

Opsins in the cephalic and extracephalic photoreceptors in the marine gastropod *Onchidium verruculatum*

海棲軟体動物腹足類イソアワモチの頭部眼および眼外光受容器で発現するオプシン分子の同定

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Abstract

Background:

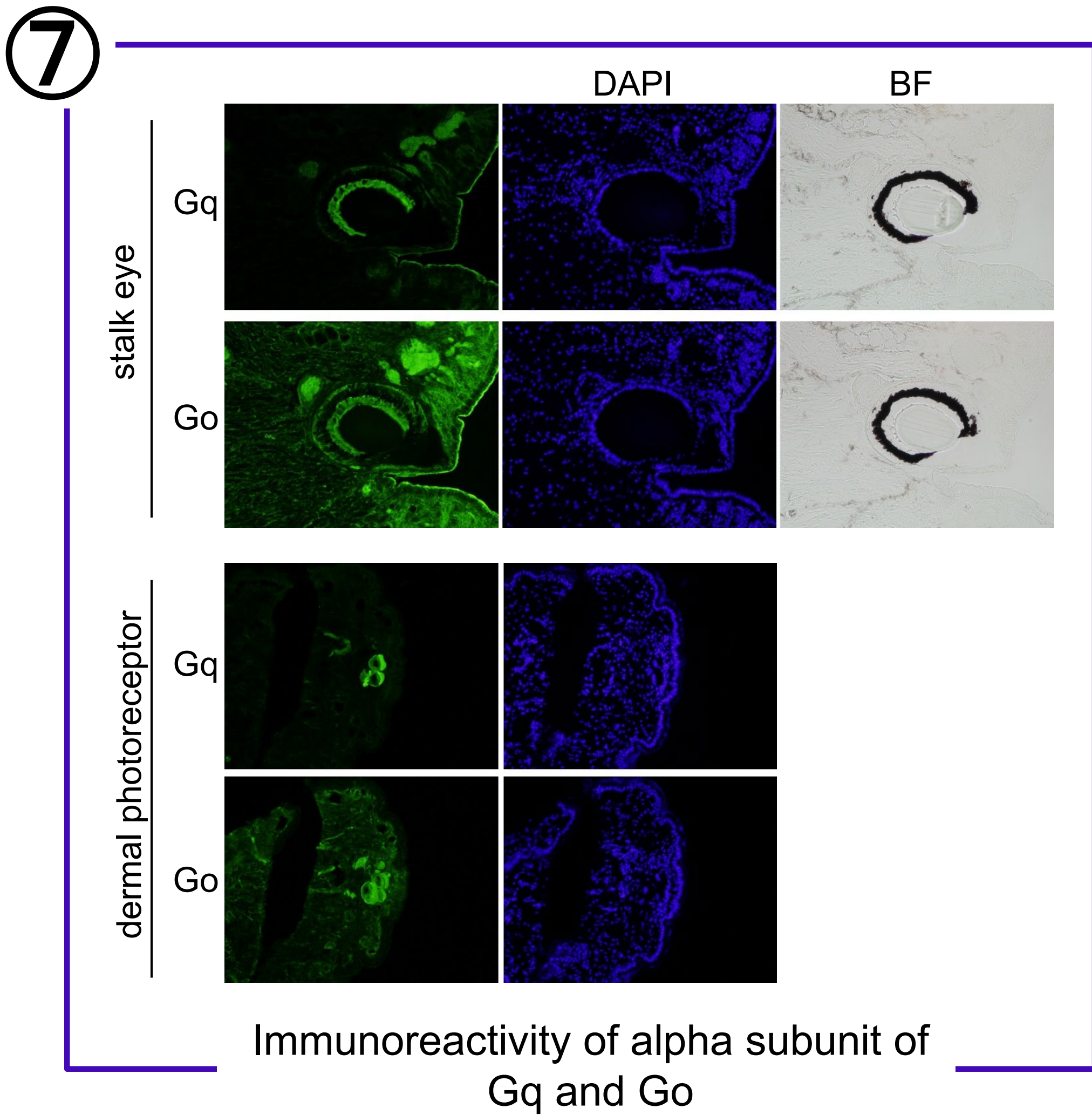
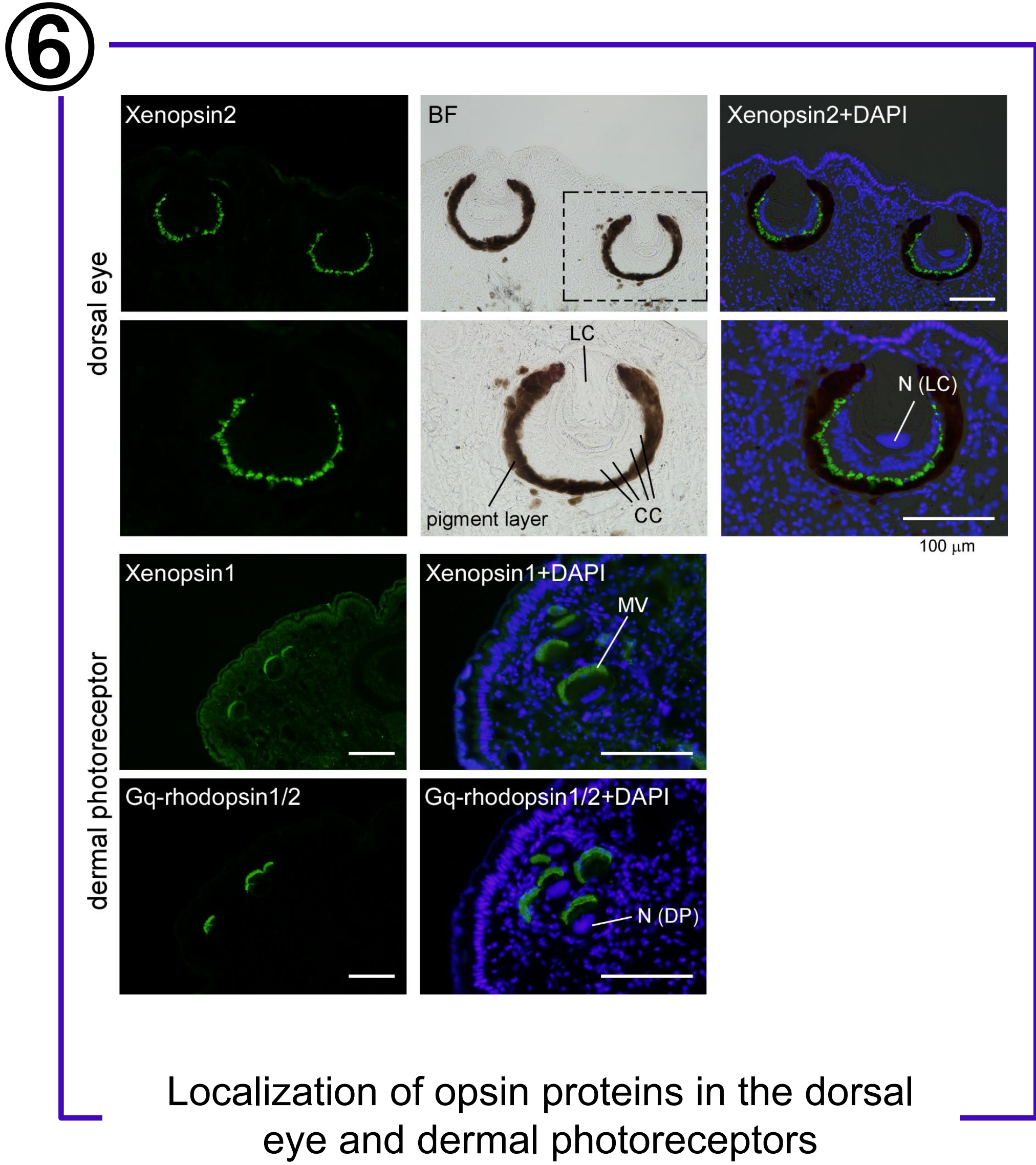
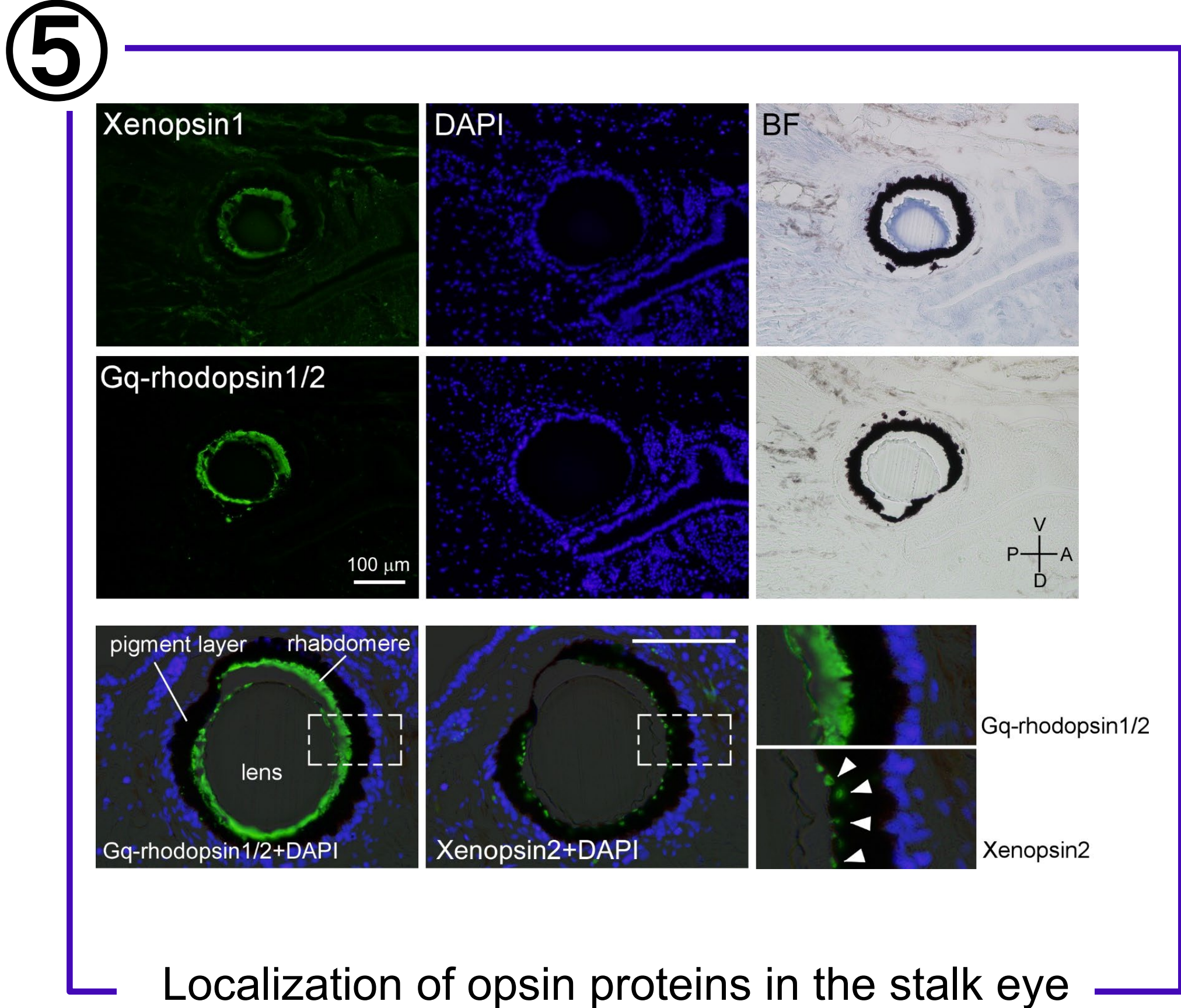
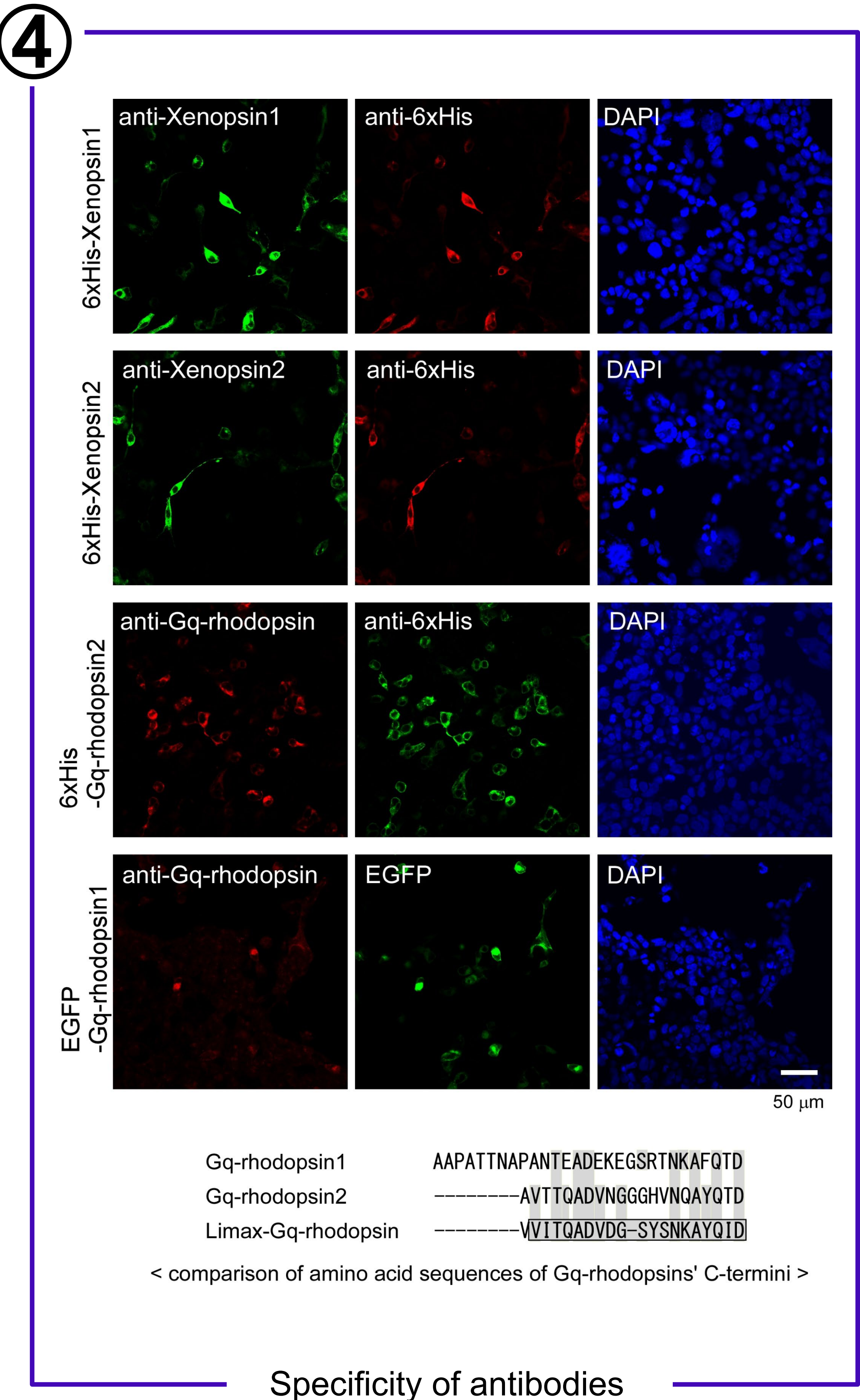
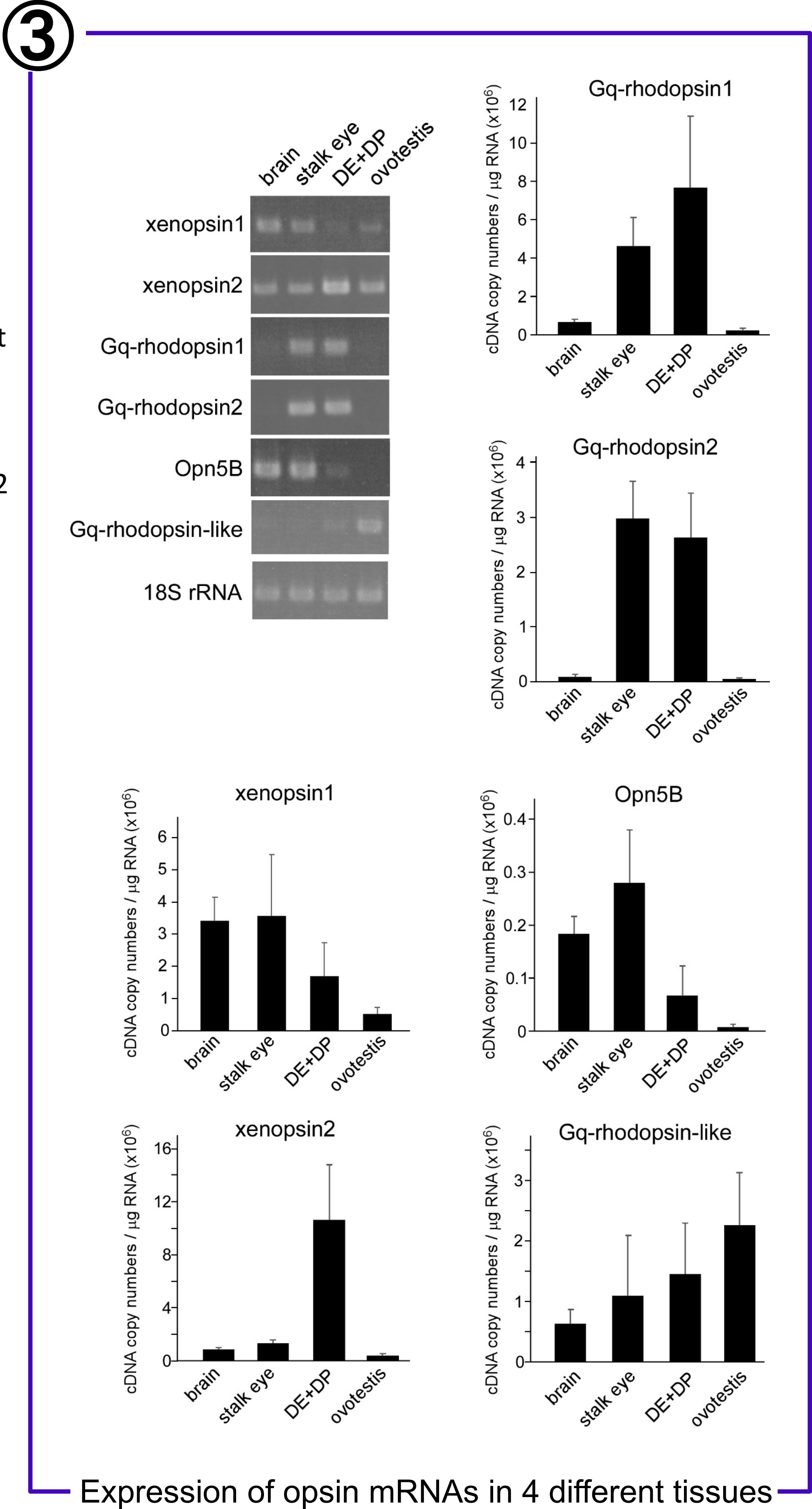
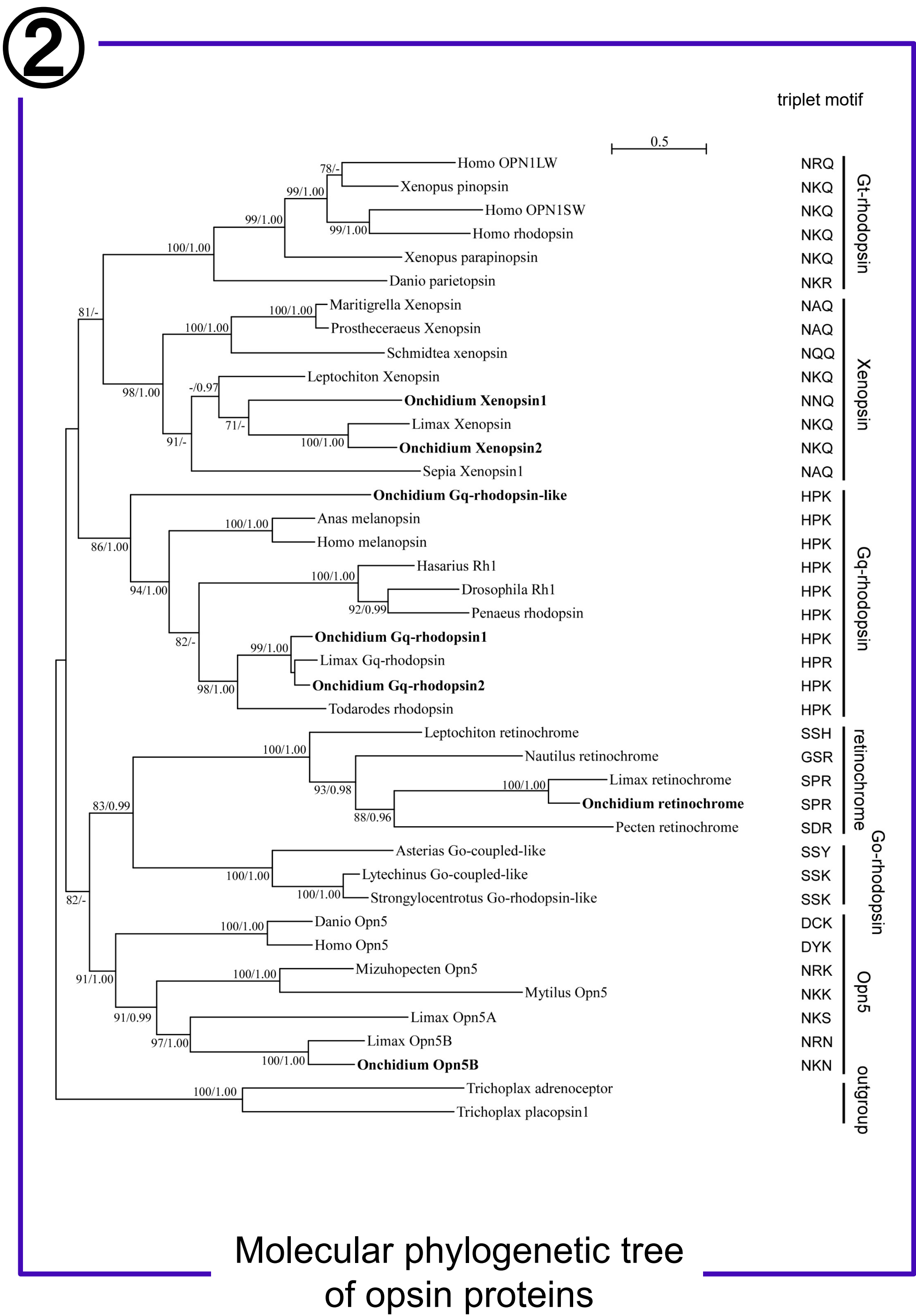
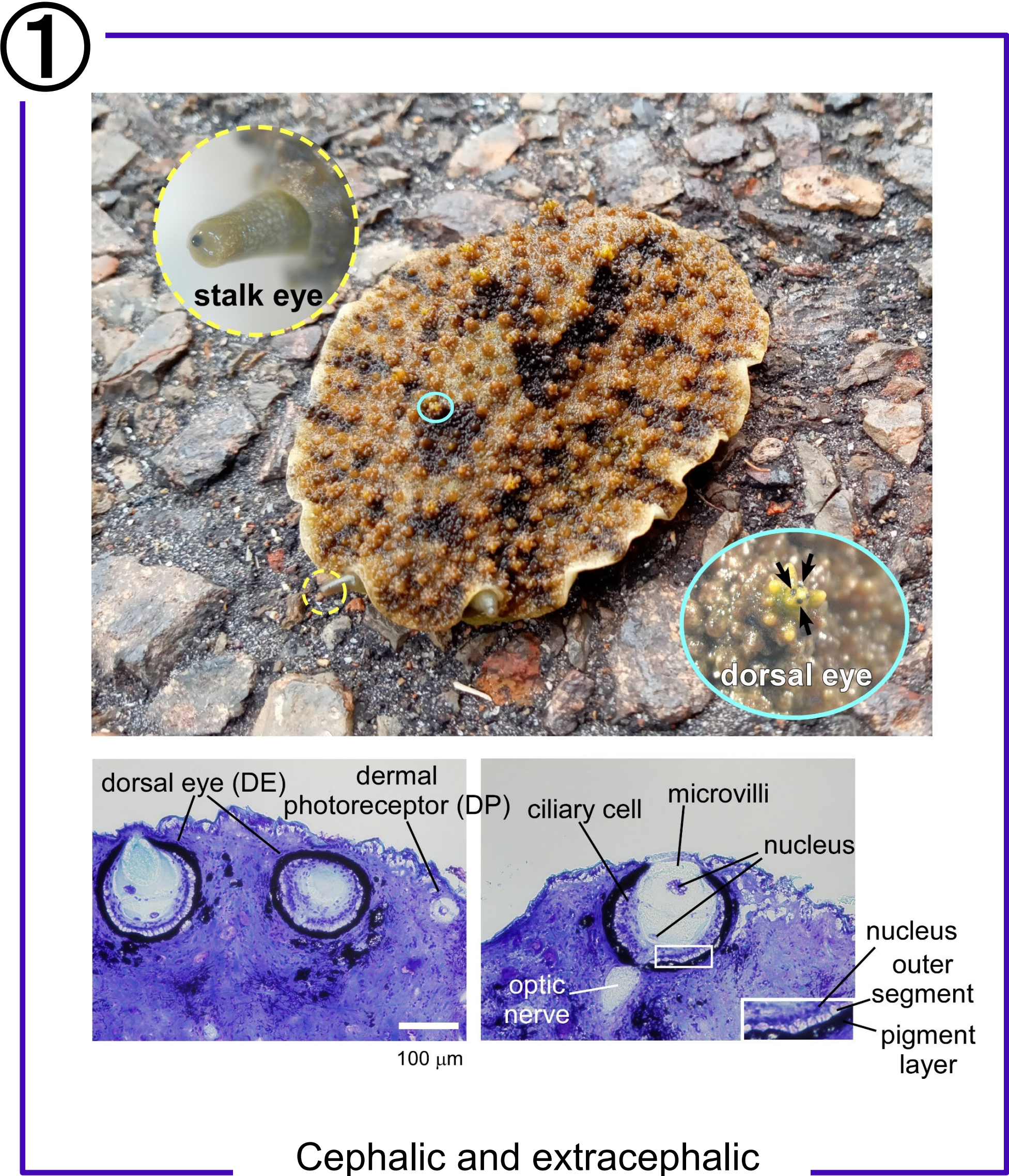
The marine gastropod *Onchidium verruculatum* has four different photosensory organs - the stalk eye (cephalic eye), the dorsal eye, the dermal photoreceptors, and the brain. However, little is known about the visual pigment molecules responsible for light detection in these organs.

Results:

We searched for opsin molecules that are expressed in the neural tissues of *Onchidium* and identified six putative signaling-competent opsin species (Xenopsin1, Xenopsin2, Gq-coupled rhodopsin1, Gq-coupled rhodopsin2, Opsin-5B, and Gq-coupled rhodopsin-like). Immunohistochemical staining of four of the six opsins revealed that Xenopsin1, Gq-coupled rhodopsin1 and Gq-coupled rhodopsin2 are expressed in the rhabdomere of the stalk eye and in the dermal photoreceptor. Xenopsin2 was expressed in the Type-II photoreceptors of the stalk eye and in the ciliary photoreceptors of the dorsal eye. Gq_α and Go_α were both detected in the rhabdomere of the stalk eye and the dermal photoreceptors.

Conclusion:

This study clarified the identities of the opsins expressed in the extracephalic photosensory organs of *Onchidium* and the distinct molecular compositions among the photoreceptors.



Summary

- Seven opsin family genes were identified in the transcriptome of *Onchidium*.
- In the stalk eye, the type-I photoreceptors express Gq-rhodopsin and Xenopsin1, whereas the type-II photoreceptors express Xenopsin2.
- The ciliary cells in the dorsal eye express Xenopsin2.
- The dermal photoreceptors express Gq-rhodopsin and Xenopsin1 as the type-I photoreceptors in the stalk eye do.
- The type-I photoreceptors and the dermal photoreceptors express both Gq_α and Go_α.

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