RETINAL ADAPTATION OF A SQUID, *LOLIGO EDULIS* CAUGHT BY JIGGING FROM THE SEABED

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Introduction

Traditionally the popular Malaysian longest squid species, *L. edulis* is caught by jigging from the coastal waters. The major squid landings are however contributed by purse seines and bottom trawls. The jigging operation in Malaysian is normally conducted at night during quarter and new moon periods and very little catch is obtained during the moonless night. Fluorescent and incandescent bulbs placed on the side of the boat are used to attract the squid to gather below the boat. In the operation it is common that the catch is obtained from the jig that is lowered to about 2 to 3 meters above the sea bed. Occasionally it is caught from the mid-water area although it is known that this species is also harvested from the mid water column by the purse seines. Before high intensity lights were introduced in the Japanese squid fishing industry, squids were caught near the surface or in the shallow layers. There is no written information about the local squid species with regards to this behaviour. As a preliminary work the author described the response of the retina of the squid to the jig with a view to applying the results to squid fishing using jig.

Materials and Methods

The squid specimens used in this study were caught by jigging at night from waters around Pulau Bidong, Terengganu, Malaysia using the university's research boat, UNIPERTAMA 111. The animals caught were immediately transferred in to the life tank of the boat and kept alive. All samples were initially conditioned in the dark. The compartment was then illuminated by a 240V, 60 watts incendescent bulbs through a 10cm hole on the compartment hatch cover. Several illuminations were exposed into the tank and the light intensity of each illumination was measured using LI-COR model 190 light meter. Under each illumination the animal was picked at random and the head was immediately preserved in Bouin's fluid and was made quickly in the dark.

A histological study was done in the campus laboratory to determine the effect of light to distribution pattern of the visual cells of the eye samples. The central part of the retina, opposite the lens was dissected and excised. From this portion, five dorsal sections (D), five ventral sections (V) and two middle sections (B) were excised out and sectioned into 14 portions by the usual paraffin method. Each portion was sectioned longitudinally at 8μm thickness. The sections were stained by haemotoxylene and eosin and then observed under a light microscope at a magnification of 1 X 40. Photomicrographs of the sections were taken in order to count the number of visual cells.

Results and Discussion

The visual sense of squid composed by a large number of visual cells. In this study, the average number of visual cells per 100 μm in the dorsal section (D), the ventral section (V) and in the middle (B) sections was compiled. It was found that the dorsal section of the retina contained a higher density of visual cells as compared to the ventral section and the least at the middle section ($P = 0.003$, $df = 9$). Higher cell counts was endowed with considerable visual sensitivity, capable of image formation and mediate pattern vision. The tendency of a squid to move either towards or away from a light determined the threshold and spectral sensitivity, which normally associate with feeding, schooling, aggressive displays and orientation. Their active predatory life style was dependent on an efficient visual sensory system. In the jigging operation the squid attacked the moving jig as its prey - the behaviour scheme for all observed Loligo sp. as described by Amaratunga (1983). The visual accuracy and sensitivity depended on the number of visual cells. As can be seen from the results of the study, more visual cells were found on the dorsal region as compared to the ventral region suggesting that the sensitivity was more on the dorsal region. Due to the deep location of the eyeball in the skull and its curvature, the sensitivity was thus adapted to the vision from the straight or downward direction. On the other hand, the ventral part of the retina which contained less cells was less sensitive to an the object seen from upward direction. Perhaps that could be the reason as to why the squid attacked the jig that is placed lower than its position above the seabed.

Conclusions

It is concluded that the dorsal portion of the retina of the squid eye contained more visual cells. The exposure time and brightness govern the visual sensitivity of the squid eye. Under a strong illumination the squid vision is disorientated and hence the squid normally tries to avoid strong light intensity.

References

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