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Report of *Myctophum phengodes* (Teleostei: Myctophidae) with Extraneous Photophores

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A unique specimen of *Myctophum phengodes* (family Myctophidae) from the South Atlantic is reported with three extraneous primary photophores along one side of the dorsal profile; all usual photophore series for this species are present. The supracaudal gland is encircled by a silvery band instead of a simple black band, a condition not observed in other species of *Myctophum* examined. Photophore patterns of myctophids are the primary method of determining species identification. Other myctophids have been found with small positional variations for a single photophore (usually only one side of the body), but are readily identifiable to species. While one specimen with extraneous photophores widely separated from and not part of typical series is not considered taxonomically significant, it is important to determine if this is a single abnormal individual or a unique population identifier.

THE mesopelagic lanternfishes (family Myctophidae) are identifiable to species by unique patterns of lateral and ventro-lateral photophores; standard abbreviations are as follows: OP, opercular; PLO, suprapectoral; PVO, subpectoral; PO, thoracic; VLO, supraventral; VO, ventral; SAO, supralateral; AO, anal (as AO_a + AO_p, anterior + posterior); Pol, posterolateral; Prc, precaudal (Fig. 1). The genus *Myctophum* is defined by the following combination of characters: 2 Prc; 5 PO, level; 4 VO, level; SAO series in a straight or somewhat curved line, with SAO_1 always behind VO_3; and one Pol (Nafpaktitis et al., 1977). No photophores normally occur above the lateral line. The species *M. phengodes* is distinguished from its congeners by having seven or more AO_p, with 3–4 over the anal-fin base, and Prc widely separated, with Prc_2 highly elevated, immediately below the lateral line. *Myctophum punctatum* is most similar in morphology, but can be separated from *M. phengodes* by distribution (North Atlantic and Mediterranean Sea versus south temperate South Atlantic and Indian oceans; Fowler's [1901] North Atlantic record of *M. phengodes* was a misidentified *M. punctatum* [Wisner, 1976]), position of Prc_2 (closer to Prc_1 along the ventral caudal peduncle versus widely separated, at or close to the lateral line), number of supracaudal gland scales (2–4 versus 6–9), and number of infracaudal gland scales (4–5 versus 3–4; Nafpaktitis and Nafpaktitis, 1969; Wisner, 1974; Nafpaktitis et al., 1977).

One of the authors (PD) noted that a specimen of *Myctophum phengodes* collected by the second author (CR) in 2010 with a neuston net had two additional photophores near the dorsal midline along the dorsal-fin base (Fig. 2), prompting a more detailed examination of the species. An additional photophore is on the left side at the anterior end of the supracaudal gland (Fig. 3). These are distinct primary photophores widely separated from the normal photophore series encountered in lanternfish. The presence of primary photophores along the dorsal profile has not been previously recorded in any specimen of *M. phengodes*, nor in any other species of myctophids except *Notolychnus valdiviae* which has three photophores raised up to the dorsal midline that are part of normal series (Kawaguchi and Aioi, 1972; Wisner, 1976; Nafpaktitis et al., 1977; Hulley, pers. comm.). Hulley (1986) has shown for *Triphoturus* that some photophores may vary slightly in position, but not significantly enough to confuse identification. Tamoykin and Trofimov (1986) indicated similar variation in photophore placement for *Myctophum nitidulum*, and suggested that this variation might identify local races of *M. nitidulum*. Wisner (1976) found slight variation in position of the Pol photophore in *M. phengodes* from different ocean basins; no mention was made of any extraneous photophores.

MATERIALS AND METHODS

Five specimens of *M. phengodes* were collected in the South Atlantic Ocean 27–30 November 2010 by the second author (CR) while aboard the RV *Sea Dragon* using a surface Manta trawl and deposited in the Marine Vertebrate Collection (MVC) at Scripps Institution of Oceanography (SIO). Standard length in mm is used unless otherwise stated.

Myctophum phengodes: SIO 12-3077, 1, 76 mm, 34°08.9′S, 15°11.2′W; SIO 12-3078, 1, 72 mm, 34°12.3′S, 15°17.4′W; SIO 12-3079, 1, 76 mm, 33°07.1′S, 12°00.5′W; SIO 12-3080, 1, 75 mm, 32°10.4′S, 08°55.5′W; SIO 12-3081, 1, 78 mm, 32°43.9′S, 04°12.0′W. All five specimens are males, based on the presence of supracaudal gland and absence of infracaudal gland, the latter found only in females of the species.

The specimens of *Myctophum phengodes* were examined with a Wild stereomicroscope and photographed with a Canon A490 digital camera. Specimens of several species of *Myctophum* from the MVC at SIO were also examined for the presence of any extraneous photophores: *M. affine*, *M. asperum*, *M. aurolaternatum*, *M. brachygnathum*, *M. nitidulum*, *M. obtusirostre*, *M. phengodes*, *M. selenops*, and *M. spinosum*; specimens of *M. orientale*, *M. fissunovi*, *M. imperceptum*, *M. lunatum*, and *M. punctatum* were unavailable for examination. Specimens of *Hygophum proximum* and *H. reinhardtii* were examined as comparison within the same subfamily Myctophinae.

Since only one specimen has extraneous photophores, no histological examination was done.

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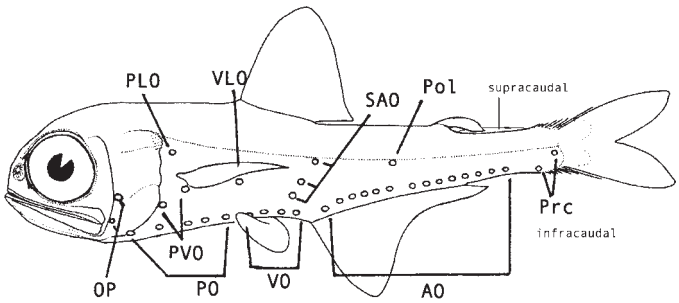

Fig. 1. *Myctophum phengodes* (Lütken) showing photophore distribution. Supracaudal gland (males only) dorso-posterior to adipose fin, and infracaudal gland (females only) ventro-posterior to anal fin. From Nafpaktitis and Nafpaktitis (1969:27, fig. 28).

RESULTS

During collection all specimens identified as *Myctophum phengodes* were abraded by the Manta trawl, mainly losing scales and skin. However, the primary photophores were still present and allowed for species identification. One specimen (SIO 12-3079) has three distinct photophores on the left side of the fish at the base of the dorsal fin. One photophore is approximately at the midpoint of the dorsal-fin base directly above the SAO_1. The second photophore, approximately 4 mm posterior, is just posterior to the end of the dorsal fin, approximately directly over the SAO_3. The third photophore is at the anterior end of the supracaudal gland. No corresponding photophores are present on the right side. All ventro-lateral photophore series agree with descriptions of *M. phengodes*: PO 5, level; VO 4, level; SAO 3, in straight line with VO_3; Pol one; $AO_a + AO_p$ 7 + 8 = 15; Prc 2, separated, with Prc_2 at or near lateral line. None of the other specimens of *M. phengodes* collected with SIO 12-3079 has any primary photophores above the lateral line nor do any of the other myctophids examined; SIO 12-3081 has a remnant of what might be a scale pocket on the right side of the dorsal fin.

The supracaudal gland of all examined sepecimens of *M. phengodes* is bordered by a thin silver band. Each individual scale of the supracaudal gland is outlined in a simple black band along the posterior edge (Fig. 3). In *Myctophum obtusirostre* (SIO 80-275) the supracaudal gland is bordered by a bronze-tinted band. All other species of *Myctophum* and the species of *Hygophum* examined have only a narrow black band outlining the gland.

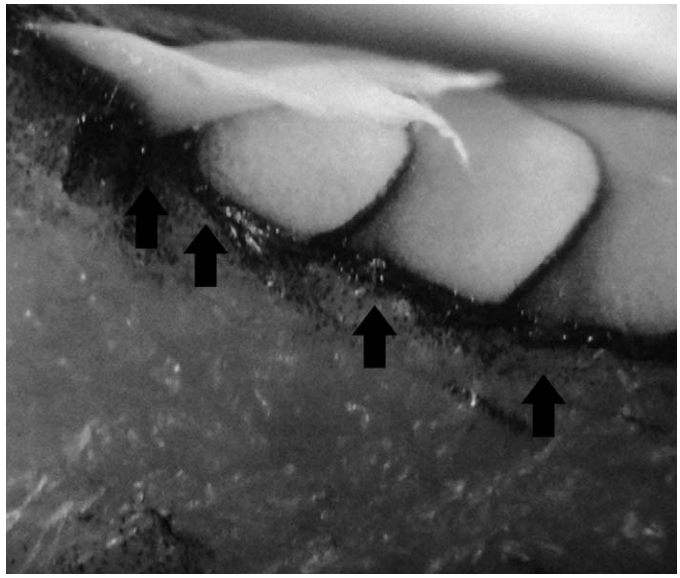

Fig. 3. Supracaudal gland of *Myctophum phengodes* (SIO 12-3079). Arrows indicate some secondary photophores.

DISCUSSION

The specimen (SIO 12-3079) has normal photophore counts and positions for *M. phengodes* in the taxonomically important series. All other specimens of *M. phengodes* collected at the same time also had normal photophore counts and positions. The skin of all specimens had heavy net-abrasion. Detection of scale pockets was impossible; however, one specimen (SIO 12-3081) had a tantalizing suggestion of a possible lost photophore on the right side of the dorsal fin. In isolation, and based on only one specimen, we do not consider these extraneous dorsal photophores taxonomically significant. Photographs of the specimen were sent to Dr. P. A. Hulley for examination. He indicated that he has no record in his notes or specimens available of any such photophores (pers. comm.) and encouraged publication of this anomaly.

These extraneous photophores are not considered secondary photophores based on their large size and the absence of any secondary photophores on the body of other specimens of *M. phengodes*. Because of the limited number of extraneous photophores, no histological work was done. A silvery band surrounds the supracaudal gland (Fig. 3) of all specimens of *Myctophum phengodes* examined.

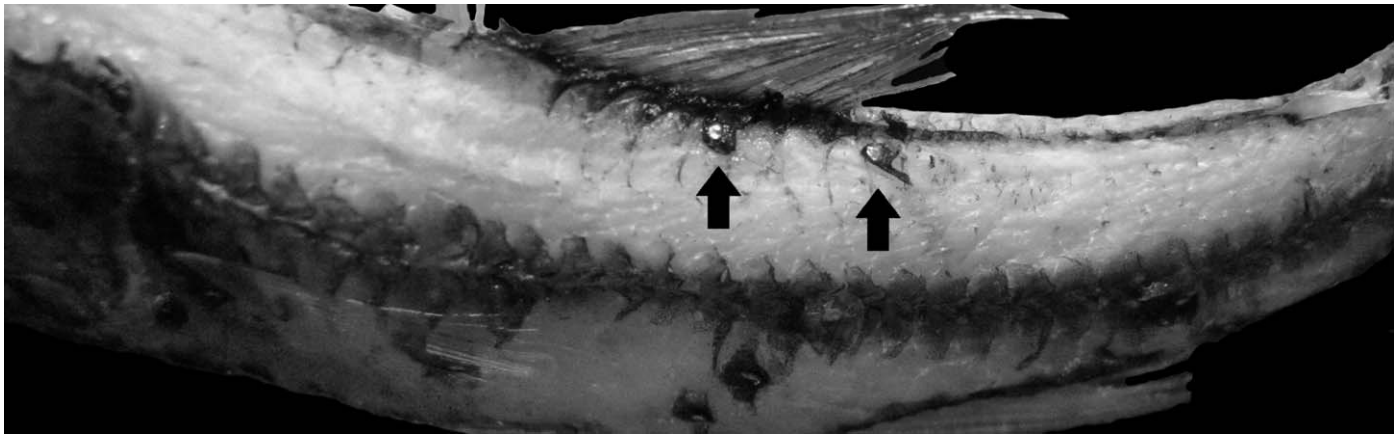

Fig. 2. *Myctophum phengodes* (SIO 12-3079). Arrows indicate two extraneous photophores on dorsal profile, left side, at base of dorsal fin.

In myctophids the absence of photophores commonly occurs from net damage during collection, but additional primary photophores are an unheard of phenomenon. The presence of the extraneous photophores on the specimen (SIO 12-3079) may just be an aberration. Or it may be a genetic anomaly in the South Atlantic population of *M. phengodes*. Examination of further material hopefully will provide a more definitive answer.

MATERIAL EXAMINED

Hygophum proximum: SIO 77-228, 45, 15–58.5 mm, 1 male, 05°53′S, 114°48′W.

Hygophum reinhardtii: SIO 77-224, 14, 27–63 mm, 4 males, 00°02′N, 127°51′W.

Myctophum affine: SIO 55-252, 25, 41–68 mm, 7 males, 4 females, 00°03′N, 83°29′W; SIO 57-85, 2, 55.5–58 mm, 1 male, 1 female, 28°50′N, 126°00′W; SIO 63-691, 16, 31–51 mm, 5 males, 7 females, 39°28′N, 69°30′W.

Myctophum asperum: SIO 86-96, 35, 22–68 mm, 3 males, 1 female, 00°44′S, 149°46′W; SIO 86-97, 31, 21–66 mm, 17 males, 9 females, 03°38′S, 149°56′W; SIO 98-220, 21, 20–56 mm, 8 males, 00°03′N, 145°05′W.

Myctophum aurolaternatum: SIO 58-207, 1, 92 mm, male, 18°11′N, 106°55′W; SIO 75-310, 35, 22–96 mm, 2 males, 1 female, 02°02′S, 119°42′W; SIO 77-229, 8, 20–106 mm, 2 males, 02°44′S, 111°57′W; SIO 98-300, 1, 102 mm, female; 01°52′N, 157°20′W; SIO 06-295, 1, 90 mm, 1 female, 05°00.6′N, 113°35.4′W.

Myctophum brachygnathum: SIO 71-71, 3, 16–73 mm, 1 male, 10°10.0′S, 41°53.7′E; SIO 98-185, 1, 52 mm, male, 21°26′N, 158°31′W; SIO 99-7, 24, 25–68 mm, 5 males, 6 females, 03°52′N, 159°20′W.

Myctophum lychnobium: SIO 60-269, 4, 39–99 mm, 1 male, 2 females, 15°04.5′N, 156°12.5′W; SIO 73-26, 4, 77–83 mm, 2 males, 2 females, 05°48′S, 111°29′W; SIO 76-23, 4, 71–100 mm, 3 males, 1 female, 33°08′N, 118°19.8′W; SIO 12-3064, 1, 101 mm, 1 male, 14°55′N, 146°35′E.

Myctophum nitidulum: SIO 57-85, 3, 17–72 mm, 2 males, 28°50′N, 126°00′W; SIO 95-181, 1, 74 mm, 31°11′N, 159°08′W; SIO 03-179, 19, 14–56 mm, 10 males, 3 females, 00°17.5′S, 81°53.6′W; SIO 12-69, 2, 65–71 mm, 1 male, 1 female, 30°59′N, 122°36′W.

Myctophum obtusirostre: SIO 80-275, 1, 50.5 mm, 25°14′N, 144°41′W; SIO 98-133, 1, 68 mm, male, 02°40′S, 174°56′E; SIO 98-157, 3, 58–75 mm, 2 males, 1 female, 21°30′N, 150°00′W; SIO 04-19, 1, 85.5 mm, male, 20°30′N, 157°10′W.

Myctophum phengodes: SIO 58-280, 1, 43 mm, 21°19.0′S, 79°09.5′W, male; SIO 61-75, 1, 21 mm, sex unknown, 29°48.0′S, 73°49.7′E; SIO 61-76, 1, 29.5 mm, sex unknown, 30°50.0′S, 73°12.5′E; SIO 63-540, 1, 15 mm, sex unknown, 32°26.7′S, 8°49.0′E; SIO 63-1016, 1, 26 mm, female, 23°43.0′S, 82°37.0′W; SIO 65-642, 1, 18.0 mm, sex unknown; SIO 72-312, 1, 21.1 mm, sex unknown, 25°10.9′S, 155°00.9′W; SIO 75-634, 1, 24 mm, male, 25°30.4′S, 155°24.1′W.

Myctophum selenops: SIO 72-321, 1, 77.5 mm, male, 19°10.0′S, 150°10.8′W; SIO 73-103, 1, 67 mm, male, 21°20–30′N, 158°20–30′W; SIO 73-336, 1, 55.8 mm, male, 28°28.3′N, 155°23.1′W; SIO 75-522, 1, 68 mm, male, 21°25′N, 158°25′W; SIO 76-166, 1, 57 mm, male, 14°14′S, 150°54′E; SIO 80-175, 2, 48.5–59.5 mm, 2 males, 21°24′N, 158°18′W.

Myctophum spinosum: SIO 98-162, 5, 19–104 mm, 1 male, 1 female, 19°30′N, 150°00′W; SIO 12-3065, 2, 107–112 mm, 1 male, 1 female, 23°02′N, 161°31′W; SIO 12-3070, 1, 89 mm, male, female, 26°33′N, 170°30′W.

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LITERATURE CITED

Fowler, H. W. 1901. *Myctophum phengodes* in the North Atlantic. Proceedings of the Academy of Natural Sciences, Philadelphia 53(3):620–621.

Fujii, E. 1984. Myctophidae, p. 64–75. *In*: The Fishes of the Japanese Archipelago. H. Masuda, K. Amaoka, C. Anaga, T. Uyeno, and T. Yoshino (eds.). Tokai University Press, Tokyo.

Hulley, P. A. 1986. A taxonomic review of the lanternfish genus *Triphoturus* Fraser-Brunner, 1949 (Myctophidae, Osteichthyes). Annals of the South African Museum 97:71–95.

Kawaguchi, K., and K. Aioi. 1972. Myctophid fishes of the genus *Myctophum* (Myctophidae) in the Pacific and Indian Oceans. Journal of the Oceanographical Society of Japan 28:161–175.

Nafpaktitis, B. G., R. H. Backus, J. E. Craddock, R. L. Haedrich, B. H. Robison, and C. Karnella. 1977. Family Myctophidae. Memoirs of the Sears Foundation for Marine Research 1(7):13–265.

Nafpaktitis, B. G., and M. Nafpaktitis. 1969. Lanternfishes (family Myctophidae) collected during Cruises 3 and 6 of the R/V *Anton Bruun* in the Indian Ocean. Bulletin of the Los Angeles County Museum of Natural History 5:1–79.

Tamoykin, N. Y., and A. G. Trofimov. 1986. Identification and description of local races based on the arrangement and number of photophores in *Myctophum nitidulum*. Journal of Ichthyology 26:131–137.

Wisner, R. L. 1976. The taxonomy and distribution of lanternfishes (family Myctophidae) of the eastern Pacific Ocean. NORDA Report 3:1–229.