Lateral lines on the bodies of African clawed frogs may be sensitive to light

September 9 2015, by George Wigmore

Researchers have shown that water movement sensors - known as lateral lines - on the bodies of the African clawed frog may also be sensitive to light.

The finding, which is published in the *Journal of Experimental Biology* was done in collaboration with researchers from City University London, the University of Oxford, Tübingen University in Germany and Radboud University in the Netherlands.

Melanopsin is a recently discovered visual pigment that is distinct from those within the rods and cones of the eye, which are usually associated with the detailed analysis of form and colour. In mammals, melanopsin was previously shown to occur in a third type of photoreceptor in the

inner retina. This work shows it also occurs in the lateral lines of clawed frogs.

While rods and cones act on much faster time scales, as seen when your eyes adapt when moving from a bright to dark location, melanopsins differ as they do not adapt to light levels but instead detect the overall brightness of the light. Melanopsins have been implicated in many behaviours such as the setting of circadian rhythms and the pupil response.

In the African clawed frog, which is native to much of Sub-Saharan Africa, melanopsin is present in the frog's lateral line organs which are grouped into raised 'stitches' arranged in patterns on the skin's surface. In fish these lateral lines form characteristic lines along the flank of the animal.

While it was already known that these lateral lines enable the African clawed frogs (Xenopus) to sense water movement, for the first time it has been shown that the presence of melanopsin perhaps enables the frogs to move away from bright light or change the sensitivity of the lateral lines at different times of day.

In the frogs it has also been suggested that these melanopsins could be beneficial as while in light frogs use their eyes to detect predators, in low light it has been suggested that the frogs instead use the melanopsin in their lateral lines to increases the sensitivity to water movement enabling them to detect potential predators.

Speaking about the study, Professor Ron Douglas from the Division of Optometry and Visual Sciences at City University London and one of the authors of the study, said:

"What we have shown is that the lateral lines of the African clawed frog

(Xenopus) contain melanopsin. This means that they are most probably light sensitive. So the lateral lines of Xenopus, as well as perhaps other aquatic vertebrates, as well as sensing water movement, maybe also function to monitor overall light levels. This might, for example, enable them to move away from bright light or change the sensitivity of the lateral lines at different times of day."

More information: "Light sensitivity in a vertebrate mechanoreceptor?" *J Exp Biol.* jeb.125203; First posted online July 23, 2015, DOI: 10.1242/jeb.125203

Provided by City University London