

Flash patterns of the light on luminous land snail
Quantula striata (GRAY) from Singapore

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(With 1 text-figure and 1 plate)

発光カタツムリ *Quantula striata* の発光パターン

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シンガポールの発光カタツムリ *Dyakia striata* についてはすでに報告 (羽根田, 1946; HANEDA, 1955) したが, 本種は *Quantula striata* (GRAY) と再同定された。その発光と生活環については HANEDA and TSUJI (1969) に示されている。BASSOT and MARTOJA (1968) はカンボジアから別種の発光カタツムリ *Hemiplecta weinkauffiana* (GROSSE et FISCHER) を報告したが, BASSOT は直接, 著者に *H. weinkauffiana* は *Q. striata* と同一種であると訂正した。

著者は1977年6月と1978年8月にシンガポールで *Q. striata* を採集して, 飼育器の温度を 20-25°C に保ち, キュウリ, ナスを飼料とし, 幼貝を得た。主発光器の発光状態はカラー写真で撮影され, 発光器の光及び成貝の腹足の一見連続的発光にみえる極めて弱い光については, 光増幅装置と記録計によってチャートレコードを得た。すなわち, 連続的にみえる腹足の光は, チャートレコードで微妙な変化がみられ, 暗所で生貝の腹面に微細な光のフラッシュが散在しているのと一致した (Fig. 1-2)。幼貝の主発光器の発光パターンも肉眼的観察と一致した。

The existence of luminous species among the terrestrial gastropods Pulmonata was not known until 1942 when *Quantula striata* (GRAY) (Syn. *Dykia striata*) of the Zonitidae, was discovered (HANEDA 1946, 1955) in Singapore. As already described that some specimens of this snail were collected in Singapore and brought to Japan kept alive and studied the structure of luminous organ and its life history (HANEDA 1963, HANEDA and TSUJI 1969). Another luminous land snail, *Hemiplecta weinkauffiana* (GROSSE et FISHER) was reported in Cambodia (BASSOT and MARTOJA 1968), however this snail was same to *Q. striata* (personal communication by BASSOT during the stay in Madang at that time of Alpha Herix New Guinea Expedition in 1969), so *Q. striata* is still only one luminous species among the Pulmonata in the world.

Adapted from the previous reports, *Q. striata* spawned white eggs in soil. From eggs very weak continuously light were observed. About 10 days after the egg was spawned, an embryo developed within the egg. Immediately after being hatched the young snail, about 1.0 mm in shell diameter emitted continuous light over the whole surface of the foot. When the foot was examined under low power

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magnifications, the entire surface had a diffused glow. The luminescence seemed to be produced by many micro individual flashes of light. As the snail developed, the luminescence condensed to an oval luminous organ which was found to be located beneath the mucous fold of the head. It was oval in shape not visible from the surface. Luminescence of the main luminous organ is most frequently observed in young stages, of a shell diameter from 5.0 to 15.0 mm. In a specimen of 15.0 mm diameter the main luminous organ near the mouth measured 2.0 mm in diameter. As the snail grows, the flicker rate diminish, and some adult specimens shows no luminescence at all. The normal duration of flash at 25°C is 2 to 3 seconds. The snail flashes 2 to 4 times, and the pauses for 30–40 seconds before beginning another period of flashing. The luminescence of this snail is intracellular, no luminous secretion from the cell.

In June 1977 and August 1978, I collected several adult specimens of this snail from the same locality in Singapore, then cultivated in terrarium which keeping the temperature 20–25°C, and supplied eggplant and cucumber as a bait. Thereafter juvenile specimens were born.

A chart record (Fig. 1) of the flash pattern of main luminous organ and the weak light of the foot on the specimens were obtained by the autorecorder and photomultiplier amplifier compartment (Hitachi, I-R-532). In the present work, the previous visual observation of flash pattern of this snail were correct by an aid of chart record.

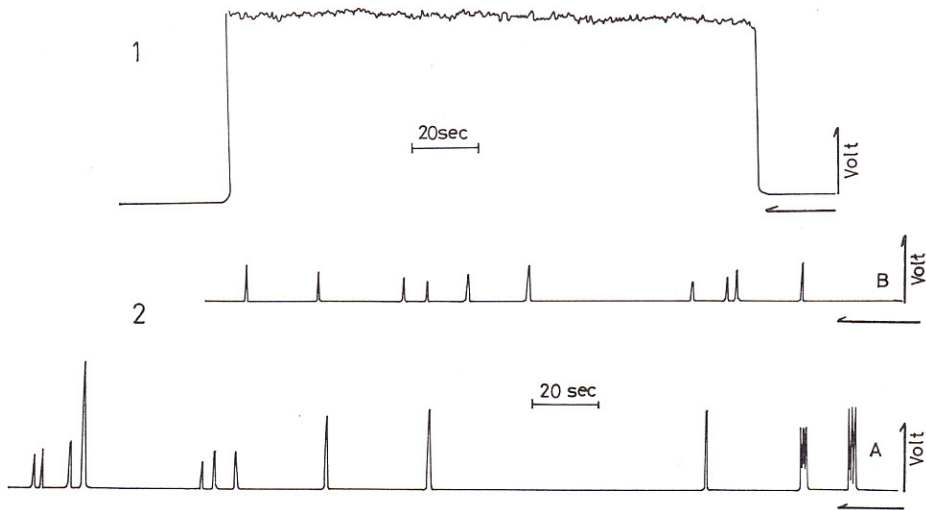


Fig. 1. Chart records of flash light of luminous organs.

1. Foot of the adult specimen. Coarse: 7, range: 0.1 V, selector: $\times 10$, chart speed: 20 mm/min.
- 2-A, B. Main luminous organ. Coarse: 4, range: 1.0 V, selector: $\times 10$, chart speed: 20 mm/min.

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Explanation of plate 8

Photographs of luminous land snail, *Quantula striata* in dim light room.
a, d: flashes of main luminous organ; b, c: flashes of creeping snail.
(Nikommat EL F 1.4, Ektachrome ASA 400, time exp. 4 seconds)