

to increase with shell length. ~~Meanwhile~~In contrast, the shells of ophiuroids and ~~the crinoid~~ *M. metaerinus rotundus* were the brightest, ~~contrasting sharply with the coloration of~~ *Laqueus* (Figure 3(c): black arrowhead). Molluscan shells were gray in color but somewhat faint compared to *L. aqueus rubellus*. Sediment particles that were trapped in pectinid ribs were dark gray, ~~as were resembling~~ bioclasts and rock fragments (Figures 3(c) and 3(d): white arrowhead).

3.3. Grayscale Image Analysis

Figure 4 shows a ~~256-~~shades of grayscale histogram for selected individuals. Counts of each grayscale plot among the individuals are significantly different ($P < 0.001$, pairwise ANOVA). ~~The~~ Mean values ~~in the case of for~~ *L. aqueus rubellus* were around 40, ~~that~~ ~~which was were~~ the lowest (darkest) among the animals. ~~The mean values observed for~~ Bivalves, ophiuroids, and scleractinian corals ~~s exhibit were~~ similar ~~mean values, the range of~~ ~~which were~~ (around 51–62, 52–77, and 58, respectively), but those of bivalves were slightly lower than ~~those observed for~~ the other two groups. The histograms ~~in the case of~~ obtained for two crinoid *Metaerinus* show a gentle convex shape, with the peak occurring at around 90 ~~in for Metaerinus 1 one individual~~ and around 160 ~~in for Metaerinus 2 the other~~.

Discussion

4.1. Optical Evasion from Macropredators

~~For sessile benthic organisms, Not being remaining un~~detected by predators is an efficient ~~survival~~ strategy ~~of decreasing the mortality rate of sessile benthic organisms~~. The reddish coloration of the benthic organisms ~~we studied here~~ may help them ~~not be detected~~ avoid ~~detection~~ by macropredators. This ~~phenomenon~~ can be explained by the optical properties of visible light.

Comment [A11]: When you say “faint,” do you mean that their color intensity was lower? If yes, please revise this sentence as follows:
“Molluscan shells were gray but had lower color intensity than that observed for *L. rubellus*.”

Comment [A12]: This statement is slightly unclear. Could you specify which individuals you are referring to and what you mean by counts of plots?

Comment [A13]: The means of which values are you referring to? Color intensity? Please clarify.

Comment [A14]: This is slightly unclear. Do you mean two individuals belonging to this species? If so, please revise this as “two *M. rotundus* individuals.”

Comment [A15]: You have not used these designations (*Metaerinus 1* and *Metaerinus 2*) before. I’ve revised this sentence to avoid confusing readers. Please confirm that this is indeed what you meant.

~~The reddish appearance of a~~An object ~~appears red means that if~~ the red portion of the visible spectrum is reflected by its surface, while other wavelengths ~~of visible light~~ are absorbed. Red light has the longest wavelengths in the visible spectrum, and ~~its the lowest~~ energy ~~is lower~~ [18]. Such low-energy light is preferentially diffused under water, ~~because of which resulting in a loss of~~the red ~~optical element component of visible light is lost~~ at the bottom of the sublittoral zone [18, 19]. Benthic organisms that appear reddish under visible light conditions ~~therefore, would will therefore~~ appear black ~~in color~~ at the ~~bottom of the sublittoral bottomzone~~. *L. aqueus rubellus* and ~~organisms associated with it~~ on the outer shelf of Suruga Bay ~~should must~~ appear dark in color in their natural habitat, making it possible for them to ~~go remain unrecognised undetected~~ by ~~the eyes of~~ macropredators such as fish and squid [20–24].

Comment [A16]: When you say organisms associated with *L. rubellus*, are you referring to other brachiopods or other organisms found in the sublittoral zone? Please clarify.

~~Unlike the natural visibility of benthic organisms,~~ Their contrasting infrared visibility suggests the possibility of another survival strategy against predators. Almost all deep-sea fishes have eyes that are sensitive to light in the blue-to-green visible spectrum because these wavelengths can penetrate ~~deep deeply~~ into the ocean [24]. Malacosteids, however, have retinal pigments that are particularly sensitive to red light, and these fishes have been compared to snipers armed with infrared “snooperscopes” at night [25, 26]. One such predator, the malacosteid *Photostomias guernei*, ~~is reportedly has been reported to be~~ present in the seas around Japan, as well as in Suruga Bay [27, 28]. However, ~~it is unlikely that~~ *L. aqueus rubellus* is ~~likely to remain undetected affected by even~~ by deep-sea fishes with ~~the~~ long-wavelength sensitivity ~~of deep sea fishes, as it shows the similarly dark appearance of~~ ~~because it resembles dark~~ rocks and skeletal fragments. ~~The appearance of~~ *L. aqueus rubellus* shells under infrared light suggests that ~~Laqueus-it~~ has evolved a survival strategy in which its shell behaves optically like a nonliving object ~~on at the bottom of~~ the sublittoral ~~bottomzone~~.

4.2. ~~One Likely Possibility for the Possible~~ Evolutionary Arms Race ~~b~~etween Sessile Benthic Organisms and Macro predators

The camouflage strategy of *L. aqueus rubellus* ~~to for the evading~~ detection ~~abilities of by~~ macro predators suggests the presence of an intimate and evolutionary interplay or arms race, which in turn suggests ~~This leads to~~ several evolutionary scenarios, as discussed below.

L. aqueus rubellus and ~~the vision systems of~~ its predators may have experienced selective pressure ~~the former~~ for developing optical evasion ability and ~~the latter for developing~~ detection ability of the photoreceptor ability to detect long-wavelength light, respectively.

Each enhancement of in one group of organisms ~~one~~ exerts selection pressure for developing a compensating enhancement of in the other. This is a form of coevolution [1, 29]. In addition to this predator-prey interaction, brachiopod survival ~~on at~~ the sea bottom is also affected by competition among benthic organisms, which belong to a similar guild [30–32]. ~~As a consequence~~ Consequently, several species of the benthic community are involved, and their abundances are not independent. This corresponds to the concept of “diffuse (or guild) coevolution” [1].

~~In the modern sea, h~~Highly efficient vision systems are evident-seen in teleost fishes and coleoid cephalopods, both of which originated in the early Mesozoic and drastically diversified during the Jurassic [33–35]. Spirifer ~~in~~ids, which were one of the most thrived successful brachiopod groups and showed no indications of color [36], became extinct soon after the diversification of ~~the~~ macro predators, even though they had possessed certain morphologies that are considered to be developed exquisite morphological adaptations ~~for of~~ the feeding system that are considered exquisite [37–41]. On the other hand, terebratulids did not become extinct but began to diversify and persisted to the modern era [42]. Considering the improvement over time in the predation abilities of macro predators [43], our results suggest that the red coloration and infrared opacity of terebratulids is an effective adaptation

Comment [A17]: It's not clear what the species of the benthic community are involved in. Did you perhaps mean that this predator-prey coevolution is not restricted to *L. rubellus* but also occurs in other species of the benthic community from the same guild since they are competitors exposed to the same pressures?

Comment [A18]: This section of the sentence is not very clear. Did you mean that their coloration did not evolve over time?

~~strategy to life for survival~~ at the ~~sublittoral~~ bottom of the sublittoral zone, even though these organisms are immobile and seemingly defenseless.

~~The~~ This possible relationship between ~~the~~ coloration and ~~the apparent evolutionary trend evolution~~ motivated us to consider the etiology of visibility and its evolution. Through biochemical analysis of intracrystalline proteins in the terebratulid shell, Cusack et al. [14]

identified the N-terminal amino acid sequence of a 6.5-kDa protein ~~that may whose~~ function may be to embed a red carotenoprotein in the shell. In this study, the shells of larger ~~Because~~ *L. aqueus rubellus* individuals shells examined here ~~tended~~ to exhibit have more vivid red coloration ~~in larger individuals;~~ this indicates that the red pigment is ~~probably~~ deposited gradually during the growth of the secondary shell layer. Because the 6.5-kDa protein has been extracted from different shell layers in each species, it seems to represent a phylogenetic constraint [44].

~~Enigmatic problems remain in this~~ Our hypothesis is yet to explain some problems, namely, the origin of infrared opacity and its evolution. Further studies will be needed to understand how terebratulids in the marine benthic community have evolved in response to increasing predation pressures.

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Comment [A19]: "Etiology" is the study of causes of diseases and does not appear relevant in this context. Please check if you can revise this section as "the evolution of visibility."

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