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Luminous Apogonid Fish from the Moreton Bay, Brisbane[1]

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(with 1 Plate)

ブリスベーン・モートン湾のイシモチ科の発光魚について

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Among the apogonid fishes only *Apogon ellioti*[1,2,6,7] and all the species of the genus *Siphamia*[3,4,5,8,9,11] are luminous.

The light source of *Apogon ellioti* is a chemical substance with a positive luciferin luciferase reaction, while that of *Siphamia versicolor*[3] is symbiotic luminous bacteria.

This contrast between closely related species is extremely interesting bioloically.

In regard to another species of the same genus, *Siphamia majimai*[5] and others, although it has not been proven bacteriologicaly yet, the light source is considered to be symbiotic luminous bacteria without doubt because the structures are perfectly identical.

After cooperative research works under the U. S. Japan Cooperative Science program from February to March 1965 in New Zealand; the author stayed for two weeks in the laboratory of the Department of Harbours and Marine in Brisbane, Australia through the courtesy of Mr. G. G. T. HARRISON, chief inspector of fisheries at this department. The author also cruised Moreton Bay aboard a prawn trawl fishing boat to collect luminous fishes, and examined preserved fish specimens of the laboratory. It was confirmed that the following two apogonid fishes *Adenapogon roseigaster*[10] and *Siphamia cuneiceps* are luminous fish.

Their luminous organs are here compared to those of *Apogon ellioti* and *Siphamia versicolor*.

1. Rose bellied Siphon fish *Adenapogon roseigaster* (RAMSAY and OGILBY)

According to MARSHALL (1964), this small fish is commonly found in the estuaries of the rivers and in the harbours along the coast of South Queensland and New South Wales. In Brisbane river the species is commonly taken at night in the trawl nets of the prawners

The examined materials were caught by the trawl nets of the prawners in Moreton Bay. Preserved specimens of the department of Harbours and Marine were also ex-

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amined.

The color of fresh specimens is silvery white above, passing to pale rose below.

The luminous organ of this fish consists of a luminous body and an accessary structure of translucent muscle bundles. The luminous body lies just below the anteroventral surface of the liver at the level of the base of the ventral fin. It is a small spherical body a thin tube connecting it to the intestine which measures 2.3 mm in length 2.0 mm in width and 0.5 mm in thickness in a specimen measuring 56.0 mm in length.

This structure is quite similar to that of *Siphamia versicolor*. Due to insufficient fresh material, the author could not cultivate luminous bacteria from the luminous body, but the light source of this fish is no doubt luminous bacteria.

On the ventral aspect the translucent muscle bundles originate on either side of the keel of the isthmus, and extend on each side posteriorly to the base of the ventral fin. If a transverse section of fresh material is observed these muscle bundles appear to be of transparent opaque tissue quite similar to that of *Siphamia*, *Acropoma* and *Paratrachychthys*.

These peculiar muscles diffuse the light emitted from the luminous body. Accordingly it is certain that the muscle bundles also serve as an accessory structure to the luminous body.

2. Siphon fish, *Siphamia cuneiceps* WHITLEY

This small apogonid fish, called the siphon fish, was first known from three examples which measured from 36 to 39 mm. According to MARSHALL (1964) they were taken by M. V. WARREEN of Marine Biological Laboratory, C. S. I. R. O., Cronulla, New South Wales, and were secured in the Agassiz trawl when operating off Frasser Island, Queensland, in 15 fathoms on September 14, 1938. This fish appears to be fairly common in trawls operating in Moreton Bay, Brisbane.

Siphamia versicolor and *S. zaribae* are known as intimate associates of a long-spined sea-urchin, *Diadema setosa*, and live usually inside its long spines. *Siphamia cuneiceps* and *Adenapogon roseigaster* however, seems not to be related to sea-urchins, because its behaviour is different from the other two fishes, having been found in trawl fishing nets. Color in life is brassy, covered with minute black dots. The pupil is briliant metallic blue. The luminous organ of this fish also consists of a luminous body and an accessory structure of translucent muscle bundles. The luminous organ is quite similar to that of another species of *Siphamia* and *Adenapogon roseigaster*. The luminous body is a small spherical body which measures 1.5 mm in length 1.2 mm width and 0.2 mm in thickness in a specimen measuring 37.0 mm in length The translucent muscle bundles occupy a comparatively large area as shown in Fig. 3. The function of these muscle bundles is the same as that of the other species of the genus *Siphamia*. The light source of this fish is also no doubt luminous bacteria.

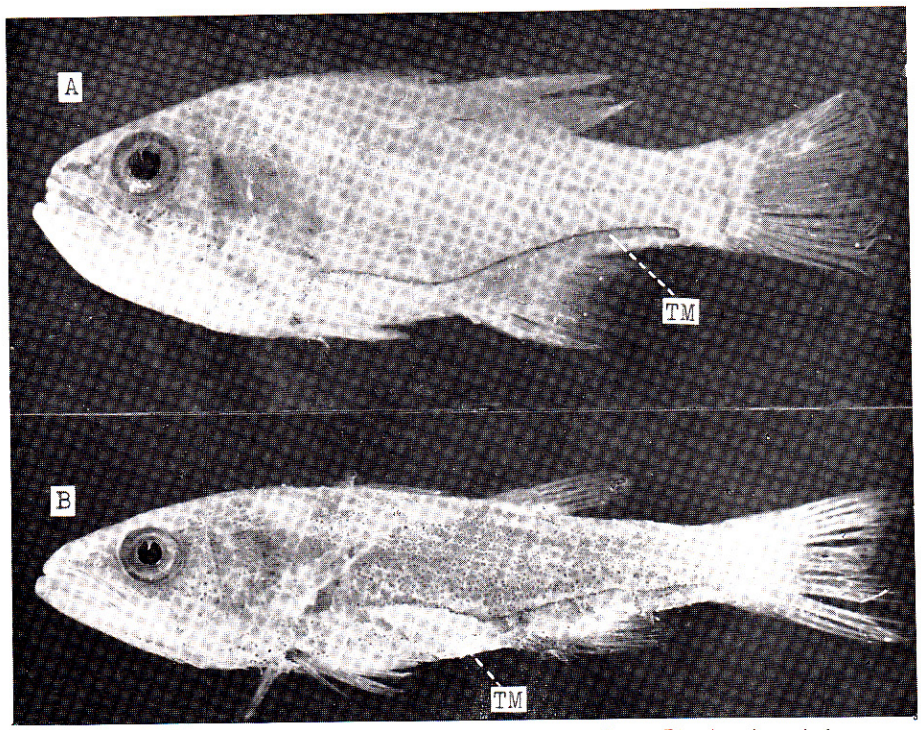

Fig. 1. *Adenapogon roseigaster* (A) and *Siphamia cuneiceps* (B), showing their translucent muscle bundles (TM).

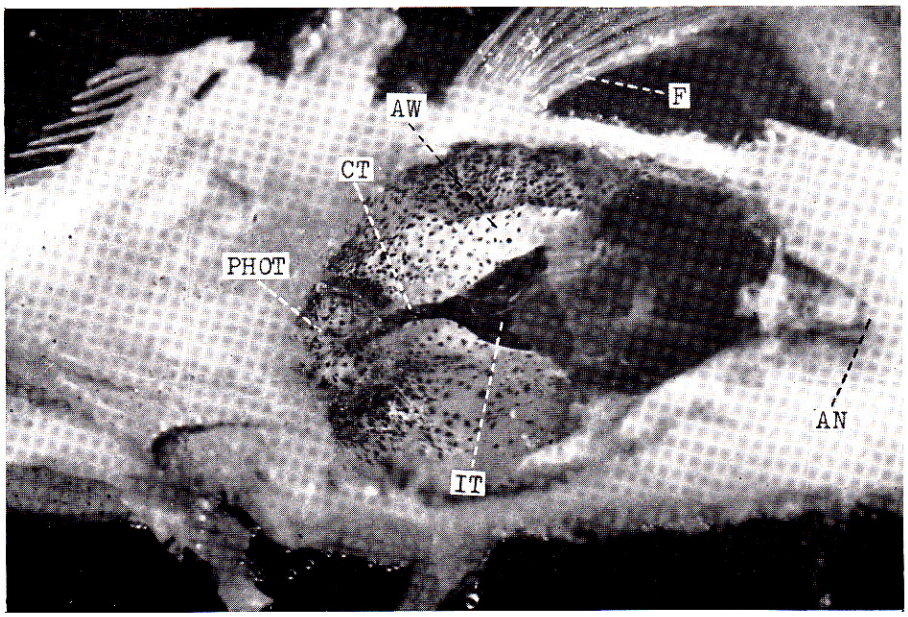

Fig. 2. Abdominal section of *Adenapogon roseigaster*, showing luminous body (PHOT), connecting lube (CT), intestine (IT), abdominal wall (AW), anus (AN) and pelvic fin (F).

抄　　録

Apogonidae の中 *Apogon* 属で，発光器を持つものはツマグロイシモチ *Apogon elliot* がただ一種類で，発光体はウミボタルの発光体とルシフェリン，ルシフェラーゼ反応において交叉反応を持つ化学物質である。*Siphamia* 属ではすべての種類が発光器を持ち，発光器が属の特徴となっている。発光器の内容は共生する発光バクテリアであって，極めて近縁の間において，発光器の構造が根本的に同じで，その発光内容のみが全く異っていることは生物学的に極めて興味ある事実である。1965 年 2 月から 3 月にかけて，プリンストン大学のフランク H. ジョンソン教授，名古屋大学の下村脩助教授とニュージーランドにおいて，日米科学協力事業のもとで，発光生物の研究を行った。帰途，著者はブリスベーンの港湾局の G. G. T. ハリソン氏の好意で同局の研究室に 2 週間滞在，同研究室の標本を調べると同時に，モートン湾のエビ底曳網漁船に便乗，発光魚，発光イカを調べる機会を得た。ここでは Apogonidae 中の 2 種の発光魚について述べる。

Adenapogon roseigaster は Rose bellied siphon fish と呼ばれ，体長 50～60 mm (尾鰭の基部まで) の腹面のバラ色の銀白色のイシモチで，発光器の構造は基本的には，*Siphamia* 属のものと同様で，胸部筋肉中にある楕円形の発光体と胸部竜骨筋，胸部，腹部の筋肉が半透明乳白色で発光体の光を拡散させ，体の腹面全体を一様に光らせる言わば発光器官の一部と見なし得る腹面の筋肉とからなっている。発光体は細い毛細管で消化管と連絡している。外形的にはこの半透明の筋肉の組織が *Siphamia* よりもくっきりと，区別されやすく，この種の発光器を知っている者には，ただちに本魚が発光魚であることが了解される。

Siphamia cuneiceps は他の *Siphamia* とは形態が異って，体長わずかに 37 mm の細長い形態をし，発光器の構造は他の *Siphamia* 属の魚と同様であるが，腹面の半透明の筋肉が他の筋肉とくっきりと区別がつき，*Adenapogon* と同様に発光魚であることがただちに了解される。両種共に発光器よりの発光バクテリアの培養試験を行う機会を得なかったが *Siphamia versicolor* と発光器の構造は全く同様であり，この両種の発光体内に発光バクテリアが共生していることは疑う余地がない。

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