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Insights into anchovy vision – retinal neuroanatomy of *Engraulis encrasicolus*

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The outer retina of the European anchovy (*Engraulis encrasicolus)* shows an unusual ultrastructure providing specific sensitivity to polarized light. Exceptional features are cone chains - so called polycones - consisting of two alternating cone types (short and long cones), the radial alignment of lamellae containing visual pigment and a wedge shaped specular tapetum to enhance photon yield. The high regularity and complexity of the cone arrangement is expected to be continued down to the level of second and third order neurons, as these structures are intrinsically tied to the photoreceptors.
To gain more insight into anchovy vision our studies are addressed to the structure of the inner retina applying four methods:
1) Investigation of nuclear patterns, cell topography and correlation maps using two-photon microscopy. **2**) Investigation of the texture of the inner plexiform layer using semithin section series and CLSM. **3**) Neuroanatomical stainings with antibodies and lipophilic dyes (cell morphology, separation of subpopulations) and CLSM. **4**) 3-dimensional reconstruction of the outer plexiform layer (connectivity of photoreceptors and second order neurons) based on ultrathin section series and TEM.
Our data reveal highly regular and complex configurations of both the outer and inner plexiform layer as the synaptical endings mirror the cone arrangement. The inner plexiform layer shows a division into several sublaminae consisting of largely regularly arranged synaptical endings. There is a strong correlation of topographical cell distributions between cone photoreceptors and second/third order neurons which is visualized by isocontour maps. Different bipolar and amacrine cell types are found with distinct nuclear characteristics (inner structure, shape, size, position) as well as cell morphology and staining specificity.
The ongoing studies may represent an important step towards the understanding of polarized light vision in vertebrates.