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First Record of the Clariid Catfish, *Clarias fuscus*, from Japan

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Abstract Nine specimens of a clariid catfish, *Clarias fuscus*, which is new to Japan, were collected at Ishigaki Island, the southern Ryukyus. Characteristics of these specimens are described, with special reference to differences among *Clarias fuscus*, *C. batrachus*, and *C. macrocephalus*. Variations of characters are investigated in 28 specimens of *Clarias fuscus* from Japan, Formosa, and Philippines. The diploid chromosome number of the species is 56, and the karyotype is described.

Introduction

The genus *Clarias* is one of the most familiar freshwater catfishes in South East Asia and India (Weber and Beaufort, 1931; Hora, 1936; Smith, 1945). *Clarias fuscus* is distributed to the highest latitude among the genus *Clarias*, and has been recorded from the Asian continent (Lacepède, 1803; Günther, 1864; Nichols, 1943), Formosa (Jordan and Evermann, 1902; Tanaka and Abe, 1955), Philippines (Fowler, 1941; Herre, 1953), and Guam (Fowler, 1928).

On the other hand, *C. fuscus* has been very poorly described since Lacepède (1803) named *Macropteronotus fuscus* on the basis of a Chinese figure, and differences between *C. fuscus* and *C. batrachus* have been left to be obscure.

Recently nine specimens of *Clarias fuscus* (Lacepède) were collected at Ishigaki Island (24°23′N, 124°09′E) in the southern Ryukyus. These specimens constitute the first record of the family Clariidae from Japan. In this

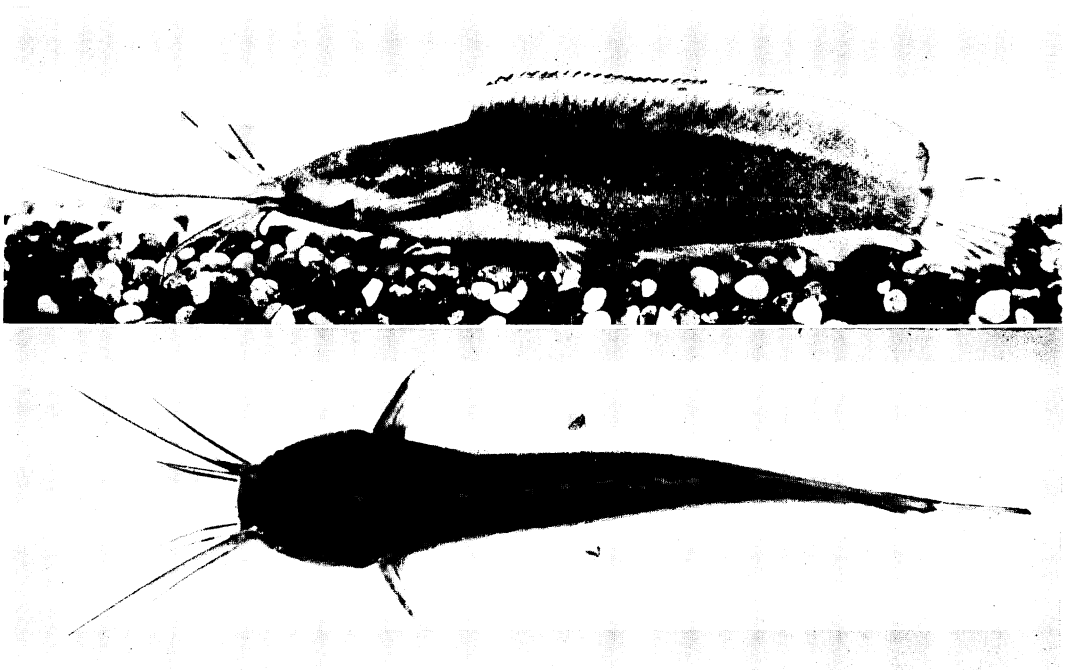

Fig. 1. *Clarias fuscus* (Lacepède) from Ishigaki Island. Upper: in lateral view, 92.0 mm S. L. and lower: in dorsal view, 101.0 mm S. L.

Table 1. Characters of *Clarias fuscus*.

Locality		Japan	Formosa	Philippines
Number of specimens*		9	16	3
Sex (♂+♀)		(0+3)	(1+2)	(0+2)
Total length (mm)		36.2～198.5	76.5～240.0	127.3～208.5
Standard length (mm)		30.9～171.5	66.1～211.5	107.7～182.5
Dorsal rays		57～62	56～62 (rarely 66)	58～63
Anal rays		44～50	43～50	44～47
Pectoral rays		I, 9～10	I, 9～10	I, 9
Ventral rays		6	6	6
Caudal rays		10～11+5～7	9～11+6～7	10～11+6
Vertebrae excluding Weberian apparatus		16+38～39	16+37～40**	16+39～40
Gill-rakers		17～18	17～18	19 (rarely 22)
Branchiostegals		8	8 (rarely 9)	8
% of total length: Body depth		13.0～16.9	13.5～19.7	13.2～15.1
Body width		16.7～19.6	16.2～19.7	17.4～19.8
Head length				
to tip of occipital process		21.8～26.0	21.7～25.5	22.4～23.6
to gill-opening		15.1～20.4	14.7～18.8	14.4～17.7
Length of dorsal fin base		52.6～55.3	51.0～60.6	57.6～58.7
Length of anal fin base		35.8～40.1	36.8～43.3	38.0～41.8
Length of pectoral spine		4.7～ 8.4	5.6～ 7.8	7.2～ 7.9
Length of ventral		7.6～ 9.5	7.4～ 9.6	8.4～ 8.9
Length of caudal		13.6～16.3	9.9～15.2	11.7～13.8
Distance between occipital process and origin of dorsal		5.3～ 6.4	4.1～ 6.3	4.0～ 5.0
Length of nasal barbel	right	16.4～30.7	15.3～26.6	18.7～22.2
	left	15.3～30.1	16.6～27.6	18.0～21.8
Length of maxillary barbel	right	21.2～39.8	22.8～39.8	25.1～31.1
	left	19.9～35.4	23.8～36.8	24.3～33.5
Length of mandibular barbel	right	19.3～31.5	19.3～33.4	21.2～28.4
	left	19.5～32.9	19.0～32.4	21.5～27.0
Length of mental brabel	right	14.6～26.0	16.1～26.5	16.3～22.8
	left	16.5～27.1	15.5～27.8	18.3～21.0
Length of snout		3.0～ 5.2	2.7～ 5.1	2.4～ 4.4
Orbit diameter		1.8～ 3.3	1.4～ 2.2	1.5～ 2.2
Interorbital width		10.1～11.2	10.7～12.8	11.3～11.9
Length of frontal fontanel		3.2～ 5.0	3.5～ 5.6	3.4～ 3.8
Length of occipital fontanel		1.6～ 4.3	1.8～ 4.0	1.5～ 2.3
Width of occipital process		5.5～ 8.5	6.2～ 7.7	6.9～ 8.3
Height of occipital process		2.5～ 4.0	2.8～ 4.3	3.0～ 3.4

* Including specimens in which sex was undetermined.
** In one specimen, 17+40.

paper, characters of *C. fuscus*, *C. batrachus*, and *C. macrocephalus* are compared and variations among specimens of *C. fuscus* from Japan, Formosa, and Philippines are examined.

Material

A specimen, NSMT-P. 17669, 48.7 mm in standard length, 58.2 mm in total length; collected at Nagura River System, Ishigaki I., on March 23, 1973. Eight specimens, NSMT-P. 17670～17677, 30.9～171.5 mm in standard length, 36.2～198.5 mm in total length; Nagura River System, Ishigaki I., on October 19, 1973. Eleven specimens, ZIUT 13534～13541, 18423, 18424 and 23604, 66.1～133.7 mm in standard length, 76.5～151.2 mm in total length; T'ai-pei, Formosa. Two specimens, ZIUT 29780 and 29781, 104.0 and 118.8 mm in standard length, 121.4 and 131.8 mm in total length; T'ain-nan, Formosa. Three specimens, ZIUT 2514, 34321 and 39445, 88.8～211.5 mm in standard length, 101.2～240.0 mm in total length; Formosa. Three specimens, ZIUT 39519～39521, 109.7～182.5 mm in standard length, 127.3～208.5 mm in total length; Philippines. Specimens indicated as "NSMT-P" are deposited in the Department of Zoology, National Science Museum, Tokyo, and specimens marked "ZIUT" are in the Zoological Institute, Faculty of Science, University of Tokyo.

As comparative material, following two species were examined.

Clarias batrachus (Linnaeus): A specimen, IBRP 4520, 64.1 mm in standard length; collected at the Mekong River, near Pakse, Laos, on June 26, 1970. Three specimens, IBRP 4793, 5056 and 5121, 143.5～162.5 mm in standard length; Nam Ngum River, near Tha Ngon, Laos.

Clarias macrocephalus (Günther): Two specimens, NSMT-P. 17667 and 17668, 123.6 and 241.5 mm in standard length; Cantho, South Vietnam. A specimen, IBRP 4712, 122.7 mm in standard length; Mekong River, near Tha Bo, Thailand, on September 14, 1970. Specimens marked "IBRP" are deposited at the Institute for Breeding Research, Tokyo University of Agriculture.

Description

Clarias fuscus (Lacepède), 1803.

D. 56～63 (66 in one specimen); A. 43～50; P. I, 9～10; V. 6; caudal, 9～11+5～7. Vertebrae excluding Weberian apparatus, 16 (17 in one specimen)+37～40; branchiostegals, 8 (9 in one specimen); gill-rakers, 17～19 (22 in one specimen). Values of proportional measurements are shown in Table 1.

Body elongate, depth 5 to 8 in total length. In the following lines, head length is the distance from tip of snout to gill-opening. Head depressed, 5 to 7 in total length, longer

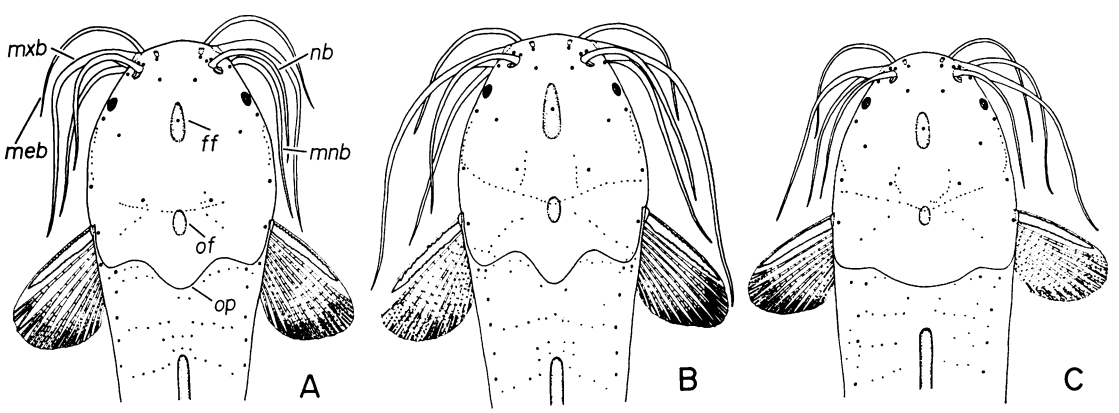

Fig. 2. Dorsal views of head and anterior part of body to commencement of dorsal fin in three species of *Clarias*. A, *Clarias fuscus*, NSMT-P. 17677, 171.5 mm S. L., from Ishigaki Island; B, *C. batrachus*, IBRP 5121, 162.5 mm S. L., from Laos; C, *C. macrocephalus*, NSMT-P. 17667, 241.5 mm S. L., from South Vietnam. mxb, maxillary barbel; meb, mental barbel; nb, nasal barbel; mnb, mandibular barbel; ff, frontal fontanel; of, occipital fontanel; op, occipital process.

than high (Fig. 4). Greatest breadth above opercles 0.9 to 1.2 in head. Occipital process triangular, its height about 2 in its base, more blunt in old specimens (Fig. 2). Occipital fontanel at least two times shorter than frontal fontanel, the latter extending anteriorly to the middle of eyes (Fig. 2). Orbit 6.2 to 11.0 in head, and 3.3 to 7.9 in interorbital width. Snout 3.3 to 3.9 in head. Anterior nostril tubular.

Nasal barbels extend to occipital fontanel, equal in length to mental barbels; maxillary barbels, which are the longest of four kinds of barbels, extend at least to middle of pectorals, and mandibular barbels a little shorter than maxillary ones.

Distance between origin of dorsal and occi-

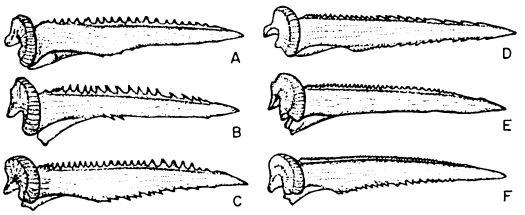

Fig. 3. Pectoral spines in three species of *Clarias*. A, *Clarias fuscus*, NSMT-P. 17676, 122.7 mm S. L., female from Ishigaki Island; B, *C. fuscus*, ZIUT 13540, 109.8 mm S. L., from T'ai-pei; C. *C. fuscus*, ZIUT 39519, 182.5 mm S. L., female from Philippines; D, *C. batrachus*, IBRP 4793, 143.5 mm S. L., male from Laos; E, *C. macrocephalus*, IBRP 4712, 122.7 mm S. L., male from Thailand; F, *C. macrocephalus*, NSMT-P. 17667, 241.5 mm S. L., female from South Vietnam.

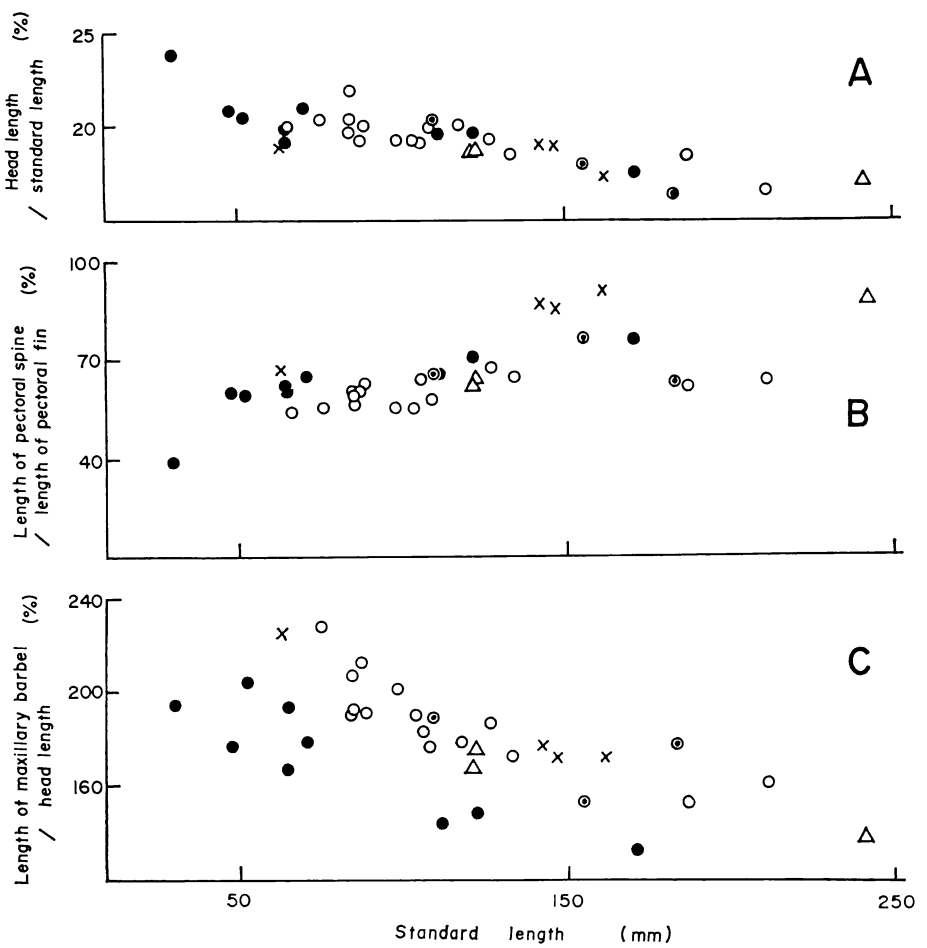

Fig. 4. Comparison of body parts in relation to body length in three species of *Clarias*. *Clarias fuscus*, from Ishigaki Island (●), Formosa (○), and Philippines (⊙); *C. batrachus* (×); *C. macrocephalus* (△). A, head length; B, length of pectoral spine; C, length of maxillary barbel.

pital process 3.9 to 6.3 in the length from tip of occipital process to tip of snout. Caudal rounded, not united with dorsal and anal. Ventrals rounded, extending on anal, about 0.8 in pectorals. Pectorals rounded, a little shorter than head without snout, their spines slightly denticulated on the anterior edge, 1.1 to 2.7 in postorbital part of head (Figs. 3 and 4).

Villiform teeth on the maxillaries in left and right contiguous quadrangular patches, each patch being about twice as broad as long (Fig. 6). Vomerine teeth in a crescentic band as broad as or narrower than the maxillary tooth-band; its hind-border more or less prominent in the middle in specimens from Japan (Fig. 6). Gill-rakers slender, 17 to 19. In only one specimen from Philippines they are 22 (Fig. 5).

Canal pores and pit lines on head: Canal pores distributed sparsely on dorsal and ventral sides of head (Fig. 2). Preoperculomandibular pores traverse the lower jaw and preopercle. Supraorbital canal pores open between right and left nostrils and at interorbital space; an interorbital pore at frontal fontanel. Infraorbital canal pores present near the base of nasal barbel. (Names of sensory canal system are referred to Taylor, 1969.)

Body color in life: Dark brown above, belly and underside of head light. Transverse rows of white spots along side of body (Fig. 1.)

Karyotype

A specimen from Ishigaki Island, 122.5 mm in total length, other than those examined for description, was used for chromosome observation. The method of chromosome preparation is the same as that of Arai and Katsuyama (1973). Classification of chromosomes follows Levan et al. (1964).

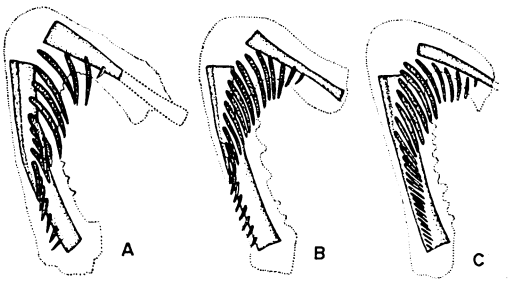

Fig. 5. Gill-rakers in three species of *Clarias*. A, *Clarias fuscus*, NSMT-P. 17676, 122.7 mm S. L., from Ishigaki Island; B, *C. batrachus*, IBRP 4793, 143.5 mm S. L., from Laos; C, *C. macrocephalus*, IBRP 4712, 122.7 mm S. L., from Thailand.

Chromosome figures of 12 epithelial cells of the gill were observed. As shown in Fig. 7, the diploid number of chromosomes is 56, and includes many metacentrics and submetacentrics. The karyotype of *Clarias fuscus* differs from that of *C. batrachus* in diploid number as well as in chromosome morphology, i. e., 2n=56 in *C. fuscus*, and 2n=52 in *C. batrachus* (see Srivastava and Das, 1968). No large metacentrics in *C. fuscus*, were found.

Remarks

As shown in Table 2, *Clarias fuscus* closely resembles *C. batrachus*, but differs from the latter in the following points: (1) vertebrae

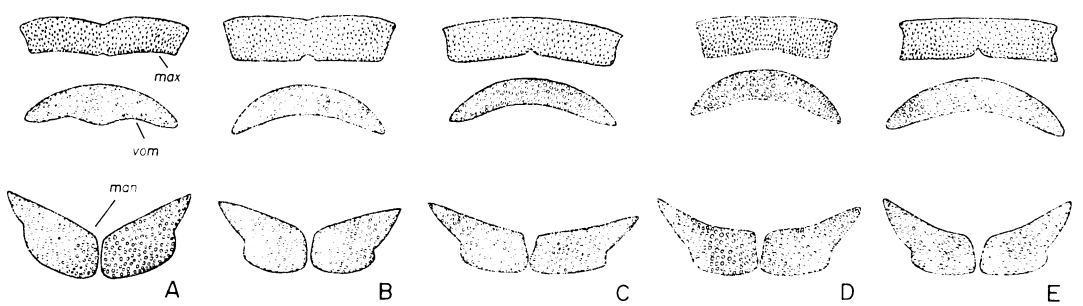

Fig. 6. Comparison of dentition in three species of *Clarias*. A, *Clarias fuscus*, NSMT-P. 17676, 122.7 mm S. L., from Ishigaki Island; B, *C. fuscus*, ZIUT 13540, 109.8 mm S. L., from T'ai-pei; C, *C. fuscus*, ZIUT 39519, 182.5 mm S. L., from Philippines; D, *C. batrachus*, IBRP 4793, 143.5 mm S. L., from Laos; E. *C. macrocephalus*, IBRP 4712, 122.7 mm S. L., from Thailand. max, maxillary teeth; vom, vomerine teeth; man, mandibular teeth.

Table 2. Comparison of characters of three species of the genus *Clarias*.

Species		*fuscus*	*batrachus*	*macrocephalus*
Number of specimens*		28	4	3
Sex (♂+♀)		(1+7)	(2+1)	(1+2)
Total length (mm)		36.2~240.0	74.4~185.9	142.0~276.1
Standard length (mm)		30.9~211.5	64.1~162.5	122.7~241.5
Dorsal rays		56~63 (rarely 66)	63~72	65~69
Anal rays		43~50	45~54	51~52
Pectoral rays		I, 9~10	I, 10~11	I, 8~10
Ventral rays		6	6	6
Caudal rays		9~11+5~7	10~11+6~7	10~11+5~6
Vertebrae excluding Weberian apparatus		16+37~40**	17+39	17+41~43
Gill-rakers		17~19 (rarely 22)	22~25	30~31
Branchiostegals		8 (rarely 9)	8	8
% of total length: Body depth		13.0~19.7	11.4~14.3	13.9~15.3
Body width		16.2~19.8	15.4~17.5	15.1~17.3
Head length				
to tip of occipital process		21.7~26.0	21.5~22.7	20.5~22.3
to gill-opening		14.4~20.4	15.0~16.6	14.9~16.5
Length of dorsal fin base		51.0~60.6	55.6~58.2	58.1~61.6
Length of anal fin base		35.8~43.3	39.1~40.9	40.2~42.0
Length of pectoral spine		4.7~ 8.4	7.5~ 9.1	6.8~ 8.0
Length of ventral		7.4~ 9.6	7.0~ 8.5	8.3~ 8.9
Length of caudal		9.9~16.3	12.6~13.8	12.5~13.6
Distance between occipital process and origin of dorsal		4.0~ 6.4	5.2~ 6.3	3.3~ 4.8
Length of nasal barbel	right	15.3~30.7	16.6~24.9	17.7~21.9
	left	15.3~30.1	16.8~23.9	14.3~19.5
Length of maxillary barbel	right	21.2~39.8	26.4~35.9	21.0~26.1
	left	19.9~36.8	25.9~36.8	27.0~29.2
Length of mandibular barbel	right	19.3~33.4	21.8~30.9	23.9~24.3
	left	19.0~32.9	22.9~31.7	24.2~26.2
Length of mental barbel	right	14.6~26.5	15.2~23.3	14.9~20.2
	left	15.5~27.8	15.0~22.4	13.9~21.3
Length of snout		2.4~ 5.2	3.6~ 4.4	3.7~ 3.8
Orbit diameter		1.4~ 3.3	1.6~ 2.0	1.4~ 2.1
Interorbital width		10.1~12.8	15.4~17.5	15.1~17.3
Length of frontal fontanel		3.2~ 5.6	4.7~ 5.5	3.4~ 4.4
Length of occipital fontanel		1.5~ 4.3	2.0~ 3.6	1.5~ 2.2
Width of occipital process		5.5~ 8.5	5.4~ 8.1	10.5~11.6
Height of occipital process		2.5~ 4.3	2.7~ 3.6	2.2~ 2.9
Locality		Japan, Formosa Philippines	Laos	Thailand S. Vietnam

* Including specimens where sex was undetermined.
** In one specimen, 17+40.

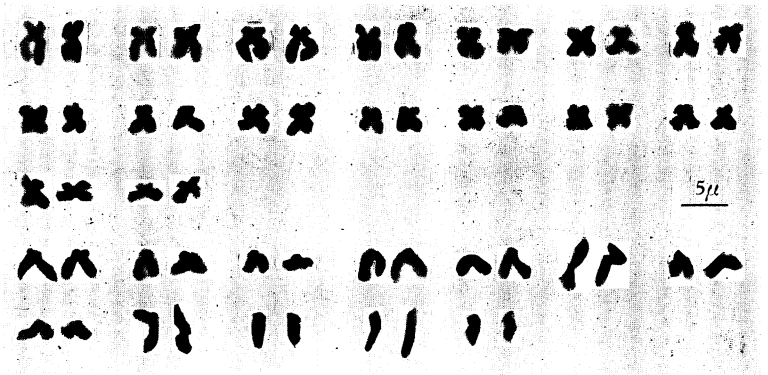

Fig. 7. Karyogram of *Clarias fuscus*, 108.0 mm S. L., from Ishigaki Island. 2n=56.

excluding Weberian apparatus 16+37~40, (2) dorsal rays 56~63, (3) gill-rakers 17~19, (4) serration on both anterior and posterior edges of pectoral spine is asymmetrical and like a saw (Fig. 3), (5) diploid number of chromosomes 56, and (6) distribution (northern Philippines, Asian continent, Formosa, and Japan).

Clarias fuscus also differs from *C. macrocephalus* in form of occipital process, number of vertebrae, and number of gill-rakers.

Discussion

It is unknown whether *Clarias* specimens from Ishigaki Island are natural or introduced, but they agree with *C. fuscus* in numbers of dorsal and anal fin-rays and body color (Lacepède, 1803; Günther, 1864; Fowler, 1941; Nichols, 1943). Therefore, they were identified as *C. fuscus*.

As for variation of *C. fuscus*, specimens from Ishigaki Island seem to be different from those from Formosa and the Philippines in the following points: (1) as shown in Fig. 3A, the serration on the posterior edge of the pectoral spine is poor, (2) relative length of the maxillary barbel to head length seems to be low (Fig. 4), and (3) the hind-border of the vomerine tooth-band convex at the middle (Fig. 6A).

Acknowledgments

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We are also indebted to Dr. Morizumi Nakamura of the Department of Zoology, National Science Museum, Tokyo, for a *C. fuscus* specimen to use for chromosome observation, to Mr. Yukio Sawada for chromosome preparation, and to Mr. Moritaka Aragaki and members of the Yaeyama Branch of the Okinawa Prefectural Fisheries Laboratory, and to Mr. Akihiro Ōsato for collecting *C. fuscus* specimens from Ishigaki Island.

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日本から初記録のヒレナマズについて

新井良一・平野　宏

1973年の春と秋に沖縄県石垣島で体長 30.9～171.5 mm のヒレナマズ (*Clarias fuscus*) が採集された。ヒレナマズ科 (Clariidae) の採集記録は日本では初めてのことである.

本種はフィリピン，中国大陸，台湾に広く分布するが，近縁の *Clarias batrachus* とのちがいについて従来の知見は貧弱なので，いくつかの分類形質を比較した．この結果，腹椎骨数・背鰭条数・鰓耙数・胸鰭棘の形態・核型などに相違が見出された.

なお，フィリピン・台湾・石垣島産のヒレナマズについて分類形質の変異を調べた．石垣島のヒレナマズが移殖魚の自然繁殖したものに由来するか否かは明らかではないが，台湾産のものと石垣島産のものとは，分類形質がかならずしも一致しないようである.

(160 東京都新宿区百人町　国立科学博物館　動物研究部 • 154 東京都世田谷区下馬　日本大学農獣医学部)