The role of the antennae in sun and moon compass mechanism of *Talitrus saltator* (Crustacea, Amphipoda)

Alice Ciofini¹*, Alberto Ugolini¹, Vittorio Pasquali², Laura S. Hoelters³, David C. Wilcockson³

¹Dipartimento di Biologia, Università di Firenze, Via Romana 17, 50125 Firenze, Italy; ²Dipartimento di Psicologia, Università di Roma “La Sapienza”, Via dei Marsi 78, 00185 Roma, Italia; ³Aberystwyth University, Penglais Campus, IBERS, Aberystwyth, Ceredigion SY23 3DA, UK.

*alice.ciofini@unifi.it

To orientate along the sea-land axis of sandy beaches, the supralittoral amphipod *Talitrus saltator* (Montagu) employs several cues, such as the sun and the moon whose use requires continuous adjustments to account azimuthal variations. The sun and the moon compasses rely on separate endogenous chronometric mechanisms (Ugolini et al., 1999) and the biological clock involved in the sun compass also regulates the circadian locomotor activity rhythm exhibited by this species (Ugolini et al., 2007). Our work wants to assess the existence of an antennal clock necessary for the proper functioning of the sun and/or the moon compass as demonstrated in the Monarch butterfly *Danaus plexippus* relatively to the sun compass (Merlin et al., 2009). The circadian expression of four canonical clock genes (*Per, Clk, Tim and Cry2*) in both the brain and the antennae was quantified and tests of solar and lunar orientation of intact and “antennaeless” individuals were conducted. The eventual impairment of the mechanism regulating the sun compass was also evaluated recording the locomotor activity rhythms of (intact and operated) animals subjected to different light:dark regimes. Molecular analysis revealed circadian oscillations of *Per* and *Cry2* expression in the antennae. As regard behavioural experiments, both intact and antennaeless individuals (exhibiting comparable activity rhythms) tested under the sun showed directional choices in agreement with the expected directions. Instead, the lunar orientation was highly compromised by the removal of these appendages and antennae-ablated individuals were uniformly distributed. Therefore, we concluded that antennae have a role in the functioning of the moon compass but are not necessary for a proper solar orientation.

References

