Neural components contributing to the lamina cartridge in the butterfly, *Papilio xuthus*

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Foraging *Papilio* recognizes color of a small target detected only with a single or at least a few ommatidia, each housing 9 photoreceptors (R1-9) of several different spectral sensitivities. The R1-9 all project into a cartridge, the unit constructing the first optic neuropil, the lamina, where they relay spectral information to large monopolar cells (LMCs). A few neighboring cartridges are connected by processes of some photoreceptors. These behavioral and anatomical data imply that a set composed of a few neighboring cartridges bears a basic mechanism underlying color vision. We therefore initiated an anatomical work of the *Papilio* lamina to establish the anatomical basis of wavelength information processing. We combined local injection of biotin into the lamina and immunohistochemistry of neurotransmitter candidates, and then identified three populations of centrifugal neurons whose somata located 1) in the cortex overlying medulla, 2) at anterior base of medulla, and 3) between medulla and lobula plate. Cells in 2) and a subset of cells in 3) were immunoreactive to anti-serotonin and anti-GABA, respectively. Biotin injection also revealed distinct terminals in medulla layers 1-5. In layer 4, R1, 2 and 9 terminate, whereas the terminals in layers 1-3 and 5 probably correspond to LMC subtypes.