

Chromosomes of Japanese Gobioid Fishes (IV)

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In the previous papers, we described the karyotypes of 26 species of gobioid fishes (ARAI & SAWADA, 1974, 1975; ARAI *et al.*, 1974). Their karyotypes are various, i.e., the diploid chromosome number ranges from 40 to 50 and the arm number from 40 to 84. As regards chromosomes of foreign species, AHMED (1974) reported $2n=38$ in both *Gobiosoma macrodon* and *G. zebrella*, and IVANOV (1975) $2n=30$ in *Gobius batrachocephalus* (= *Mesogobius batrachocephalus*).

Recently, Prince AKIHITO gave us an opportunity to observe chromosomes of two species of gudgeons from Thailand, *Oxyeleotris marmorata* and *Ophiocara porocephala*, and a coral goby from Australia, *Gobiodon rivulatus rivulatus*. In this report, karyotypes are described on these three species and two species from Japan, *Sicyopterus japonicus* and *Gobiodon quinquestrigatus*.

Method of chromosome preparation is the same as that of ARAI (1973). Classification of chromosomes is adopted from LEVAN *et al.* (1964). Metacentrics and submetacentrics are described as two-arm chromosomes, and subtelocentrics and acrocentrics as one-arm chromosomes. The definition of the new arm number (NAN) is referred to ARAI and NAGAIWA (1976).

All the specimens used for the experiments are deposited in the fish collection of the Department of Zoology, National Science Museum, Tokyo.

Oxyeleotris marmorata (BLEEKER)

(Figs. 1 A-D)

Ten juvenile specimens (Nos. E·91·1–E·91·12 except Nos. E·91·5 and E·91·9), 36.8 to 54.4 mm in total length, were sent to Prince AKIHITO from Mr. Chertchai AMATAYAKUL. These specimens had been cultured at Ubolratana Reservoir, Thailand. Characters of material fishes are shown in Table 1.

As shown in Table 2, the diploid chromosome number of this species is 46. Two types of karyotypes (Types A and B) were observed. Type A comprises one metacentric, one smaller submetacentric, two larger submetacentric and 42 subtelocentric-

Table 1. Characters of five species of material fishes.

Species	No. of fish	S.L. (mm)	D ₁	D ₂	A	VN
<i>Oxyeleotris marmorata</i>	10	29.4-43.0	VI	I, 9	I, 8	10+16
<i>Ophiocara porocephala</i>	2	43.2-49.5	VI	I, 6*-8	I, 7	10+16
<i>Sicyopterus japonicus</i>	3	62.5-73.0	VI	I, 10	I, 10	10+16
<i>Gobiodon r. rivulatus</i>	7	32.0-38.9	VI	I, 10-11	I, 9-10	10+16
<i>Gobiodon quinquestrigatus</i>	2	28.2-31.8	VI	I, 10	I, 8- 9	10+16

* abnormal.

Table 2. Frequency distributions of diploid chromosome counts in five species of material fishes.

Species	2n											Total
	40	41	42	43	44	45	46	47	48	49	50	
<i>Oxyeleotris marmorata</i>	3	7	4	7	27	36	126	10	1			221
<i>Ophiocara porocephala</i>	1	1	2	2	3	4	6	11	28	1	1	60
<i>Sicyopterus japonicus</i>			3	5	17	44	1	1				71
<i>Gobiodon r. rivulatus</i>				2	4	33	5					44
<i>Gobiodon quinquestrigatus</i>	1		1	3	14	1						20

acrocentric chromosomes (Figs. 1 A, C). Type B comprises 2 metacentric, 2 large submetacentric and 42 subtelocentric-acrocentric chromosomes (Figs. 1 B, D). The arm number of both karyotypes is 50. As the sex of material fishes is unknown, it is not known whether the two types of karyotypes reflect the difference of males and females or not.

Composition of two-arm chromosomes of this species is similar to that of *Bostri-
chthys sinensis*, but the number of one-arm chromosomes of *O. marmorata* is smaller by two than that of *B. sinensis* (see ARAI *et al.*, 1974).

Ophiocara porocephala (VALENCIENNES) “Hoshimadara-haze”

(Figs. 2 A, C)

Two juvenile specimens (Nos. E·92·1 and E·92·2), 51.5 and 61.6 mm in total length, are gift from Prince AKIHITO who was given these specimens from Mr. C. AMA-
TAYAKUL. Material fishes were collected in Thailand, but the detailed locality is unknown (Table 1).

The diploid chromosome number is 48 (Table 2). The karyotype comprises 24 pairs of subtelocentric-acrocentric chromosomes. The chromosomes are comparable in appearance and show a gradation in size which makes it impossible to arrange them in size groups. The arm number of this species is 48. Among karyotypes of Asian gobioid fishes, this karyotype is similar to that of *Bathygobius fuscus* (see ARAI & SAWADA, 1975).

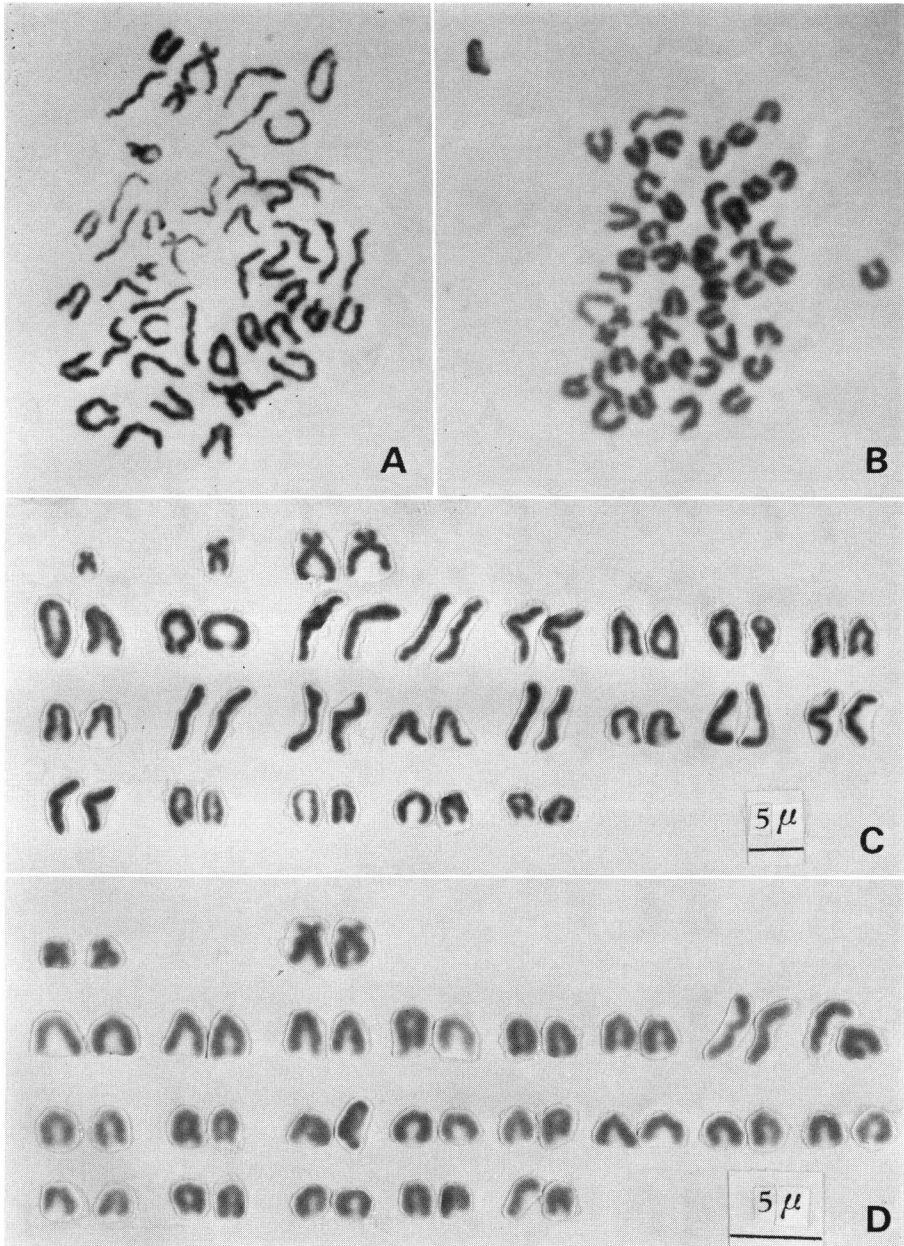


Fig. 1. Photomicrographs of mitotic metaphase chromosomes and karyotypes from gill epithelial cells of *Oxyeleotris marmorata*. — A, Type A (No. E·91·7), $2n=46$, $\times 1,430$; B, Type B (No. E·91·6), $2n=46$, $\times 1,960$; C, Type A, from Fig. A, $NF=50$, $\times 1,430$; D, Type B, from Fig. B, $NF=50$, $\times 2,410$.

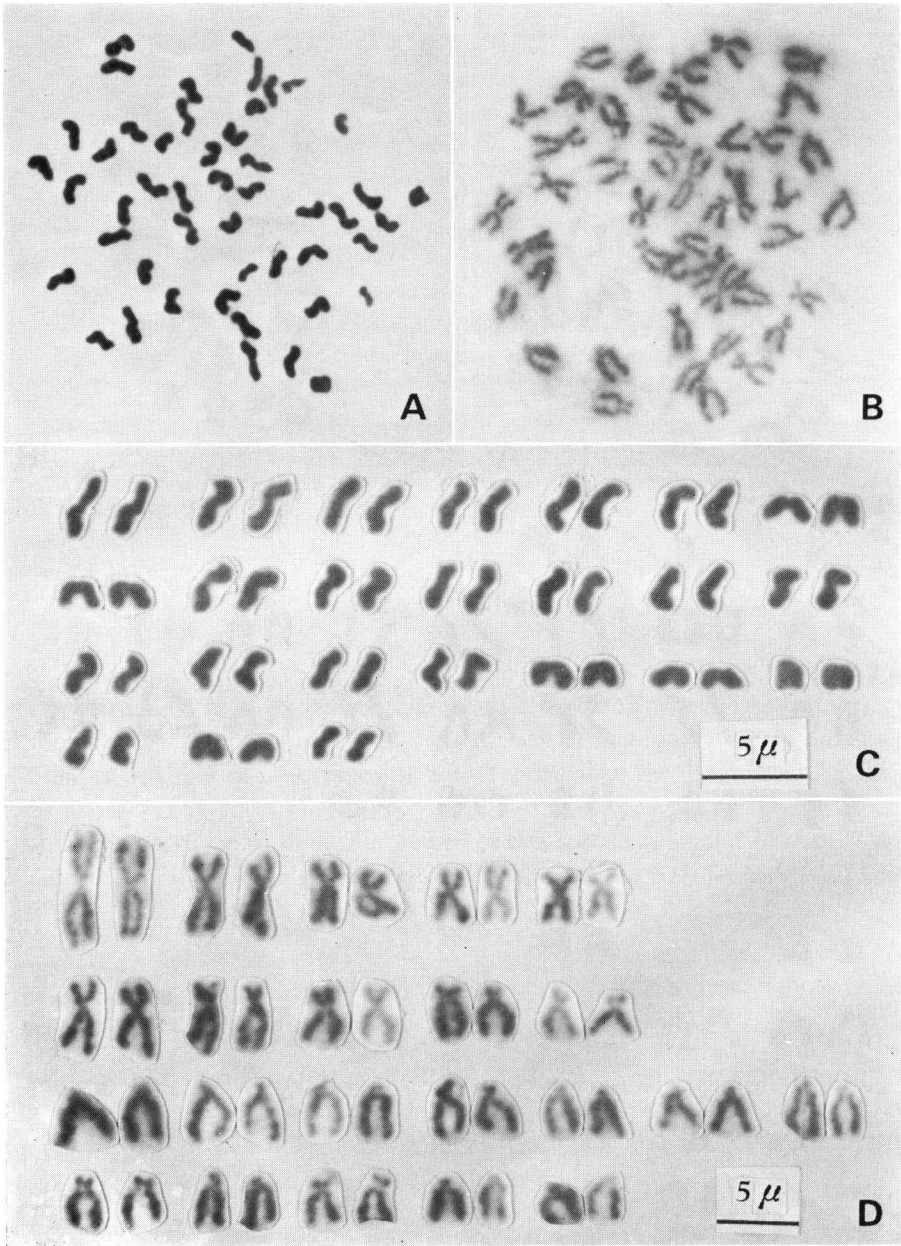


Fig. 2. Photomicrographs of mitotic metaphase chromosomes and karyotypes from gill epithelial cells of the mullet gudgeon and a toothed-lipped goby. — A, *Ophiocara porocephala*, $2n=48$, $\times 1,760$; B, *Sicyopterus japonicus*, $2n=44$, $\times 1,580$; C, *Ophiocara porocephala*, from Fig. A, $NF=48$, $\times 2,700$; D, *Sicyopterus japonicus*, from Fig. B, $NF=64$, $\times 2,200$.

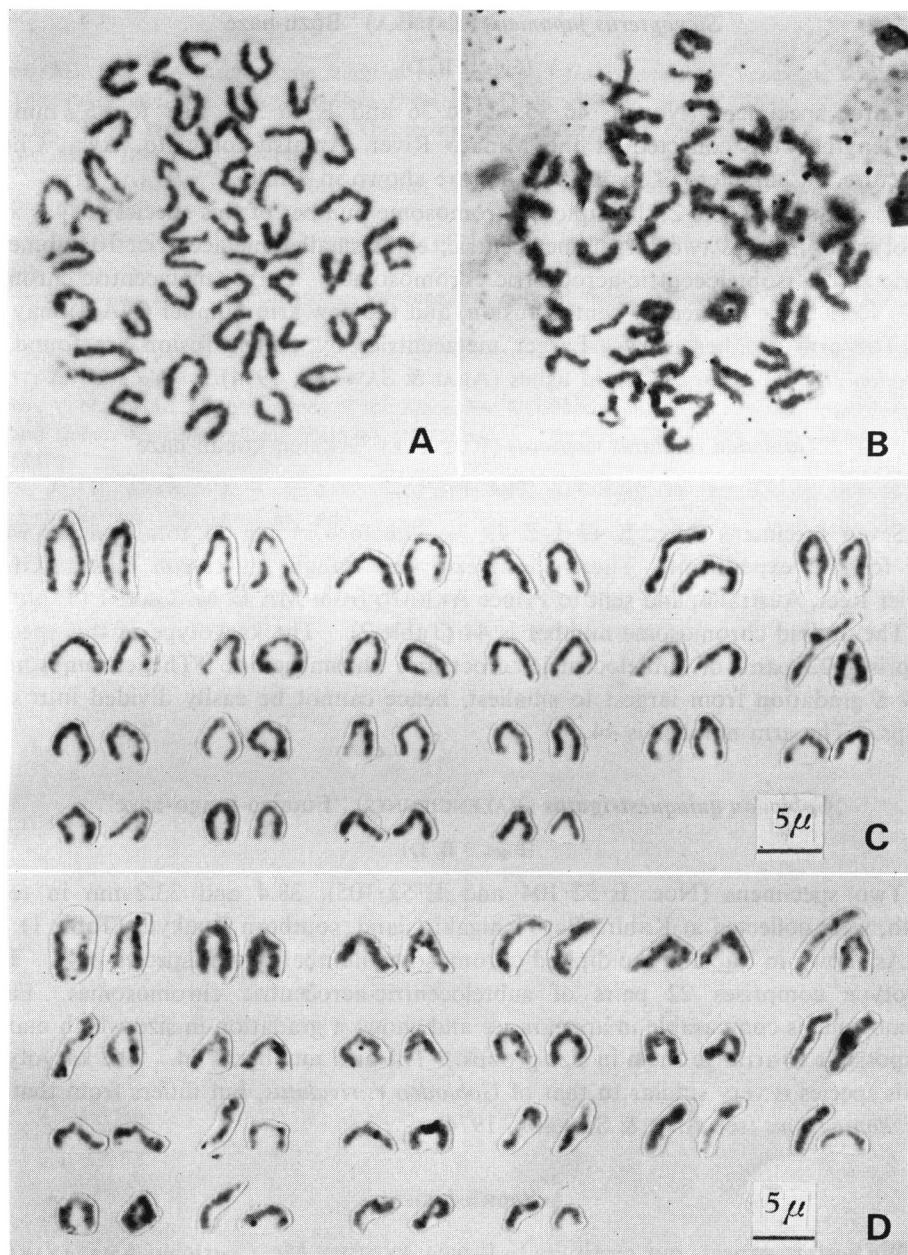


Fig. 3. Photomicrographs of mitotic metaphase chromosomes and karyotypes from gill epithelial cells of coral-gobies. — A, *Gobiodon r. rivulatus*, $2n=44$, $\times 1,390$; B, *Gobiodon quinquestrigatus*, $2n=44$, $\times 1,580$; C, *Gobiodon r. rivulatus*, from Fig. A, $NF=44$, $\times 1,600$; D, *Gobiodon quinquestrigatus*, from Fig. B, $NF=44$, $\times 1,740$.

Sicyopterus japonicus (TANAKA) "Bôzu-haze"

(Figs. 2 B, D)

Three specimens (Nos. E·46·35, E·46·36 and E·46·38), 73.8 to 85.2 mm in total length, were collected at the Minato River, Amatsu-kominato, Awa, Chiba Prefecture. Characters of material fishes are shown in Table 1.

As shown in Table 2, the diploid chromosome number of this species is 44. The karyotype comprises two larger metacentric, eight smaller metacentric, 10 submetacentric and 24 subtelocentric-acrocentric chromosomes. Larger metacentric chromosomes seem to be formed by centric fusion, and the new arm number (NAN) may be 46. The arm number is 64. Larger metacentrics by centric fusion are found in *Gobiodon citrinus* among gobioid fishes (ARAI & SAWADA, 1974).

Gobiodon rivulatus rivulatus (RÜPPELL) "Akaten-koban-haze"

(Figs. 3 A, C)

Seven specimens (Nos. E·49·1–E·49·7), 39.8 to 47.4 mm in total length, were used for the experiment. These specimens were caught at Heron Island, Great Barrier Reef, Australia, and sent to Prince AKIHITO from Mr. E. M. GRANT (Table 1).

The diploid chromosome number is 44 (Table 2). The karyotype of this species comprises 22 pairs of subtelocentric-acrocentric chromosomes. The chromosomes show a gradation from largest to smallest, hence cannot be easily divided into size groups. The arm number is 44.

Gobiodon quinquestrigatus (VALENCIENNES) "Futairo-sango-haze"

(Figs. 3 B, D)

Two specimens (Nos. E·52·104 and E·52·105), 38.4 and 33.2 mm in total length, were collected at Kabira Bay, Ishigaki Island, southern Ryukyus (Table 1).

As shown in Table 2, the diploid chromosome number of this species is 44. The karyotype comprises 22 pairs of subtelocentric-acrocentric chromosomes. Each chromosome is comparable in appearance and shows a gradation in size which makes it impossible to arrange them in size groups. The arm number is 44. The karyotype of this species is very similar to that of *Gobiodon r. rivulatus*, but differs from that of *Gobiodon citrinus* (see ARAI & SAWADA, 1974).

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