ALBERTO UGOLINI[1], TAKAHIKO HARIYAMA[2], LUCA MERCATELLI[3]

1 Dipartimento di Biologia, Università di Firenze, Via Romana 19, Firenze, Italy
2 Hamamatsu University School of Medicine, 1-20-1 Handayama, Higashi-ku, Hamamatsu, Japan
3 Istituto Nazionale di Ottica – CNR, L.go E. Fermi 6, Firenze, Italy

THE POLARIZATION GRADIENT OF THE SKY AND THE ORIENTATION OF THE YOUNG SANDHOPPERS

Arthropods utilize multiple celestial orienting cues to make efficient excursions, sometimes following a rectilinear path between a particular destination and their homes. During the day, the position of the sun in the sky is generally hierarchically dominant over other celestial orientation cues such as the spectral gradient, radiance gradient and skylight polarization (e.g. see UGOLINI *et al.*, 2009, 2012, 2014, 2023; EL JUNDI, 2014; CIOFINI *et al.*, 2021). Several species of supralittoral amphipods are known for their capacity to use multiple celestial orienting cues to return rapidly to the damp belt of sand or stranded materials in which they spend the hottest hours of the day: the sun, the moon, skylight spectral and radiance gradients. Recently, it has been demonstrated that the vision of the polarized light seems to allow (or increase) the perception of the gradient of radiance and/or colour in adult individuals of *T. saltator*. It is also known that laboratory–born (inexpert) young of this species perform a similar zonal recovery using the solar or lunar compass. Our experiments aim to test the use of the skylight polarization gradient in their zonal recovery in expert (collected in the field) or inexpert (born in the laboratory) young sandhoppers.

Young sandhoppers of various ages were tested in a transparent bowl under an artificial sky (an opaline Plexiglas dome). The bowl was covered by a blue gelatin filter with a grey filter and a linear polarizing filter positioned under the blue one in such a way as to occupy half of the upper surface of the Plexiglas bowl so as to create a linear polarization gradient. Releases were made around local noon.

Our tests show that adult and expert young sandhoppers perceive and use the linear polarization gradient, whilst inexperienced young are unable to take any direction: most of them turn around the perimeter of the bowl.

Unlike the use of the sun and moon as orienting factors in the zonal recovery of adult and young sandhoppers, our results suggest that the use of the polarization gradient as an orientation factor is learned.