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Morphometric and Meristic Variation in Ricefishes, Genus *Oryzias*: a Comparison with Cytogenetic Data

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Abstract Morphometric and meristic data from type and other material of ricefishes of the genus *Oryzias*, particularly on *O. latipes* and *O. curvinotus*, were retaken to compare relationships of ricefishes indicated by morphological data with the relationships indicated by the cytogenetic analyses (Uwa, 1986). Along with morphometric and meristic characters traditionally used, two morphometric characters are useful for the classification of this genus: the relative length of the abdominal part and the relative position of the dorsal-fin origin. External anatomical data mostly agree with a classification of ricefishes based on karyology; although, like the cytogenetic data, they are not sufficient to distinguish all species, or to define monophyletic groups. *Oryzias latipes* is widespread in eastern Asia. *Oryzias curvinotus*, a name applied to ricefish from Hainan Island, is distributed more widely in southern China, including Hainan, Guangdong, Hong Kong, and Hanoi.

Ricefishes of the genus *Oryzias* Jordan and Snyder are small atherinomorph fishes found widespread in continental and insular Asia. They are common in freshwater ponds, ditches, and paddy fields, and may inhabit brackish water. Seven (Rosen, 1964) or ten (Yamamoto, 1975) species have been recognized so far. Recently, there has been a renewed interest in the comparative osteology (Iwamatsu and Hirata, 1980), karyology (Uwa and Iwata, 1981; Uwa and Ojima, 1981; Uwa et al., 1981), isozyme variation (Sakaizumi et al., 1980, 1983), and phylogenetic position (Rosen and Parenti, 1981) of ricefishes.

The eight species on which karyotype data are available can be divided into three chromosomal groups: the monoarmed chromosome group, *O. melastigma* (McClelland) and *O. javanicus* (Bleeker), with 2n=48 acrocentric or subtelocentric chromosomes; the biarmed chromosome group, *O. latipes* (Temminck and Schlegel), *O. curvinotus* (Nichols and Pope), *O. luzonensis* (Herre and Ablan) and *O. mekongensis* Uwa and Magtoon, with 2n=48 including metacentric and submetacentric chromosomes; and the fused chromosome group, *O. minutillus* Smith and *O. celebensis* (Weber), with 2n=34 or 36 including "large" metacentric or submetacentric chromosomes (Uwa et al., 1983; Uwa, 1986). The monoarmed and biarmed chromosome groups have disjunct distributions, being found in western and eastern Asia, respectively. The fused chromosome group is distributed between these two areas, in Thailand and Sulawesi (Uwa, 1986).

The division of *Oryzias* species by karyology coincides with divisions suggested by electrophoretic studies of allozymes and parvalbumin by Sakaizumi (1985a, b), who recognized three groups: *O. melastigma* and *O. javanicus*, *O. latipes* and *O. luzonensis*, and *O. celebensis*. A similar division was recognized on the basis of differences in the morphology of pit organs (Iwamatsu et al., 1984): *O. melastigma* and *O. javanicus* have the canal type; whereas, *O. latipes* and *O. celebensis* have the naked type. However, polarity of these characters has not been hypothesized; therefore, monophyly of the divisions has yet to be evaluated.

Ricefishes have been identified traditionally on the basis of morphometric and meristic characters, such as body length and numbers of dorsal- and anal-fin rays. Cytogenetic data may also be used to distinguish ricefish species, but the nomenclature of these fishes is confused because few or no such data are available of old, preserved material, including type specimens.

Reexamination of type material and other early collections of ricefishes is critical for comparison of relationships indicated by morphological data with the relationships of *Oryzias* indicated by the cytogenetic analyses. In the present study, many measurements and counts reported in the original descriptions were retaken of type and other material of the above *Oryzias* species, particularly *O.*

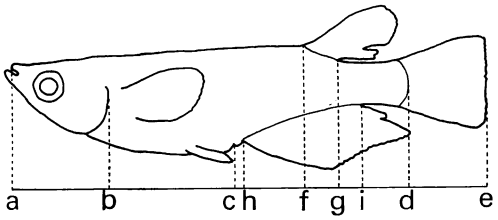

Fig. 1. Outline drawing of a male *Oryzias latipes* indicating points of measurements. See the text for description of measurements.

latipes, from throughout China, Korea, Japan, and from one locality in eastern USSR, and *O. curvinotus*, from Hainan Island, S China, described as differing from *O. latipes* by having a higher number of anal-fin rays (Nichols and Pope, 1927). We present this report to confirm the specific identification of the recent collections used in the cytogenetic studies, and to discuss our preliminary observations on the correlation of the cytogenetic data with those from comparative anatomical studies.

Materials and methods

Preserved specimens from recent and early collections, including types, were examined. For *O. melastigma*, specimens from near the type locality (Calcutta, India) were used in place of the type specimens which are missing (A. Menon, pers. comm.).

Straight-line measurements, as labelled in Fig. 1, were taken from (a) tip of the snout to (b) posterior border of the operculum, (c) anal opening, (d) point of flexure of the caudal fin, (e) posterior extent of the caudal fin, (f) origin of the dorsal fin, (g) posterior extent of the dorsal-fin base, (h) origin of the anal fin, and (i) posterior extent of the anal-fin base. The characters used are: 1) HL, head length, a–b; 2) PAL, preanal length (distance from snout to anus), a–c; 3) SL, standard length, a–d; 4) TL, total length, a–e; 5) PDFL, predorsal fin length, a–f; and 6) PAFL, preanal fin length, a–h. Measurements were taken under a dissecting microscope to the nearest 0.25 mm with a meristic ruler, and are reported as a percentage of SL.

Lengths of median fin bases were estimated, as follows. The length of the dorsal-fin base is the distance from (a to g) minus the distance from (a to f), and the length of the anal-fin base is the distance from (a to i) minus the distance from (a to h) (Fig. 1).

Counts of dorsal- and anal-fin rays were taken on alcoholic specimens and were confirmed, when possible, on cleared and stained (CS) preparations, identified by CS following a catalogue number. Immature and bent or broken specimens were not measured or counted.

Specimens have been examined from the following institutions: AMNH, American Museum of Natural History, New York; ANSP, Academy of Natural Sciences of Philadelphia, Philadelphia; BMNH, British Museum (Natural History), London; CAS, California Academy of Sciences, San Francisco; FMNH, Field Museum of Natural History, Chicago; RMNH, Rijksmuseum van Natuurlijke Historie, Leiden; SU, Stanford University, now at CAS; USNM, United States National Museum of Natural History, Washington, D.C.; ZMA, Zoologisch Museum, Amsterdam; and ZMH, Zoologisches Museum, Hamburg.

Type specimens examined. *O. javanicus*—Indonesia:

Table 1. Proportions and counts of type or type locality material of *Oryzias*. Proportions in counts given as a mode with range in parentheses. For the abbreviations see the

Species	N	SL (mm)	Dorsal-fin rays	Anal-fin rays	HL
melastigma	44	23.7±2.5	7 (6–7)	23 (19–24)	24.2±1.5
javanicus	14	20.9±2.5	7 (7)	23 (22–25)	24.8±1.8
latipes	3	33.1	6 (6)	18 (18–20)	24.7
curvinotus	7	19.9±1.0	6 (5–6)	19 (18–20)	25.1±0.9
luzonensis	30	25.3±2.6	6 (5–7)	17 (16–19)	21.4±1.4
mekongensis	4	12.4	6 (6–7)	15 (14–15)	26.3
celebensis	13	24.2±4.0	9 (8–10)	21 (19–22)	22.5±1.7
timorensis	8	25.0±5.9	9 (9–10)	19 (17–19)	28.4±1.1
minutillus	5	13.1	6 (6)	19 (19)	24.4

Perdana, Java, coll. P. Bleeker, 1866, BMNH 1866.5.2: 101, 1 male, and RMNH 6979, 7 males and 6 females (syntypes). *O. latipes*—Japan: Nagasaki, coll. Bruger and von Siebold, RMNH 2713, 3 females (holotype and paratypes; see Boeseman, 1947). *O. curvinotus*—China: Nodoa, Hainan, coll. C. H. Pope, 1922–1923, AMNH 8398, 1 male (holotype) and AMNH 14766, 3 males and 3 females (paratypes). *O. luzonensis*—Philippines: Solsona, N. Luzon, coll. G. L. Ablan, 1933, SU 29079, 15 males and 15 females (paratypes). *O. mekongensis*—Thailand: Yang Talat, NE Thailand, coll. H. Uwa and W. Magtoon, 1984, USNM 268540, 1 male (holotype), and USNM 268541, 1 male and 2 females (paratypes). *O. celebensis*—Indonesia: Ujung Pandung, S Celebes, coll. M. Weber, 1888, ZMA 100.567, 1 male and 5 females; Maros, S Celebes, coll. M. Weber, 1888, ZMA 112.585, 3 males and 4 females (syntypes). *O. timorensis* (Weber and de Beaufort)—Indonesia: Mota Talau, Timor, coll. M. Oyens, 1911, ZMA 100.571, 3 males and 5 females (syntypes). *O. minutillus*—Thailand: Bangkok, Cen. Thailand, coll. H. M. Smith, 1934, USNM 107985, 1 female (holotype), and USNM 109789, 1 male and 3 females (paratypes).

Other specimens examined. *O. latipes*—Japan: Ichinoseki, Iwate, coll. D. S. Jordan and J. O. Snyder, SU 20123, 1 male; Kichi R., Nagoya, coll. D. S. Jordan, 1922, AMNH 26760, 4 males and 3 females, and AMNH 26760CS, 9 males and 7 females; Wakanoura, Wakayama, coll. D. S. Jordan and J. O. Snyder, US 9866, 25 males and 25 females; Kawatana, Nagasaki, coll. D. S. Jordan and J. O. Snyder, SU 20125, 15 males and 15 females; Tsushima I., coll. Holst, 1891, BMNH 1891.10.15: 30–38, 9 males and 5 females; Kagoshima, SU 24663, 1 male; Okinawa, coll. D. S. Jordan and S. Tanaka, SU 23664, 4 males; S Okinawa, coll. T. D. White, 1947, CAS 54866, 2 males and 2 females. Korea: Suigen, coll. D. S. Jordan, 1911, FMNH 55474, 7 males and 3 females. China: Beijing, Hebei, coll. Reinke, 1927, AMNH 14469, 2 males and 1 female; Jinan, Shandong, coll. C. H. Pope, 1924, AMNH 10344, 33 males and 33 females, and AMNH 10344CS, 3 males and 3 females; Chusan I., Zhejiang, coll. A. W. C. T. Herre, 1936, SU 32587, 21 males and 23 females; S Hubei, presented by F. W. Styan, 1902, BMNH 1902.5.30: 61–65, 3 males and 2 females; Wanxian, Sichuan, coll. W. Granger, 1921–1922, AMNH 10483, 1 male; Giran, Taiwan, coll. M. Oshima, 1917, ANSP 76433, 19 males and 9 females; Gangkhen, SW Fujian, coll. J. L. Gressitt, 1936, SU 39659, 1 male; Yimnasan, NE Guangdong, coll. J. L. Gressitt, 1936, SU 39658, 3 males; Gangzhou, Guangdong, coll. A. W. C. T. Herre, 1934, SU 30248, 2 males and 1 female; Taiping, Guangdong, coll. A. W. C. T. Herre, 1931, SU 28185, 3 males and 6 females; Wuzhou, Guangxi, coll. A. W. C. T. Herre, 1934, SU 30247, 16 males and 16 females. Hong Kong: Fanling, Kowloon, coll. R. L. Bolin, 1954, SU 61181, 2 males and 6 females, and CAS 40759, 3 males and 1 female. Vietnam: Tonkai, Hanoi, coll. Bruning, 1913, ZMH 18606, 3 males. USSR: Iri R., Kazakhstan, presented by N. V. Parin, 1974, AMNH 38404, 4 males and 4 females, and AMNH 38404CS, 1 male and 1 female. *O. curvinotus*—China: Nodoa, Hainan, coll. C. H. Pope, 1922–1923, AMNH 10493, 15 males and 14 females, and AMNH 10493CS, 6 males and 1 female. *O. melastigama*—India: Uttarbhag, Ganges Delta, coll. A. W. C. T. Herre, 1937, SU 35653, 16 males and 28 females, and SU 35653CS, 2 males and 2 females; Calcutta, coll. F. Day, 1889, BMNH 1889.2.1: 2112–13, 1 male and 1 female.

Results

Oryzias species have similar body proportions (i.e. relative HL or TL) regardless of the body size (SL) at maturation. Adults of *O. mekongensis* and *O. minutillus* average 12.4 and 13.1 mm SL, respectively; whereas, other *Oryzias* examined average 20 to 33 mm SL (Table 1). The species

SL (%) given as an average with standard deviation for populations of more than 5 specimens; text.

PAL	TL	PDFL	a–g	PAFL	a–i
52.3±2.1	125±2	82.5±1.2	89.4±1.7	56.1±1.8	88.1±1.4
50.7±2.2	120	83.6±1.3	88.9±0.9	53.6±2.5	87.1±1.2
57.7	120	79.0	84.7	64.0	87.3
55.7±1.3	121±2	81.6±1.9	86.0±1.5	58.0±1.5	85.7±0.8
55.0±1.8	124±3	77.8±1.2	84.6±1.4	59.2±2.1	83.9±1.9
53.5	125	78.3	84.0	57.8	81.0
55.2±1.6	124±2	81.7±1.4	89.9±1.7	59.2±2.2	86.1±2.3
55.3±1.7	123	77.4±1.1	86.9±1.1	59.6±1.5	83.0±0.8
50.6	—	82.2	89.2	55.4	83.8

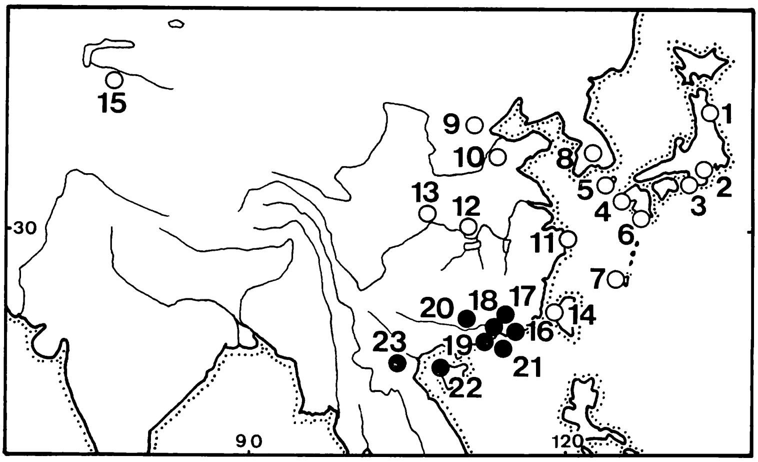

Fig. 2. Geographical distribution of two morphometrically distinguished groups of *Oryzias latipes* and *O. curvinotus* in eastern Asia: dorsal-fin origin anterior (open circles), dorsal-fin origin posterior (closed circles). Localities are numbered as in text.

may be divided into two groups by two morphometric characters: relative length from snout to anus (PLA), and predorsal fin length (PDFL). The anus is located at midbody (PAL 51 to 52% of SL) in *O. melastigma*, *O. javanicus*, and *O. minutillus*; and slightly more posterior (PAL 54 to 58% of SL) in the other species. The dorsal fin originates farther forward (PDFL 76 to 79% of SL) in *O. latipes*, *O. luzonensis*, *O. mekongensis*, and *O. timorensis* than in the other species (PDFL 81 to 84% of SL) (Table 1). Both *O. celebensis* and *O. timorensis* have a relatively long dorsal-fin base, whereas *O. melastigma* and *O. javanicus* have a relatively long anal-fin base.

Dorsal- and anal-fin ray counts are useful for distinguishing some species. *Oryzias celebensis* and *O. timorensis* are distinctive in having a large number of dorsal-fin rays (modally 9); *O. melastigma* and *O. javanicus* are distinguished by their large number of anal-fin rays (modally 23). *Oryzias mekongensis* is unique in having a reduced modal number of 15 anal-fin rays. No notable

Table 2. Proportions and counts of *Oryzias latipes* and *O. curvinotus* from selected localities. 5 specimens; counts given as a mode with range in parentheses. For the abbreviations

Locality	N	SL (mm)	Dorsal-fin rays	Anal-fin rays	HL
Wakanoura	50	29.2±2.0	6 (5–6)	18 (16–21)	25.2±1.1
Kawatana	30	26.0±2.9	6 (6–7)	19 (17–22)	25.0±1.7
Tsushima	14	27.7±3.5	6 (5–7)	17 (16–19)	24.6±1.9
Okinawa	4	17.9	6 (6)	17 (17–19)	27.0
Suigen	10	18.6±1.6	6 (5–6)	17 (17–19)	25.7±1.2
Beijing	3	25.3	6 (6)	17 (17–18)	25.3
Jinan	66	22.5±1.8	6 (5–7)	17 (15–20)	25.7±1.5
Chusan	44	20.9±1.7	6 (6–7)	17 (15–19)	26.2±1.3
Taiwan	28	26.6±3.4	6 (6–7)	18 (16–19)	24.2±1.5
Kazakhstan	10	23.5±1.9	6 (6–7)	17 (16–19)	24.5±1.3
Yimnasan	3	24.3	6 (5–6)	18 (17–18)	25.0
Guangzhou	3	24.7	6 (6)	19 (19)	22.7
Taiping	9	20.8±2.7	6 (6)	20 (18–21)	24.1±1.5
Wuzhou	32	21.4±2.3	6 (6–7)	18 (16–19)	25.1±1.3
Hong Kong	12	24.3±1.7	6 (5–7)	20 (18–21)	23.7±0.7
Hainan	29	18.0±1.9	6 (5–6)	19 (18–20)	26.0±0.9
Hanoi	3	18.3	6 (6)	19 (18–19)	25.3

difference was found in the number of anal-fin rays between *O. latipes* (modally 18, range 18–20) and *O. curvinotus* (modally 19, range 18–20).

Populations identified as *O. latipes* from Japan, Korea, China, Hong Kong, Vietnam, and USSR may be divided into two groups by the relative anterior or posterior origin of the dorsal fin. The geographical distribution of these two groups of *O. latipes*, along with *O. curvinotus* from Hainan Island, is shown in Fig. 2, and measurements of specimens from selected localities are summarized in Table 2. Populations with a dorsal fin in a relatively anterior position (PDFL 77 to 79% of SL) are: 1) Ichinoseki, 2) Nagoya, 3) Wakanoura, 4) Kawatana, 5) Tsushima, 6) Kagoshima, 7) Okinawa, 8) Suigen, 9) Beijing, 10) Jinan, 11) Chusan, 12) S Hubei, 13) Wanxian, 14) Taiwan, and 15) Kazakhstan. Populations with a relatively posterior dorsal-fin origin (PDFL 80 to 82% of SL) are: 16) Gangkhen, 17) Yimnasan, 18) Gangzhou, 19) Taiping, 20) Wuzhou, 21) Hong Kong, 22) Hainan, and 23) Hanoi. Specimens from Kazakhstan, USSR, have a dorsal fin with a relatively anterior origin (PDFL 78% of SL), whereas specimens from Hanoi, Vietnam, have a dorsal fin with a relatively posterior origin (PDFL 81% of SL). Populations with a dorsal fin with a relatively posterior origin are found only in southern China around Guangdong, Hong Kong, Hainan, and Hanoi.

No notable meristic differences were found between *O. latipes* from southern China and *O. curvinotus* from Hainan, nor among *O. latipes* populations from Kazakhstan, eastern China, Korea, and Japan.

Discussion

Oryzias species have been described traditionally on the basis of differences in body proportions and fin placement which have often been presented in such a manner that it is difficult to compare them directly among species. *Oryzias melastigma* and *O. javanicus*, of the monoarmed charomosome group, have a relatively short abdominal part of the body, as measured from the tip of the snout to the anus (a to c in Fig. 1), and, consequently, a relatively long caudal part of the body. These findings agree with other characters, such as the correlated characters of a relatively longer anal-fin base and a larger number of anal-fin rays. Length of the fin base and number of rays are correlated also in the dorsal fin of *O. celebensis* and *O. timorensis*.

Species in the biarmed chromosome group are characterized by a relatively anterior dorsal-fin origin, except for *O. curvinotus* and *O. latipes* from southern China, in which the dorsal-fin origin is relatively posterior. The biarmed chromosome group is characterized morphologically

Proportions in SL (%) given as an average with standard deviation for populations of more than
see the text.

PAL	TL	PDFL	a–g	PAFL	a–i
56.1±2.1	—	78.8±1.2	84.3±1.5	60.5±2.2	85.9±1.8
55.2±1.7	122±3	78.8±1.5	84.5±1.9	59.1±1.6	85.5±1.9
55.9±1.4	121±4	78.1±1.6	84.2±2.0	59.3±1.8	85.9±1.4
55.0	125	76.5	83.3	57.5	86.8
54.3±1.2	119±3	77.9±0.7	83.2±0.9	57.1±1.4	82.8±1.4
60.7	119	78.0	83.0	64.7	83.3
56.2±2.3	122±3	78.0±1.6	83.8±1.6	59.1±2.2	84.7±1.7
56.9±1.7	123±2	78.4±1.1	84.5±1.3	59.9±1.9	85.4±1.1
54.9±2.1	121±3	78.2±2.0	83.5±1.8	57.5±1.8	83.9±2.0
56.8±2.4	123±2	78.0±1.2	84.5±1.4	59.6±2.6	84.3±1.2
53.7	124	80.7	86.7	56.0	85.3
55.0	123	80.7	85.3	59.0	85.3
55.8±2.2	121±2	81.6±1.0	86.9±0.8	58.4±2.1	85.7±1.6
55.5±2.4	123±3	79.5±2.0	84.8±2.0	57.5±2.5	85.2±1.6
55.8±1.9	123±2	81.3±1.5	86.0±1.8	58.7±1.7	85.9±1.3
54.0±1.3	123±2	80.7±1.2	86.3±1.2	56.7±1.2	85.5±1.2
53.3	120	81.3	88.0	56.7	85.7

by a parallelogram-shaped anal fin in the male which is formed by the elongation of the posterior rays (Fig. 1), whereas the anterior anal-fin rays are elongated in the males of the other chromosome groups (Formacion and Uwa, 1985).

A ricefish from Hainan was first reported as *O. latipes* by Oshima (1926). Nichols and Pope (1927) described the ricefish from Hainan as *O. curvinotus*, distinguishing it from *O. latipes* by a large number of anal-fin rays, 25. However, Harada (1943) included ricefishes from Hainan in *O. latipes* because a large number of anal-fin rays were not observed in his material. We found no significant differnce in the number of anal-fin rays among early collections of specimens including types identified as *O. latipes* and *O. curvinotus*. Nichols and Pope (1927) probably miscounted the number of anal-fin rays.

The ricefish from Hainan is characterized by the dorsal-fin origin being farther posterior, and this has been described by Nichols and Pope (1927) and Harada (1943). *Oryzias latipes* populations that have a more posterior dorsal-fin origin are also known from Guangdong, Hong Kong, and Hanoi. The karyotype of a ricefish identified as *O. curvinotus* was studied by Uwa et al. (1982) on specimens imported to Japan via Singapore, although the collecting locality was not identified. The specimens were karyotypically similar to *O. mekongensis* from northeast Thailand (Uwa and Magtoon, 1986), but different from *O. latipes* from Japan (Uwa and Ojima, 1981) and eastern China (Uwa, 1986). Thus, we postulate that a group of ricefish populations which may be known as *O. curvinotus* (including populations identified initially as *O. latipes*) is distributed widely in southern China, including Hainan, Guangdong, Hong Kong, and Hanoi.

Oryzias latipes is widely distributed throughout eastern Asia. Abdil'dayev and Dubitskiy (1974) reported *Aplocheilus* sp. (=*Oryzias latipes*) from the Ili River basin, Kazakhstan, and suggested that this ricefish dispersed from western China. Alternatively, the Kazakhstan population may represent a remnant of a more widespread distribution of ricefishes throughout eastern continental Asia. We have no way of choosing between these two historical biogeographic hypotheses at this time. Geographical variations in *O. latipes* have been reported in the number of anal-fin rays (Egami, 1953), isozymes (Sakaizumi et al., 1980, 1983), and karyotypes (Uwa, 1986). An examination of geographical variation in *O. latipes* and *O. curvinotus* at the population level throughout eastern Asia is required to interpret the systematic significance of these differences.

Species of the fused chromosome group, *O. celebensis* and *O. minutillus*, have a highly derived chromosome number and constitution; yet, we have found no derived anatomical characters to unit the two. Magtoon and Uwa (1985) reported that interspecific hybridization studies indicated a close relationship between *O. celebensis* and *O. minutillus*; however, whether this genetic similarity is primitive or derived for a subgroup of *Oryzias* needs to be evaluated.

The diminutive *O. minutillus* has a relatively short abdominal part of the body, hence a relatively long caudal part, as do species of the monoarmed chromosome group. Conversely, *O. celebensis* has a relatively long abdominal part of the body as do those species of the biarmed chromosome group. Iwamatsu and Hirata (1980) reported that *O. celebensis* has osteological characters which may be considered intermediate between *O. javanicus* and *O. latipes*. However, Sakaizumi (1985a) has suggested that *O. celebensis* is allozymically divergent from species of the monoarmed (*O. melastigma* and *O. javanicus*) and biarmed (*O. latipes* and *O. luzonensis*) groups. A hypothesis of a monophyletic origin of the fused chromosome group by centric fusion remains to be tested with other, presumably independent characters.

Oryzias timorensis and *O. celebensis* share a large number of dorsal-fin rays, which we interpret as a derived character, although the dorsal-fin origin is relatively anterior or posterior, respectively, in the two species. We presume that *O. timorensis* will be found to have "large" biarmed chromosomes, and hence, a reduced chromosome number.

We conclude that live *Oryzias* used in cytogenetic studies by Uwa and co-workers, cited herein, have been properly identified as to their species, and that results from those studies can be incorporated into a genetic revision along with other, more traditional characters.

Additional remark: Type specimens of *O. marmoratus* (Aurich) and *O. matanensis* (Aurich) from C Sulawesi (Aurich, 1935; Zool. Anz., 112: 7–107) were lost in Munich in 1944 (F. Terofal, pers. comm.).

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メダカ属魚類の計測と核型によるグループ分けの検討

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メダカ（*Oryzias*）属魚類は，核型から単腕，両腕染色体型，染色体融合型の 3 つのグループに分けることができる．この核型によるグループ分けと形態によるグループ分けとの関連を調べるため，8 種のメダカについて，タイプ標本を中心に計測，計数を行った．形態計測によるグループ分けは核型によるグループ分けと概ね一致するが，融合型に分けられたタイメダカ *O. minutillus* の計測的特徴はむしろ単腕型のそれに近い．また，東アジア各地から採集された標本の計測結果から，これまで不明確だったメダカ *O. latipes* とハイナンメダカ *O. curvinotus* の関係が明らかになり，ハイナンメダカがハイナン島だけでなく，中国南部に広く分布していることが推定できた．

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