

## A New Lanternfish, *Diaphus kuroshio* (Family Myctophidae), from the Kuroshio Waters off Japan

Kouichi Kawaguchi and Basil G. Nafpaktitis

(Received June 10, 1978)

**Abstract** A new lanternfish, *Diaphus kuroshio*, is described. This species is readily distinguished from its close relatives, *D. aliciae*, *D. mollis* and *D. fulgens*, in having higher total gill-raker counts of 22~25 (17~20 in its relatives). *D. kuroshio* is abundant in the Kuroshio Waters off Japan, extending its distribution to the adjacent warm waters.

### *Diaphus kuroshio*, sp. nov.

New Japanese name: Kuroshio-hadaka  
(Figs. 1 and 2)

Holotype: ZUMT (Department of Zoology, University Museum, University of Tokyo) 54126; female, 61.5 mm in standard length; cruise KH 77-2, sta. 18, 31°24.1'N, 136°52.4'E, July 11, 1977, IKMT-10 ft., 3000 m wire out (net depth, 0~770 m).

Paratypes: ORI (Ocean Research Institute, University of Tokyo) -1394-1~7; males 4 (59.5~61.5 mm SL), females 3 (61.5~62.0 mm SL); cruise KT71-6, sta. 27-1, 34°52.2'N, 138°35.2'E, May 29, 1971, IKMT-6ft, 400 m wire out (0~150 m). ZUMT 54127~54130; males 3 (57.5~60.5 mm SL), female 1 (63.5 mm SL); cruise KT67-1, sta. 207, 35°09.3'N, 139°16.8'E, January 18, 1967, ORI-net, 2000 m wire out (0~750 m). ORI-1127 to 1132, 1147, 1148 and 1281 to 1289; 17 (58.5~64.5 mm SL); KT64-4, sta. 1, 35°06.9'N, 139°20.7'E, March 24, 1964, IKMT-10 ft., 600 m wire out (0~300 m).

### Diagnosis

The high total gill-raker counts, 22~25, easily distinguish *D. kuroshio* from its close relatives *D. aliciae* Fowler 1934 (17~20), *D. mollis* Tåning 1928 (17~19) and *D. fulgens* (Brauer) 1904 (17~20). *D. kuroshio* further differs from *D. mollis* in having slender gill rakers in stead of short, broad-based ones, and from *D. fulgens* by its larger mouth (20.2~21.7% of standard length vs. 16.3~17.1% in *D. fulgens*).

### Description

The following counts are based on the holotype and 37 specimens, including 28 paratypes (counts for the holotype followed by the range in parentheses): D. 13(12~14); A. 13(12~13); P. 11(10~12); gill rakers on first arch 7(7~8)+1+15(14~16), total 23(22~25). AO 5(5~6)+4(3~5), total 9(8~10); lateral line organs 34(34~35).

Snout round and short; 2.2~2.5 in eye diameter. Mouth large; length of upper jaw 1.4~1.5 in head length. Eye large; its horizontal diameter 2.1~2.3 in length of upper jaw and 3.0~3.4 in head length.

Operculum truncate to slightly emarginate posteriorly, rounded posterodorsally. Origin of dorsal fin about over base of ventral fin. Origin of anal fin 1/4~1/5 of length of base of this fin behind vertical through end of base of dorsal fin. Pectoral fin not reaching base of ventral fin. Ventral fin barely reaching origin of anal fin. Length of anal-fin base 1.2 to 1.3 in length of dorsal-fin base.

Proportionality data, expressed in percent of standard length (arithmetic means are followed by extreme values in parentheses) and based on 37 specimens, 51.5~67.5 mm SL: head length 30.6 (29.2~31.9); eye diameter 9.7 (9.3~10.2); upper jaw length 21.1 (20.2~21.7); body depth at vertical through base of pectoral fin 23.6 (21.9~24.7); least depth of caudal peduncle 10.6 (9.7~11.8); tip of snout to: origin of dorsal fin 46.2 (44.2~48.0), base of ventral fin 45.4 (44.2~47.8), base of pectoral fin 30.5 (28.8~32.4), origin of anal fin 66.1 (64.7~67.5), anterior end of base of adipose fin 79.5 (77.0~82.0); length of base

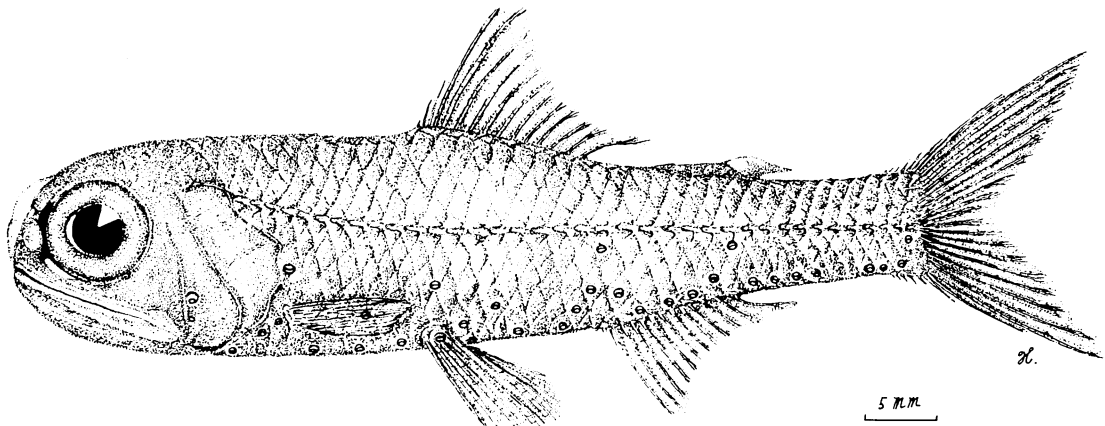


Fig. 1. *Diaphus kuroshio*, sp. nov. Adult female with immature ovary, 63.5 mm SL, Cat. No. ZMUT 54128, one of paratypes.

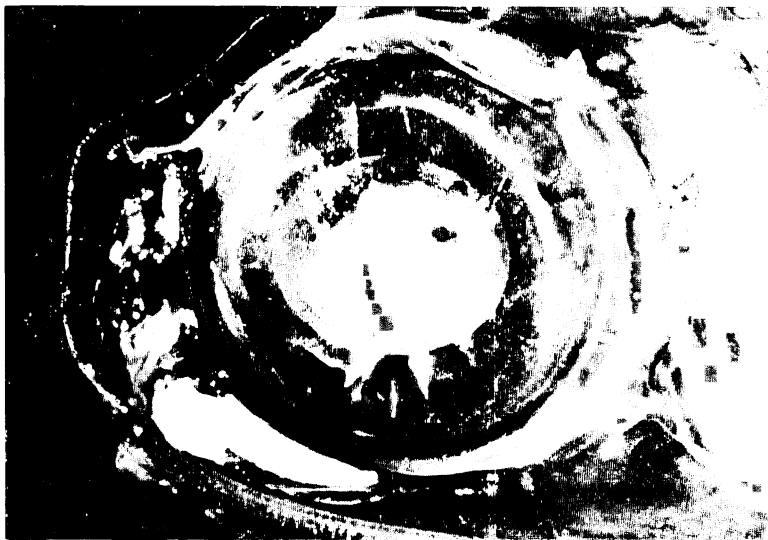


Fig. 2. Sexually dimorphic Vn along anteroventral margin of orbit in adult male of *Diaphus kuroshio*.

of dorsal fin 18.7 (17.8~19.9); length of base of anal fin 15.0 (13.9~16.0).

Luminous organs: Dn round, directed forward, deeply recessed in a cup-shaped structure, its diameter equal to half that of nasal rosette or slightly larger. Vn sexually dimorphic; in adult males occupying space bordered by anteroventral margin of orbit, ventral margin of nasal organ and premaxillary, tapering posteriorly to a point just in front of So; same organ in females and juveniles small, at anteroventral margin of orbit, its length more than twice that of distance between its posterior end and So. So smaller

than PLO and on or slightly behind vertical through center of orbit.

PLO closer to base of pectoral fin than to lateral line. VLO midway between lateral line and base of ventral fin or somewhat lower. SAO series usually slightly angular; SAO<sub>1</sub> closer to VO<sub>3</sub> than to SAO<sub>2</sub>; SAO<sub>2</sub> closer to SAO<sub>1</sub> than to SAO<sub>3</sub>; SAO<sub>3</sub> above origin of anal fin and 1.5~2 times its own diameter below lateral line. First AOa abruptly elevated, its position variable, but always a little lower than SAO<sub>2</sub>; last AOa elevated, about at level of SAO<sub>2</sub>. Pol 1.5~2 times its own diameter below lateral line.

AOp behind base of anal fin. Prc interspace progressively wider; Prc<sub>4</sub> about its own diameter below lateral line.

A small luminous scale at PLO, its vertical diameter 1~1.5 times as large as that of PLO.

Body color: Body color black with bluish tint in fresh or alive specimens, turning light brown in preserved ones. Lateral-line scales forming a silver band in freshly caught, intact specimens.

Size: A medium-sized myctophid fish, reaching a size of about 70 mm SL. Ripe females were rarely found in the study material, but one ripe female, 66 mm SL, was collected in Suruga Bay.

#### Remarks

*Diaphus kuroshio* shares many characters with Form R-1, Form R-2 and Form R-3 of the *Diaphus rafinesquii* species complex of Wisner (1976). Meristic and other characters such as position of PLO, VLO and SAO show no significant differences separating this species from the three forms. However, *D. kuroshio* and the three forms differ in the distance between a vertical through the end of the base of the dorsal fin and the origin of the anal fin, and in the size of the luminous scale at the PLO. At present we are uncertain whether or not these differences warrant a specific distinction of all four forms involved. Current studies on geographic variation of these and other related forms of the large, complex genus *Diaphus* will hopefully resolve this issue.

#### Distribution

*Diaphus kuroshio* commonly occurs in the Kuroshio Waters between 25°N and 40°N and is one of the most dominant species of the genus *Diaphus* off Japan. Its range, which extends as far east as 180° in the Kuroshio Extension and the North Pacific Current areas, overlaps with those of the three forms of the *Diaphus rafinesquii* complex reported by Wisner (1976). The species also occurs in Sagami and Suruga Bays off central Japan and is often stranded on the beach of Miho

Key in Suruga Bay.

#### Acknowledgments

We are greatly indebted to the following people. Dr. Tadashi Kubota, Tokai University and Mr. Eiichi Fujii, Nippon Luther Shingaku Daigaku, kindly offered the information on the stranded specimens on the beach of Miho Key and allowed examination of these materials. Miss Hiroko Shimizu, Ocean Research Institute, University of Tokyo, made a fine drawing.

#### Literature cited

- Brauer, A. 1904. Die Gattung *Myctophum*. Zool. Anz., 28(10): 377~404, figs. 1~9.  
 Fowler, H.W. 1934. Descriptions of new fishes obtained 1907 to 1910, chiefly in the Philippine Islands and adjacent seas. Proc. Acad. Nat. Sci. Philadelphia, 85: 233~367, figs. 1~177.  
 Tåning, A.V. 1928. Synopsis of the scopelids in the North Atlantic. Vidensk. Meddr. Dansk Naturh. Foren., 86: 49~69, figs. 1~2.  
 Wisner, R.L. 1976. The taxonomy and distribution of lanternfishes (Family Myctophidae) of the eastern Pacific Ocean. US Navy Ocean Research Development Activity (NORDA), Report 3: 1~229, figs. 1~208.  
 (KK: Ocean Research Institute, University of Tokyo, 1-15-1, Minamidai, Nakano-ku, Tokyo 164, Japan; BGN: Department of Biological Sciences, University of Southern California, University Park, Los Angeles, California 90007, U.S.A.)

#### 黒潮とその周辺海域に広く分布するハダカイワシ科の新種クロシオハダカ

川口 弘一・Basil G. Nafpaktitis

黒潮とその周辺海域に広く分布するハダカイワシ属 *Diaphus* の新種を *D. kuroshio* (和名クロシオハダカ) として記載した。記載種は, *D. alliciae*, *D. mollis* および *D. fulgens* (コビトハダカ) の近似種であるが, 鰓耙数などにより明瞭に区別出来る。本種は従来 *D. fulgens* として報告されてきた可能性が大いにある。両種はともに黒潮域に出現する互いに別の種である。

(川口: 東京都中野区南台 1-15-1, 東京大学海洋研究所; Nafpaktitis: 南カリフォルニア大学, ロスアンジェルス, カリフォルニア, USA).