

# The compound eyes of mantis shrimps (Crustacea, Hoplocarida, Stomatopoda). II. Colour pigments in the eyes of stomatopod crustaceans: polychromatic vision by serial and lateral filtering

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## SUMMARY

The stomatopod eye is divided into three distinct regions, two peripheral 'hemispheres' and a dividing mid-band. Each of these areas has a separate function and it is the six rows of ommatidia in the mid-band which are the main subject of study here.

Rows one to four of the mid-band are probably not sensitive to polarized light (paper I (*Phil. Trans. R. Soc. Lond. B* **334**, 33–56 (1991))) and instead possess many structural features which suggest that they are concerned with colour analysis and perhaps colour vision. This, the second of two consecutive papers, examines these adaptations in detail. They include brightly coloured intrarhabdomal filters, apparent lateral filters and a photoreceptor tiering system unique to the crustacea.

Cronin & Marshall (*J. comp. Physiol.* **166**, 261–275 (1989*b*)) have shown that mid-band rows one to four contains at least eight distinct visual pigments. These, in combination with the structures described here, allow the spectrum of light available to stomatopods to be sampled over a broad spectral range by receptors with narrowly tuned sensitivities.

It is the photostable screening and filtering pigments, rather than the visual pigments, which are examined in detail in this paper. These have been divided into two categories: (i) the 'standard' retinal pigments: those that are often found in other crustacean eyes; (ii) the 'unusual' retinal pigments: some of these are unique to stomatopod eyes and may be involved in colour vision.

## 1. INTRODUCTION

Marshall *et al.* (1991) (hereafter referred to as paper I) outline the general structure of the eyes of mantis shrimps. They are divided into three areas: two peripheral retinæ and a centrally positioned mid-band

region. The various structural adaptations of two rows of the mid-band, rows five and six, and also those of the peripheral retinæ, strongly indicate that these eye regions are involved in some form of polarization vision (paper I).

It is the structure and function of the remaining mid-