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Notes on a rare deep-sea eelpout, *Melanostigma orientale*, from Tosa Bay, southern Japan (Perciformes, Zoarcidae)

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Abstract: A single, 106.1 mm total length female specimen of the deep-sea zoarcid fish species, *Melanostigma orientale*, trawled from Tosa Bay was compared with the holotype and two hitherto unrecorded specimens from unknown localities. This species has been represented by only four specimens collected in Suruga Bay and Sagami Bay, central Japan. The following intraspecific variation in meristic counts of *M. orientale* were confirmed: 18−20+73−90=93−110 vertebrae, 86-95 dorsal fin rays, 73-80 anal fin rays, 7-8 pectoral fin rays, 8-9 caudal fin rays and 12-16 rakers on the first gill arch. The specimen from Tosa Bay possesses 110 total vertebrae, 90 caudal vertebrae, 95 dorsal and 80 anal fin rays, 7 pectoral fin rays, 16 rakers on the first gill arch, and large and slightly recurved anterior jaw teeth which differ from those of the holotype and additional specimens.

Key words: *Melanostigma orientale*, Deep-sea zoarcid, Tosa Bay, Intraspecific variation

INTRODUCTION

Fishes of the family Zoarcidae, commonly known as eelpouts, are broadly distributed in tropical seas to the Arctic and the Antarctic regions (Anderson, 1994). Hatooka (1993) reported 64 eelpout species comprising 22 genera from Japanese waters. Of these, *Petroschmidtia albonotata* and *P. toyamensis* are presently considered to be members of *Lycodes*, and *Allolepis hollandi* should be transferred to the genus *Bothrocara* (Anderson, 1994). In addition, *Derjuginia japonica* is a junior synonym of *D. ochotensis* (Anderson, 1994). Machida and Ohta (1996) first recorded the occurrence of *Taranetzella lyoderma* from Suruga Bay, central Japan. Currently, 64 species and 21 genera of this family are known in the waters around Japan.

The deep-sea species, *Melanostigma orientale* Tominaga, 1971, has been considered to be endemic to Japan (Tominaga, 1971; Hatooka, 1993; Anderson, 1994). This species was described on the basis of three specimens collected from the depths of Sagami Bay and Suruga Bay, though Anderson (1994) noted the presence of four *M. orientale* individuals from these localities, indicating the presence of a single non-type specimen. In 1988, a single specimen of this species was trawled from Tosa Bay, southern Japan, by the R/V Kotaka Maru of the Nansei National Fisheries Research Institute. In addition, we had an opportunity to examine two unknown locality specimens of *M. orientale* deposited in the Department of Zoology, University Museum, University of Tokyo (ZUMT). Subsequent study of the fish revealed that this species exhibited remarkable intraspecific variation in some important meristic characters and dental morphology. Therefore, we herein report our specimen in some detail.

Methods for measuring and counting generally followed Hubbs and Lagler (1958), and terminology of the cephalic sensory pores followed Anderson (1994). Counts for vertical fin

rays and vertebrae including urostyle were taken from radiographs. The specimen is deposited in the fish collection of the Department of Biology, Faculty of Science, Kochi University (BSKU).

Melanostigma orientale Tominaga, 1971
(Japanese name: Konnyaku-hadaka-genge)

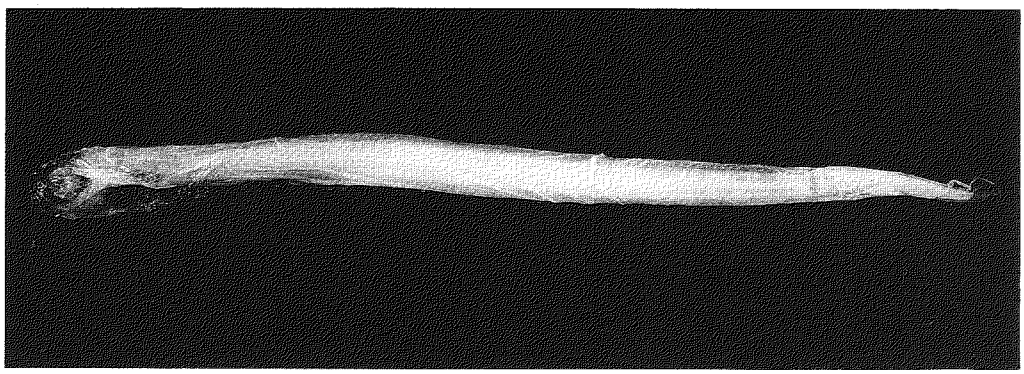

Fig. 1. *Melanostigma orientale*, BSKU 44840, 106.1 mm TL, from Tosa Bay.

Melanostigma orientale Tominaga, 1971: 151 (original description); Hatooka, 1993: 909; Anderson, 1994: 38.

Material examined. BSKU 44840, 106.1 mm total length (TL), female with ripened eggs, 32°59'19"N, 133°35'52"E, Tosa Bay, southern Japan, 700-720m, otter trawl, R/V Kotaka Maru, 21 Jun. 1988.

Comparative material. Three *M. orientale* specimens: ZUMT 52454, holotype, 127.3 mm TL, probably male *, Sagami Bay, 26 Jan. 1968; ZUMT 60906-60907, two specimens, 72.9-81.0 mm TL, sex unknown, localities and date unknown. [*after Tominaga (1971)]

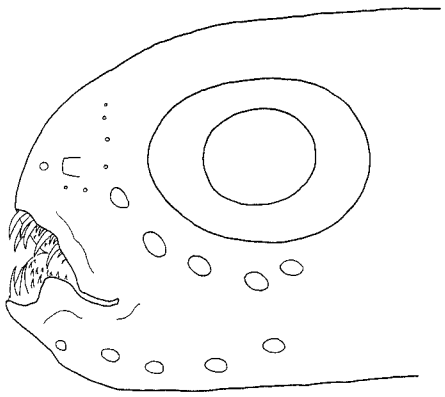

Fig. 2. Anterior part of head of *Melanostigma orientale*, BSKU 44840. Scale = 5 mm.

Description. Counts and measurements are given in Table 1.

Body elongate (Fig. 1), subcylindrical before pectoral fin base, compressed posteriorly. Mouth oblique, small, the gape not reaching to a vertical from anterior margin of orbit (Fig. 2). Nostril single in each side, with a short tube. Eye large, covered with transparent spectacle. Gill opening small, pore-like, situated just above pectoral fin base. Suborbital canal running along lower border of eye from behind nasal tube to posterior margin of iris. Preoperculomandibular canal running from behind mandibular symphysis to below last suborbital pore. Occipital pore absent. Jaw teeth conical, movable, arranged in irregular rows. Anterior teeth in jaws enlarged, sharp-pointed (Fig. 2). Teeth present on vomer and palatines. Dorsal

Table 1. Comparison of *Melanostigma orientale* specimens

	BSKU 44840	ZUMT 60906	ZUMT 60907	ZUMT 52454	ZUMT 52455* NMC 71-208*
Locality	Tosa Bay	unknown	unknown	Sagami Bay	Suruga Bay
Type status				Holotype	Paratypes
Sex	♀	probably ♂*			
Total length (mm)	106.1	72.9	81.0	127.3	48.5-52.5
Counts					
Dorsal fin rays	95	89	86	93	94**
Anal fin rays	80	73	73	77	79**
Caudal fin rays	4+4=8	4+4=8	4+4=8	4+5=9	9
Pectoral fin rays	7	8	8	8	8
Branchiostegal rays	6	6	6	6	
Gill rakers on 1st arch	16				12
Nasal pore	1	1	1	1	
Suborbital pores	5	5	5	5	
Preoperculo-mandibular pores	5	5	5	5	
Occipital pore	0	0	0	0	
Vertebrae	20+90 =110	18+75 =93	20+73 =93	18+80 =98	19+80−81 =99−100
In % of TL					
Head length	12.6	13.9	14.1	12.7	13.0-14.1
Predorsal length	15.5	16.7	16.7	15.5	
Snout to anus	32.0	30.5	30.6	28.5	28.6-30.3
In % of head length					
Snout length	17.2	23.8	26.3	24.1	
Head depth	56.7	54.5	61.4	65.4	
Eye diameter	35.8	33.7	28.1	20.0	28.6-29.4
Interorbital width	30.6	33.7	31.6	32.7	

* Tominaga (1971), ** including one-half of caudal fin rays.

fin originating above middle of pectoral fin. Anal fin origin slightly behind anus. Head, body and all fins covered with loose skin. Pelvic fins, scales and lateral line absent.

Color in alcohol: Skin semitransparent without melanophores. Anterior part of head, especially both jaws, dark brown, becoming paler posteroventrally. Areas around mandibular symphysis, gill openings and anus dark brown. Upper part of body with minute, light brown spots. Peritoneum and orobranchial cavity black.

Discussion. The genus *Melanostigma* comprised of seven species is externally characterized by the following characters: 4-5 suborbital pores, gill slit a pore-like opening above pectoral fin, single pair of nasal pores, flesh gelatinous, scales and pelvic fins absent, vomerine and palatine teeth present, and 5-10 pectoral fin rays (Anderson, 1994). It has 18−23+62−81=82−100 vertebrae (Anderson, 1994). BSKU 44840, ZUMT 60906 and ZUMT 60907 were readily identified as a species of *Melanostigma* from their external characters.

Tominaga (1971) considered that *M. orientale*, which was described as the fifth species in the genus, differed from other *Melanostigma* spp. by higher counts of its vertebrae (more than 93) and dorsal and anal fin rays including one-half of caudal rays (more than 92 and 77,

respectively). The number of precaudal vertebrae of the holotype was given as 19 in the original description, though the present study revealed it to be 18. The count of the present material is 20, and those of the two unknown locality specimens are 18 and 20. Parin (1977) described *M. inexpectatum* from the western equatorial Pacific as the sixth species in the genus. This species has 22 + 73 = 95 vertebrae, 95 dorsal and 76 anal fin rays, which include one-half of the caudal fin rays, and 16 gill rakers on the first arch (Parin, 1977). The seventh species in the genus, *M. vitiazi*, was described based on a single specimen taken from the Banda Sea (Parin, 1979). Although *M. vitiazi* possesses 23 + 71 = 94 vertebrae, the presence of a single lateral line in this species is unique in the genus (Parin, 1979; Anderson, 1994). Apparently, *M. orientale* is closely related to *M. inexpectatum* (Anderson, 1994: fig. 54).

The counts of dorsal and anal fin rays including one-half of caudal fin rays are 97 and 82 in the *M. orientale* holotype, and 99 and 84 in BSKU 44840, respectively. These counts are 93 and 77 in ZUMT 60906, and 90 and 77 in ZUMT 60907, respectively. The number of caudal vertebrae of ZUMT 60907 is less than that of the *M. inexpectatum* holotype according to Parin (1977). Although it is impossible to discriminate the four specimens examined in this study from *M. inexpectatum* in the counts of dorsal and anal fin rays, the two are clearly different in the counts of precaudal vertebrae. We, therefore, identified BSKU 44840, ZUMT 60906 and ZUMT 60907 as *M. orientale*. Parin (1977) considered 16 rakers on the first gill arch to be one of the diagnostic characters of *M. inexpectatum*. The count of 16 in BSKU 44840 indicates that the two species are indiscriminate in this character. Parin (1977) also gave the following characters to be diagnostic of *M. inexpectatum*: head small, 9.0 times in TL (=11.1%), preanal distance 2.9 in TL (=34.5%), and eye small, 2.2 times in head length (=45%). We think that it may be difficult to distinguish *M. orientale* from *M. inexpectatum* in the former two morphometirics, and the eye diameter of *M. inexpectatum* is longer than that of *M. orientale*. It is clear that the present species exhibits wider intraspecific variation in the proportional dimensions given in Table 1. Although Grinols (1966) mentioned that morphometric variation of *M. pammelas* were not excessive, our result may suggest the difficulties in discriminating *Melanostigma* species from each other based on morphometric characters.

The counts for vertebrae, 90 caudal and 110 in total, of BSKU 44840 are hitherto unknown large numbers in the genus, i.e. 18 − 23 + 62 − 81 = 82 − 100 (Anderson, 1994). There are few known specimens in each Indo-Pacific *Melanostigma* species (Anderson, 1994). The present finding of intraspecific variation in the vertebral count of *M. orientale* strongly indicates that there is more intraspecific variation in this character in the genus, at least for the Indo-Pacific species. Hatooka (1993) gave the pectoral fin ray count of *M. orientale* to be 11, but his count is erroneous.

Anterior jaw teeth of BSKU 44840 are externally visible. However, anterior upper jaw teeth of the holotype are hidden by the upper lip (Tominaga, 1971: fig. 1). We confirmed this in the holotype (Fig. 3), and there were no discrepancies between the

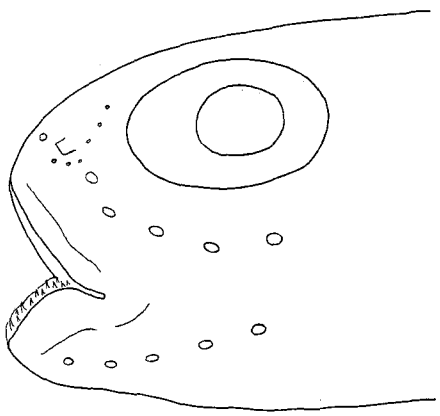

Fig. 3. Anterior part of head of *Melanostigma orientale* holotype, ZUMT 53454, 127.3 mm TL, from Sagami Bay. Scale = 5 mm.

holotype and two ZUMT specimens in this character. Jaw teeth of the four examined specimens are all conical, and posterior teeth are shorter than anterior ones as in *M. pammelas* reported by Yarberry (1965). However, anterior jaw teeth of BSKU 44840 are slightly recurved and clearly longer than those of the holotype and two ZUMT specimens. According to Anderson (1994), jaw teeth of adult males of the genus *Melanostigma* are enlarged and caniniform, and teeth in males are fewer than in females. Unfortunately, we were not able to determine the sex of the three ZUMT specimens, though Tominaga (1971) considered the holotype (127.3 mm TL) probably being male. BSKU 44840 (106.1 mm TL adult female) suggests that enlarged anterior jaw teeth in female *M. orientale* may represent hitherto unknown sexual dimorphism in the genus, or intraspecific variation in *M. orientale*

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