Supplemental Materials

S.1. Table of Symbols and Indices

Symbols
q = Photons
I = Relative Intensity
D = Facet diameter
R = Local radius of curvature of the eye
Δø = Interommatidial angle
O = Height of pot (smallest dimension of pot)
U = Maximum sighting distance of pot (m)
Φ = Photon flux ($q \cdot s^{-1}$)
L = Irradiance ($q \cdot s^{-1}\ m^{-2}$)
Ω = Solid angle (sr)
A = Area (m^2)
K = Diffuse attenuation coefficient (m^{-1})
P = Proportion of glowing twine to empty space in pot area (from side view)
d = Distance between snow crab eye and pot (m)
ʃ = Photosensitivity function
C = Michelson contrast
α = Power
S = Shape
∠ = Solar Angle

Indices
t = time (initiation of decay)
g = glowing pot
b = background
sc = snow crab eye

S.2. Acuity measurements

Local area curvature was taken by fitting circles to 2D photos of the profile of the sites of interest within ImageJ. Images were zoomed in for the most accurate local area curvature. Figure S1, below, is an example site of how circles were fitted. Next, the area of the circle was calculated within ImageJ and the radius of the circle was derived. As depicted in Figure S1, measurements were taken along the vertical axis of the eye, when the snow crab eye is in its natural elevated state.

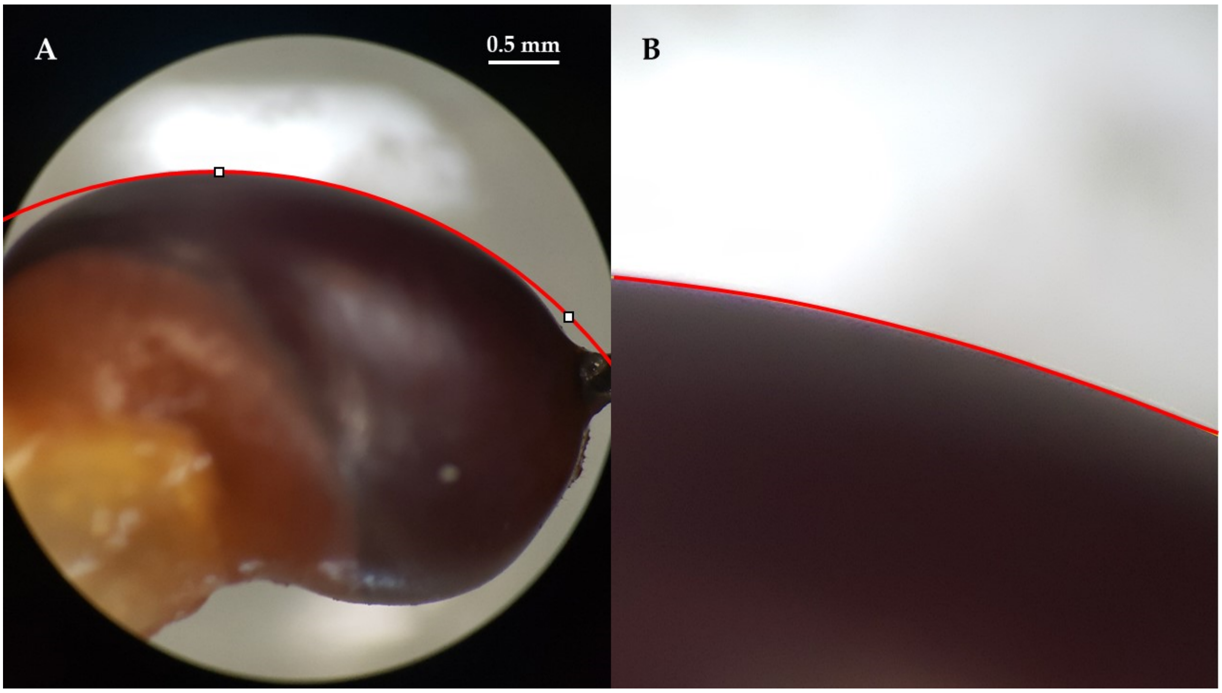

Figure S1. 2D images of the profile of middle middle portion of the snow crab eye for curvature measurements. A) The larger scale view of the fitted circle and B) the close view of the middle middle portion of the eye to ensure an accurate fit for the local area being measured.

S.3. Dartnall's nomogram

The polynomial function describing Dartnall's nomogram as given by Dawis, 1981 [38]. The estimated peak spectral sensitivity of snow crab, 495nm, is incorporated with λ_{max}.

$$B(\lambda) = \sum_{k=1}^{8} b_k [\left(\frac{L_{max}}{\lambda}\right) - \left(\frac{L_{max}}{\lambda_{max}}\right)]^k$$

L_{max} = 502 nm (for Dartnall's nomogram)
b1 = -0.0106836
b2 = -28.28
b3 = 148.133
b4 = -498.627
b5 = -1457.94
b6 = 127994.4
b7 = -789.371
b8 = -60749.2
λ_{max} = 495 nm
B(λ) = log10 (absorption coefficient per wavelength)

S.4. Contrast model vs Photon flux model

Contrast models were selected because at a depth of 200-meters in the ocean, there is enough ambient light during the day to mask low-intensity light sources. However, ambient light levels drastically reduce when the solar angle is low or during the night, and other factors need to be considered. The minimum intensity threshold of light needed to stimulate the visual system of an animal must be taken into consideration. There are no studies that show the amount of light needed to stimulate a behavioral response of snow crab and there are none performed on other deeper water crustaceans, to our knowledge, that we can use to infer such a parameter. There are studies performed on shallow water, intertidal, and semi-terrestrial crabs, but their visual demands are much different than that of a deep-water animal. Notwithstanding, to illustrate the point of our discussion about the limitations of the contrast model in extremely low light conditions, we modeled the photon flux of the phosphorescent-netting snow crab pot (eq. 7 from the manuscript) with the known minimum light intensity threshold ($4.0 +/- 1.5 \times 10^5$ q/cm^2/s) of a purple rock crab (*Leptograpsus variegatus*) [52]. We recreated the plots from the contrast models but used the minimum intensity threshold model instead to illustrate the difference between contrast and the amount of light needed to stimulate a visual response. The two figures (Figure S2 and S3) are under the same conditions but modeling different visual measures.

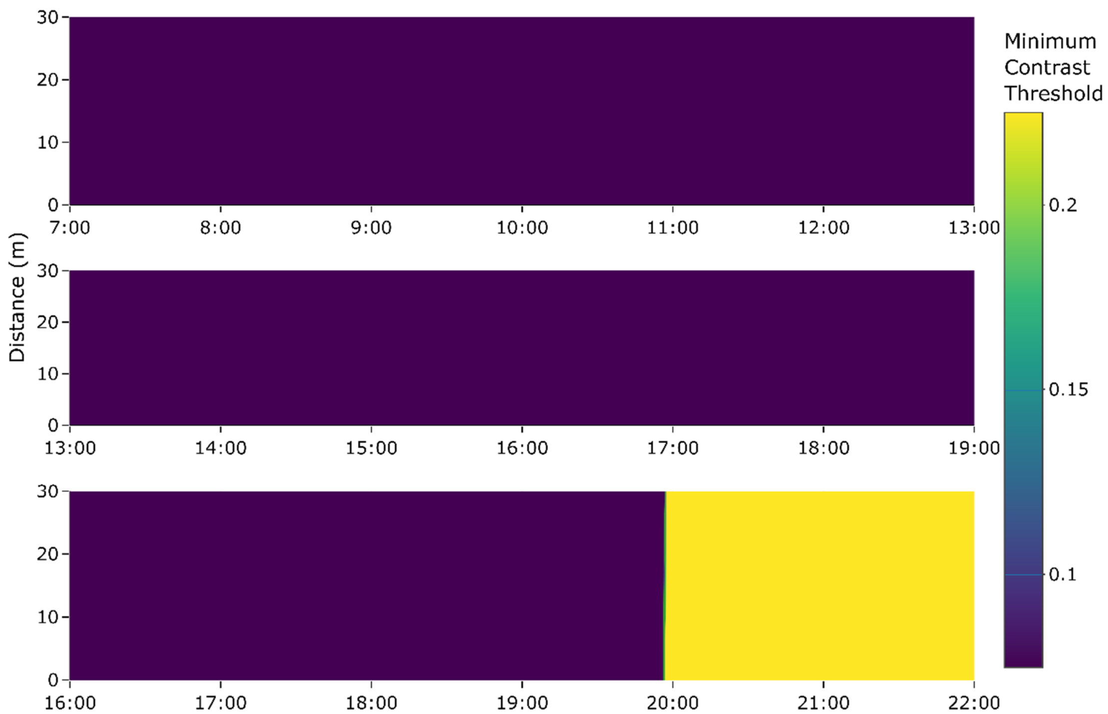

Figure S2. Snow crab visual contrast plots for 6-strand luminescent pots at three different setting times (solar angle): 07:00-13:00NT (8° to 53.4°), 13:00-19:00NT (53.4° to 8.5°), and 16:00-22:00NT (37.8° to -18.77°), Conception Bay, NL April 18, 2022. Models are all within Jerlov I waters. Colors indicate Michelson contrast values: yellow = visible, green and light blue = possibly visible, dark blue = not visible.

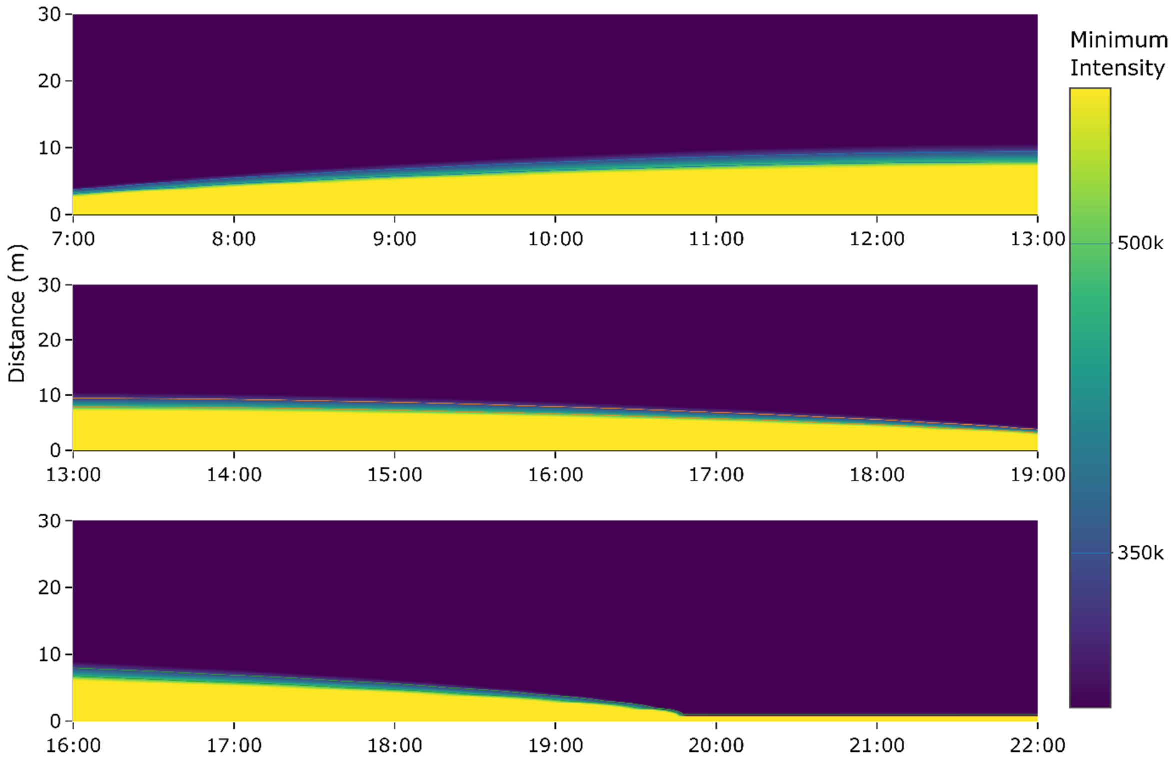

Figure S3. Purple rock crab minimum intensity plots for 6-strand luminescent pots at three different setting times (solar angle): 07:00-13:00NT (8° to 53.4°), 13:00-19:00NT (53.4° to 8.5°), and 16:00-22:00NT (37.8° to -18.77°), Conception Bay, NL April 18, 2022. Models are all simulated at 200 m depth and within Jerlov I waters. Colors indicate Michelson contrast values: yellow = visible, green and light blue = possibly visible, dark blue = not visible.

According to the contrast model, Figure S2, it would seem that because the number of photons emitted from the pot is much higher than that of the ambient light after sunset (19:57), the pot would be much more visible. However, from Figure S3, it would seem that the most light is visible from the pots before sunset when analyzing the amount of photons available from the pot area. That is not to say that the light from the pots is not visible to snow crab according to Figure S3, as snow crab likely have a better ability to see their surroundings in low-light conditions than purple rock crab. These opposing models show that additional factors need to be taken into consideration at such low light levels and because the contrast model shows that the phosphorescent pot is brighter than the ambient light, that does not mean it emits enough photons to stimulate a visual response.