteristics of the retina. The threshold and spectral sensitivity were revealed by electroretinogram recording. This study also used a new threshold analysis using for auditory brainstem response analysis. As a result, the lowest thresholds of photopic and scotopic vision were found at 520 nm and 380 nm, respectively.</p> <p>【Effects of specific light wavelengths on the gonads of medaka】</p> <p>Based on the above mention, the green light (518 nm) was irradiated in the rearing of three strains in orange-red, Hd-rR111, d-rR-olvas-GFP. Although no sex reversal fish appeared in orange-red strain. two other strains showed a higher sex reversal rate than the control (Hd-rR111: 15.9%, d-rR-olvas-GFP: 81.8%). The sex reversal fish produced fertilizable gametes, confirming that the next generation was all-female offspring. The genetic females in the green light group showed the reduction of germ cell numbers at 3 dph, with a higher number of germ cells than the genetic males and a lower number than the genetic females.</p> <p>【Effects on the gonads caused by irradiation of specific light wavelengths in tilapia】</p> <p>The induction of sex control and manipulation was attempted through the irradiation of specific light wavelengths in Nile tilapia. The male to female sex-reversal fish was observed under specific and continuous light treatments. These results indicate that the rearing with the irradiation of a specific light wavelength during sex differentiation can induce sex change in some fish. Thus, light wavelengths may be a new environmental factor that induces sex reversal.</p>	