

**A Reversed Ambicolorate Flounder,
Kareius bicoloratus, Caught
from Tokyo Bay**

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Kareius bicoloratus (Basilewsky) is a very common flatfish in Japanese coastal waters. The fish is normally dextral, having eyes and color on the right side of the body and being colorless on the blind side. An anomalous specimen, 185.5 mm in total length, was taken by a rod and line at a depth of 3 m off Kisarazu in Tokyo Bay, on January 8, 1979. Examination showed it to be a reversed, almost completely ambicolorate specimen. Numerous cases of albinism, ambicoloration and other anomalies in flatfishes have been reported by many authors, and such reports were compiled by Dawson and his coworker

(Dawson, 1964, 1966, 1971; Dawson and Heal, 1977). As far as the present species is concerned, records of albinism have been presented by Tanaka (1916, 1934) and Honma et al. (1979). Also, records of ambicoloration have been presented by Tanaka (1934), Kuronuma (1940), Matsubara (1955), and Kurata (1959). The present specimen appears to represent the first record of reversal and ambicoloration of this species.

Description

Proportional measurements in standard length and counts of this anomalous specimen, followed in parentheses by those of five normal specimens: Standard length 151.5 mm (326.0~350.0 mm); head length 3.2 (3.4~3.7); body depth 2.0 (2.2~2.4); depth of caudal peduncle 10.0 (9.5~10.9); interorbital width 116.5 (68.6~81.0); snout length 16.5 (16.0~20.5); upper jaw length 12.3 (12.6~14.3) (ocular side), 12.3 (12.0~13.4) (blind side);

Table 1. Comparison of the arrangement of rugose plates on the body of abnormal and normal *Kareius bicoloratus*, based on the present observations and data from Matsubara (1955) and Kurata (1959).

Author	Present study		Matsubara (1955)		Kurata (1959)		Present study	
Total length	185.5 mm		175.0 mm		186.4 mm		384.0~409.0 mm	
	Reversed ambicoloration		Ambicoloration		Ambicoloration		Normal (dextral) specimens (N=5)	
	Eye side (left)	Blind side (right)	Eye side (right)	Blind side (left)	Eye side (right)	Blind side (left)	Eye side (right)	Blind side (left)
Large rugose plates								
Between lateral line and dorsal fin, running longitudinally in a row	5	8	3	7	5<	5<	4~9	0
Between lateral line and anal fin, running longitudinally in a row	2	4	0	0	3	5	1~9	0
Small rugose plates								
Lateral line, above	23	13	12	13	1	4	0~15	0
below	15	18	4	0	0	1	0~14	0
Pectoral fin, on base	3	1	1	1	1	1	1~2	0
below	2	1	0	0			1~3	0
Caudal peduncle, on upper edge	2	2	2	2			1~2	0
on lower edge	2	3	2	2			1~3	0
On opercle	many	none	many	a few	none	none	many	none
On preopercle	many	none	many	many	many	a few	many	none
Behind eyes	many	none	many	many			many	none

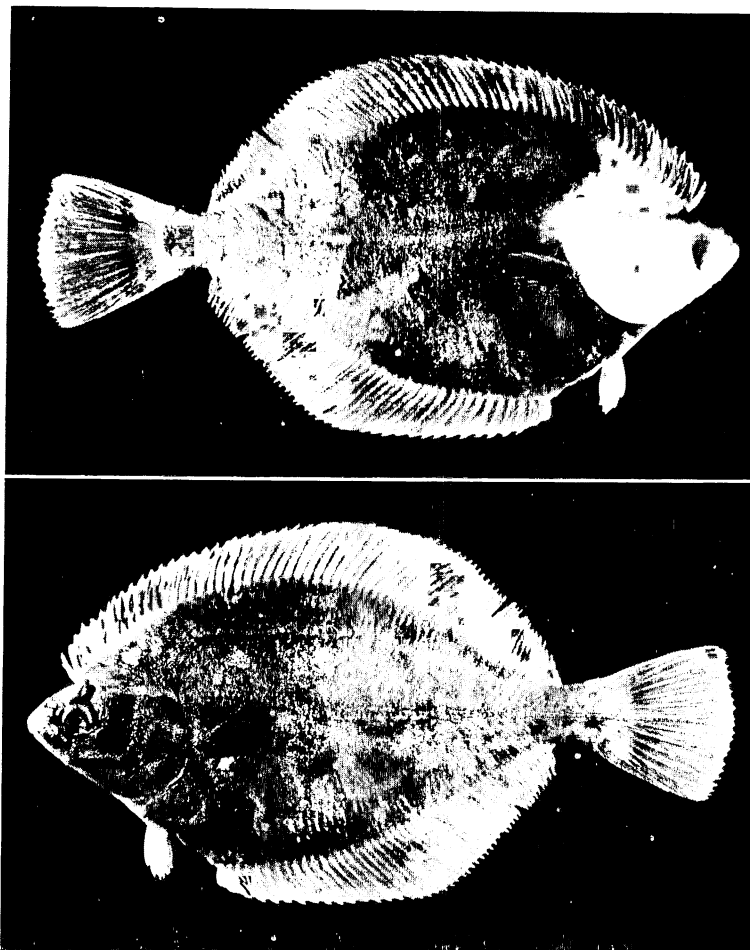


Fig. 1. Ambicolorate flounder, *Kareius bicoloratus*, with reversal sides of the body, 185.5 mm in total length. Top: right side of the body. Bottom: left side of the body.

length of pectoral fin 6.8 (7.1~7.8), 7.9 (9.5~10.6); length of pelvic fin 9.5 (9.7~10.9), 9.5 (10.0~12.0); D. 72 (63~69); A. 54 (47~52); P. 13 (12), 11 (12); V. 6 (6), 6 (6); gill rakers on lower part 5 (5~6).

The eyes, normally found on the right side of the head, are on the left. The eye rotating from its normal position is just across the dorsal ridge with a beak-like edge arrested on the dorsal crest, and is visible from the right side. Coloration, normally confined to the right side, is almost equally developed on both sides, with the exception of the head region on the blind side. The anterior edge of the dorsal fin is weakly hooked. The tip of the fleshy hook originates above the center

of the upper eye. Interorbital space is very narrow and concave. Both the jaws and dentition are almost equally developed on both sides, whereas in normal specimens they are more developed on the blind side. Characteristic rugose plates on the ocular sides are on some parts of the body as mentioned below: a longitudinal row of rugose plates between the lateral line and the dorsal fin; rather small plates between the lateral line and the anal fin; irregular series of small plates above and below the lateral line; small plates scattered over the opercle and preopercle and behind eyes; small plates on the edges of the caudal peduncle and on the base of the pectoral fin; small plates below the

pectoral fin. Rugose plates are also developed on the blind side in the same positions as those on the ocular side except for the head region which has no plates (Fig. 1). In normal specimens, the rugose plates are found only on the ocular side, though there is some variation in number between specimens (Table 1). The viscera of the abnormal fish are in the same position as in normal specimens; the liver is on the left side of the abdominal cavity, and the intestinal coils are on the right. The optic chiasma is in the same arrangement as in normal specimens, the nerve of the left eye being dorsal to that of the right eye.

Discussion

Dawson (1962) summarized known records of abnormalities in the flatfishes from North America. Nishimura and Ogawa (1963) also listed abnormalities from Japan. These authors conveniently divided them into several categories in accordance with abnormal levels. These anomalies in flatfishes may occur either independently or sometimes simultaneously. Anomalies with nearly the same conditions as in the present specimen have been known in a few cases. Cunningham (1907) gave probably the first description of reversed ambicolorate abnormality in young turbot. Since then, as far as I know, similar abnormalities have been recorded in the summer flounder *Paralichthys dentatus* (Gudger, 1936a; Deubler and Fahy, 1958), in the Atlantic halibut *Hippoglossus hippoglossus* (Gudger, 1935; Gudger and Firth, 1937), in the post-larva of the gulf flounder *Paralichthys albigutta* (White, 1962), and in the flathead flounder *Hippoglossoides dubius* (Okiyama and Tomi, 1970).

Ambicoloration in the flatfishes has been ranked as being partial, almost total, or total by Norman (1934). Among them, almost total or total ambicoloration is usually accompanied by a hooked dorsal fin and by an incompletely rotated eye. Formation of a fleshy hook of the anterior dorsal is closely related to the incompletely rotated eye during the metamorphosis and the position of the origin of the dorsal fin (Gudger, 1934, 1935, 1936a, b, 1941; Dawson, 1962; Haaker and

Lane, 1973). A similar phenomenon was observed in the present specimen.

According to Gudger (1935), the reversal of sides in the flatfishes is a relatively simple departure from the normal specimen compared with ambicoloration. A specimen of a reversed ambicolorate flathead flounder, *Hippoglossoides dubius*, recorded by Okiyama and Tomi (1970), had unusual optic chiasma and normal arrangements of the viscera. In the present specimen the external reversal of sides does not affect the relations of the internal organs. It would therefore seem that the deformity of the present specimen is more simple than that of the above mentioned *Hippoglossoides dubius*.

The rugose plates were found on both sides in the present reversed ambicolorate specimen, though they are restricted to the ocular side in normal ones. Such a condition was also shown in ambicolorate specimens by Matsubara (1955) and Kurata (1959) (Table 1). The character seems to be related to ambicoloration rather than reversal.

Acknowledgments

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東京湾から採集された側面逆位で両側有色のイシガレイ

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東京湾から 1979 年 1 月 8 日に、側面逆位で両側有色のイシガレイ (全長 185.5 mm) が採集された。本種の正常な個体では、眼は右体側にあり、有眼側が有色であるが、本標本では左体側に眼があり、右体側の頭部以外は両側とも有色で、しかも、本種に特有の瘤状物もみられた。しかし、内臓・視神経交叉の逆転は生じていない。

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