

SUPPLEMENTAL DATA

This section includes supplemental data. Tables 1 and 2 show the presence of phototransduction components in the squid *D. pealeii* and the cuttlefishes *S. officinalis* and *S. latimanus*. Table 3 includes primer sequences used to amplify phototransduction component transcripts from RNA extracts. Figures 1-4 show predicted amino acid alignments for rhodopsin, retinochrome, Gq α , and sTRP from all tissue regions tested. These figures show regions where antibodies target. Figures 5-10 serve as controls for Western Blot analysis (Supp. Figs. 5-6), secondary-only controls for immunohistochemistry (Supp. Figs. 7-8), and absorption controls for immunohistochemistry (Supp. Figs. 9-10).

Supplemental Figure 1. Predicted amino acid alignment of rhodopsin identified by RT-PCR in *Doryteuthis pealeii*, *Sepia officinalis*, and *Sepia latimanus*. The black bar represents the region against which anti-rhodopsin antibody was designed.

Supplemental Figure 2. Predicted amino acid alignment of retinochrome identified by RT-PCR in *Doryteuthis pealeii*, *Sepia officinalis*, and *Sepia latimanus*. The black bar represents the region against which anti-retinochrome antibody was designed.

Supplemental Figure 3. Predicted amino acid alignment of full length Gq α identified by RT-PCR in *Doryteuthis pealeii*. The black bar represents the region of the protein against which anti-Gq α targets. The gray bar represents the region of the Gq α transcript identified in the retina that is different from the Gq α transcripts identified in dermal tissues.

Supplemental Figure 4. Predicted amino acid alignment of partial transient receptor potential channel (TRP) identified by RT-PCR in *Doryteuthis pealeii*.

Supplemental Figure 5. Secondary only control for anti-rabbit horseradish peroxidase-conjugate (A) and anti-chicken horseradish peroxidase-conjugate (B) Western blots. Secondary-only controls lack primary antibody and show no labeling. Bands at the top of each blot represent excess protein.

Supplemental Figure 6. Absorption controls for anti-rhodopsin (A) and anti-retinochrome (B) Western blots. Rhodopsin absorption control is labeled with rhodopsin primary antibody incubated with antigenic peptide to inhibit functionality of primary antibody (A). Retinochrome absorption control is labeled with retinochrome primary antibody incubated with peptide to inhibit functionality of primary antibody (B). Bands at the top of each blot represent excess protein.

Supplemental Figure 7. Immunohistochemical secondary antibody-only control lacks primary antibody. *Doryteuthis pealeii* retina is labeled with (A) anti-rabbit 488 and anti-chicken 633 and (B) anti-rabbit 488 and anti-chicken 555 to ensure no non-specific labeling of secondary antibodies.

Supplemental Figure 8. Immunohistochemical secondary antibody-only control lacks primary antibody. *Doryteuthis pealeii* (A) ventral mantle, (B) dorsal mantle, (C) fin, (D) arm 1, and (E) tentacle labeled with anti-rabbit 488 and anti-chicken 555 to ensure no non-specific labeling of secondary antibodies.

Supplemental Figure 9. Absorption control immunolabeling of rhodopsin protein. Rhodopsin protein is expressed in retina outer segments (A) and chromatophores (C). When antibody is absorbed with antigenic peptide, protein labeling is blocked in retinal sections (B) and mantle sections (D). Transmitted light images are included to show tissue structure (A', B', C', D'). Blue represents DAPI labeling of nuclei. The location of the outer segments is represented by the vertical solid black line; that occupied by the inner segments is represented by the vertical dotted lines. Letter labels: supporting cell nuclei; pcn, photoreceptor cell nuclei; m, membrane; ps, pigment sac. Scale bar, 25 μ m.

Supplemental Figure 10. Absorption control immunolabeling of retinochrome protein. Retinochrome protein is expressed in retina inner segments (A) and chromatophores (C). When antibody is absorbed with antigenic peptide, protein labeling is blocked in retinal sections (B) and mantle sections (D). Transmitted light images are included to show tissue structure (A', B', C', D'). Blue represents DAPI labeling of nuclei. The location of the outer segments is represented by the vertical solid black line; that occupied by the inner segments is represented by the vertical dotted lines. Letter labels: supporting cell nuclei; pcn, photoreceptor cell nuclei; m, membrane; ps, pigment sac. Scale bar, 25 μ m.

Supplemental Figure 3

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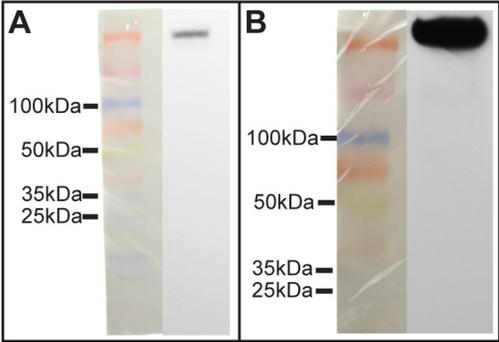
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Muscle RIRHEPGYIFLQDILLVAVITGIIIEYFDLDSIFPRMVDVGGQSRERKWIHCFENVISIMFLVALSEYDQVLVESDNENMSEKALFRITIIYWPQNSVILFLNKKDLLEKINTSHLVDYFPEYDGGKCDYAAARFFLRFMFDLND DKRII
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Lateral mantle DC RIRHEPGYIFLQDILLVAVITGIIIEYFDLDSIFPRMVDVGGQSRERKWIHCFENVISIMFLVALSEYDQVLVESDNENMSEKALFRITIIYWPQNSVILFLNKKDLLEKINTSHLVDYFPEYDGGKCDYAAARFFLRFMFDLND DKRII

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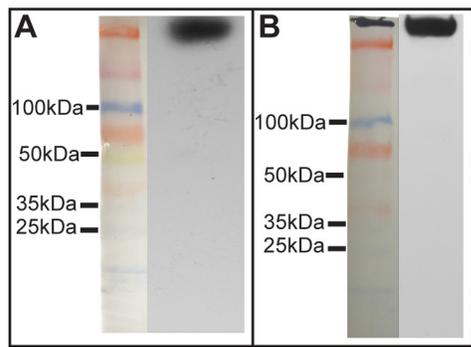
Supplemental Figure 4

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Retna	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*
Ventral Mantle	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*	
Dorsal Mantle	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*	
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Arm 2	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*	
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Tentacle	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*	
Muscle	Y	N	I	A	I	I	L	L	L	L	I	A	M	S	S	Y	O	L	I	S	Q	A	D	E	N	K	F	A	S	R	L	M	S	Y	F	A	G	A	T	V	P	P	F	N	I	P	S	K	S	F	N	N	M	L	F	K	S	L	L	H	A	G	O	K	A	K	N	V	R	S	V	K	N	K	R	E	R	Y	O	V	I	N	L	S	R	Y	I	N	K	R	O	R	D	E	M	V	S	O	D	D	V	H	E	L	K	O	D	I	S	F	F	F	E	L	M	I	L	R	D	N	G	F	E	T	V	H	O	A	K	S	S	K	L	D	R	M	K	N	L	S	A	A	E	G	O	T	E	L	M	E	E	A	G	L	D	E	E	*	

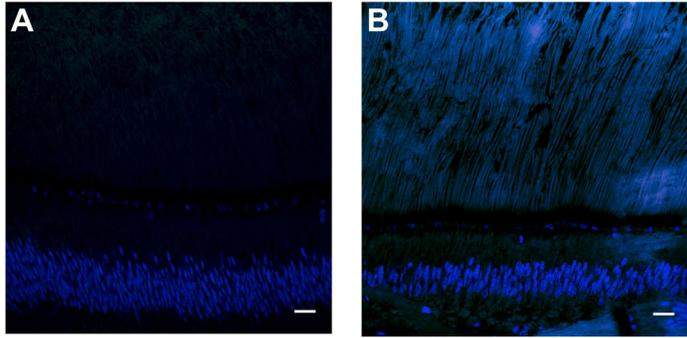
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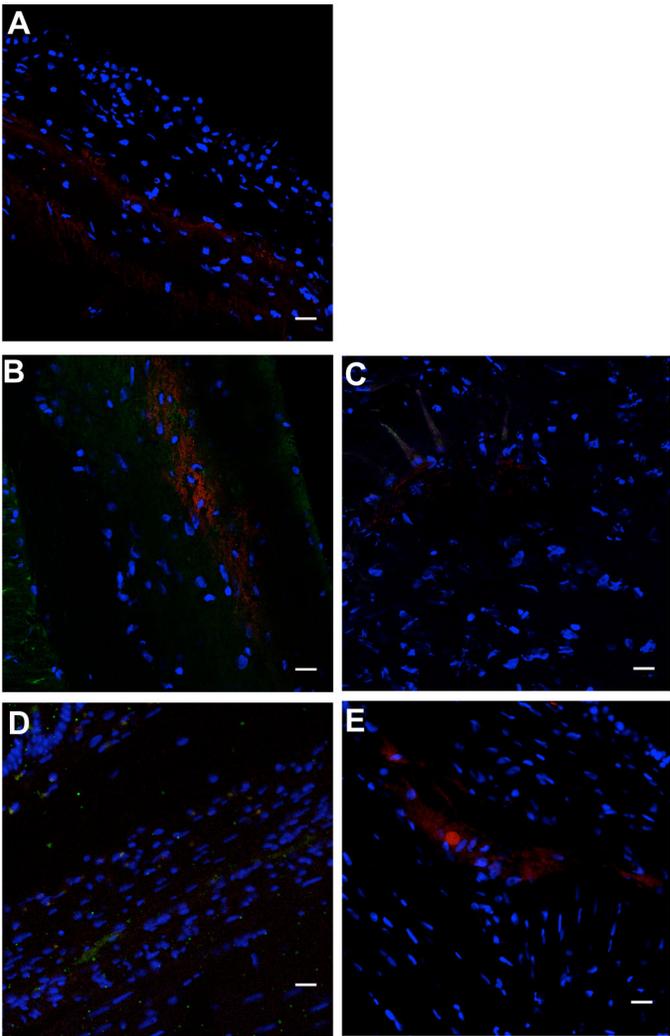
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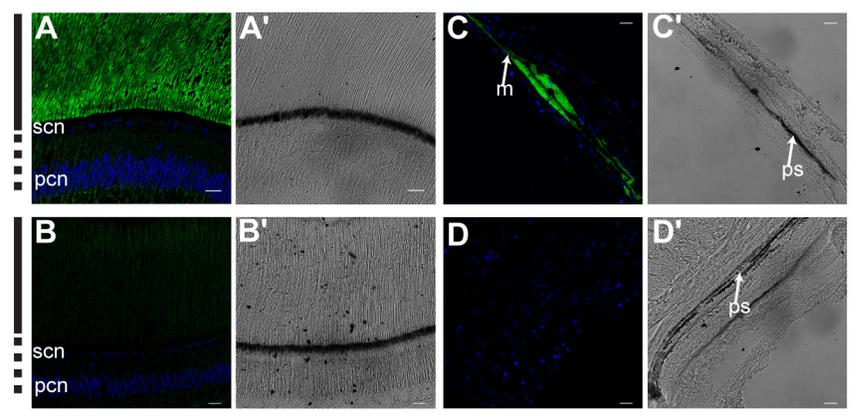
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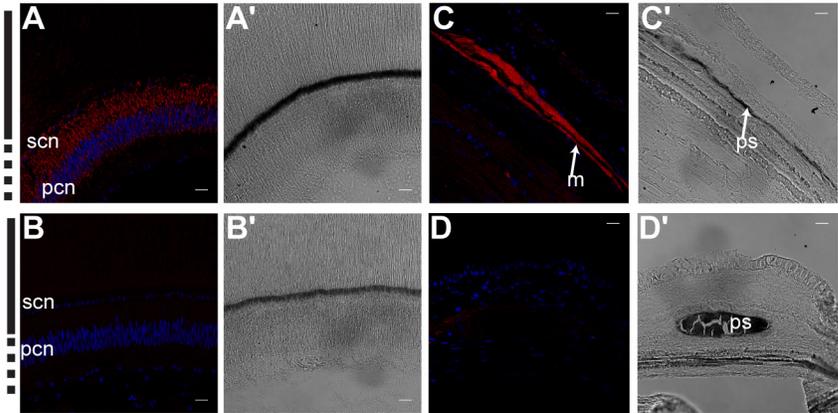
Supplemental Figure 8



Supplemental Figure 9



Supplemental Figure 10



Supplemental Table 1. Presence of phototransduction component transcripts in dermal tissues from *D. pealeii* (black), *S. officinalis* (red), and *S. latimanus* (blue). + indicates transcript found; X indicates transcript not found.

	Rhodopsin	Retinochrome	Gq α	sTRP
Retina	+++	+++	+	+
Ventral mantle	+++	+++	+	+
Dorsal mantle	+++	+++	+	+
Fin	+++	+++	+	+
Arm 1	+++	+++	+	+
Arm 2	+++	+++	+	+
Arm 3	+++	+++	+	+
Arm 4	+++	+++	+	+
Tentacle	+++	+++	+	+
Muscle	+++	+++	+	+
Fin nerve	X	X		
Stellate ganglion	X	X		

Supplemental Table 2. Presence of phototransduction transcripts in chromatophores dissociated from *D. pealeii* dermal tissue.

	Rhodopsin	Retinochrome	Gq α
Ventral mantle	+	+	+
Dorsal mantle	+	+	+
Lateral mantle	+	+	+
Fin	+	+	+

Supplemental Table 3. Gene specific primer sequences used to characterize cephalopod phototransduction transcripts.

Gene	Primer	Sequence 5'>3'
Rhodopsin	L.pealeiiRhoF1	ATGGGTCGCGATATCCCAGACAATG
	L.pealeiiRhoR1325	TTAGGCCTGGTTGTCAACCCCTGAG
	SepiaRhoF1	ATGGGTAGAGACATCCCAGATA
	SepiaRhoR1395end	TCAAGCCTGGTAGGCCTGGTTGTCAA
	S.latimanusF91	GACGCTGTTACTACTCCCTCGGTAT
	S.latimanusF189	TCCCTCCAGACTCCAGCCAACATG
	L.pealeiiR860	CATAAGGTGTTACCCATTCGAGTGGACC
Retinochrome	CephRetF1	ATGTTTCGAAATCCAGCAATGACTGG
	CephRetR906	TTAGGGCTTCTTGGTGTCACTTTTGG
	S.latimanusRetR196	GGGTCAATGGAGGAGTTGCTGCTC
	L.pealeiiRetR775	GTGACCTCCAAGTGAGTAAGGCTGGC
Gq α	LpGq_F1short	ATGGCGTGCTGCCTCAGCG
	LpGq_Rend	TCAGACCAAGTTATACTCCTTCAAGTTAAG
sTRP	L.pealeiiTRP F1852	CAACTTGCTTATCGCTATGATGAGC
	L.pealeiiTRP R2365	CCATAAGTGTTTCGGTCTGGCCC