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Title: Compound Eye Adaptations for Diurnal and Nocturnal Lifestyle in the Intertidal Ant, *Polyrhachis sokolova*

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Abstract: The Australian intertidal ant, *Polyrhachis sokolova* lives in mudflat habitats and nests at the base of mangroves. They are solitary foraging ants that rely on visual cues. The ants are active during low tides at both day and night and thus experience a wide range of light intensities. We here ask the extent to which the compound eyes of *P. sokolova* reflect the fact that they operate during both day and night. The ants have typical apposition compound eyes with 596 ommatidia per eye and an interommatidial angle of 6.0 degrees. We find the ants have developed large lenses (33 μ m in diameter) and wide rhabdoms (5 μ m in diameter) to make their eyes highly sensitive to low light conditions. To be active at bright light conditions, the ants have developed an extreme pupillary mechanism during which the primary pigment cells constrict the crystalline cone to form a narrow tract of 0.5 μ m wide and 16 μ m long. This pupillary mechanism protects the photoreceptors from bright light, making the eyes less sensitive during the day. The dorsal rim area of their compound eye has specialised photoreceptors that could aid in detecting the orientation of the pattern of polarised skylight, which would assist the animals to determine compass directions required while navigating between nest and food sources.

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