한국패류학회지: 제 12 권 1 호
Korean J. Malacol.
Vol. 12 (1) : 33 - 38, 1996

Karyological Study of *Gomphina (Macridiscus) veneriformis* (Bivalvia : Veneridae) in Korea

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= 국문요약 =

한국산 백합과 1종, 대복의 염색체 연구

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강원도 동해안에서 채집된 백합과 1종, 대복의 염색체수와 핵형을 분석하였다. 대복의 염색체수는 2n=38이며, 핵형의 구성은 3쌍의 metacentric과 16쌍의 submetacentric 염색체로 구성되었다.

INTRODUCTION

The family Veneridae includes many clams of commercial importance, because most of them belonging to this family can be edible. The chromosome numbers of venerid bivalves have been reported in the following species: *Mercenaria mercenaria* and *M. campechiensis* (Menzel & Menzel, 1965); *Saxidomus giganteus* and *S. nuttalli* (Ahmed & Sparks, 1967); *Choine cancellata* (Menzel, 1968); *Ruditapes decussatus* and *R. philippinarum* (Gerard, 1978); *Circe scripta, Irus mitus* and *Paphia vernicosa* (Ieyama, 1980); *Venerupis aurea, V. decussata, Venus gallina* and *V. verrucosa* (Rasotto *et al.*, 1981); *R. philippinarum* (Ieyama, 1985); *Chamelea gallina, V. aurea* and *R. philippinarum* (Corni & Trentini, 1986, 1990). In the venerid bivalves, chromosome numbers from 17 species in 12 genera have ranged from n=14 to n=19 (Table 1). Ieyama (1980) also reported the karyotypes of *Circe scripta, Irus mitus* and *Paphia vernicosa*.

This paper reports the chromosome number and karyotype of *Gomphina veneriformis* in Korea.

MATERIALS AND METHODS

20 specimens of *Gomphina veneriformis* employed in this study were collected in the East coast of Kangnung, Kangweon-Do in August 1995. The chromosome preparations were made on cells from gonad and gills by air-drying method described previously (Park & Kwon, 1991). After hypotonic treatment the materials were fixed and preserved in Carnoy's fixative (3:1 methyl alcohol : glacial acetic acid). Slides were stained with 5% Giemsa (Gurr R66) solution made up in 0.1 M phosphate buffer at pH 7.0 for eight minutes. The prepared slides were

observed under an Olympus microscope in the magnification of x 1,000. Morphological features were examined to compare karyotypes by the method of Leven *et al.*, (1964). Relative lengths (R.L) of chromosomes as a persentage of the total diploid chromosome length, and arm ratio (A.R) obtained by dividing the length of the short arm into that of the long arm of the chromosomes were calculated. Fundamental number (F.N.) was also calculated on the basis that metacentrics, submetacentrics and subtelocentrics have a value of four, and telocentrics with a value of two. Finally, chromosomes were arranged in homologous pairs, classified by their relative arm-length ratio and arranged according to decreasing sizes. Voucher specimens have been placed in the Department of Biology, Kangweon National University.

RESULTS

Chromosomes in ten cells of Gomphina veneriformis were observed in their gonads and gill tissues. The chromosome number was 2n=38 (Fig. 1). The lengths of mitotic metaphase chromosomes ranges from 3.12 ㎛ to 1.85 ㎛ in size. Fig. 1 shows the karyotype arranged by decreasing chromosome size and Table 2 gives the results of chromosome measurement. The karyotype observed from the metaphase chromosomes of gonads consists of three metacentric pairs and 16 submetacentric or subtelocentric pairs (Figs. 2, 3). The chromosomes are metacentric and submetacentric with fundamental number of 76. Mean total length of all chromosomes was 44.81±4.11 ㎛.

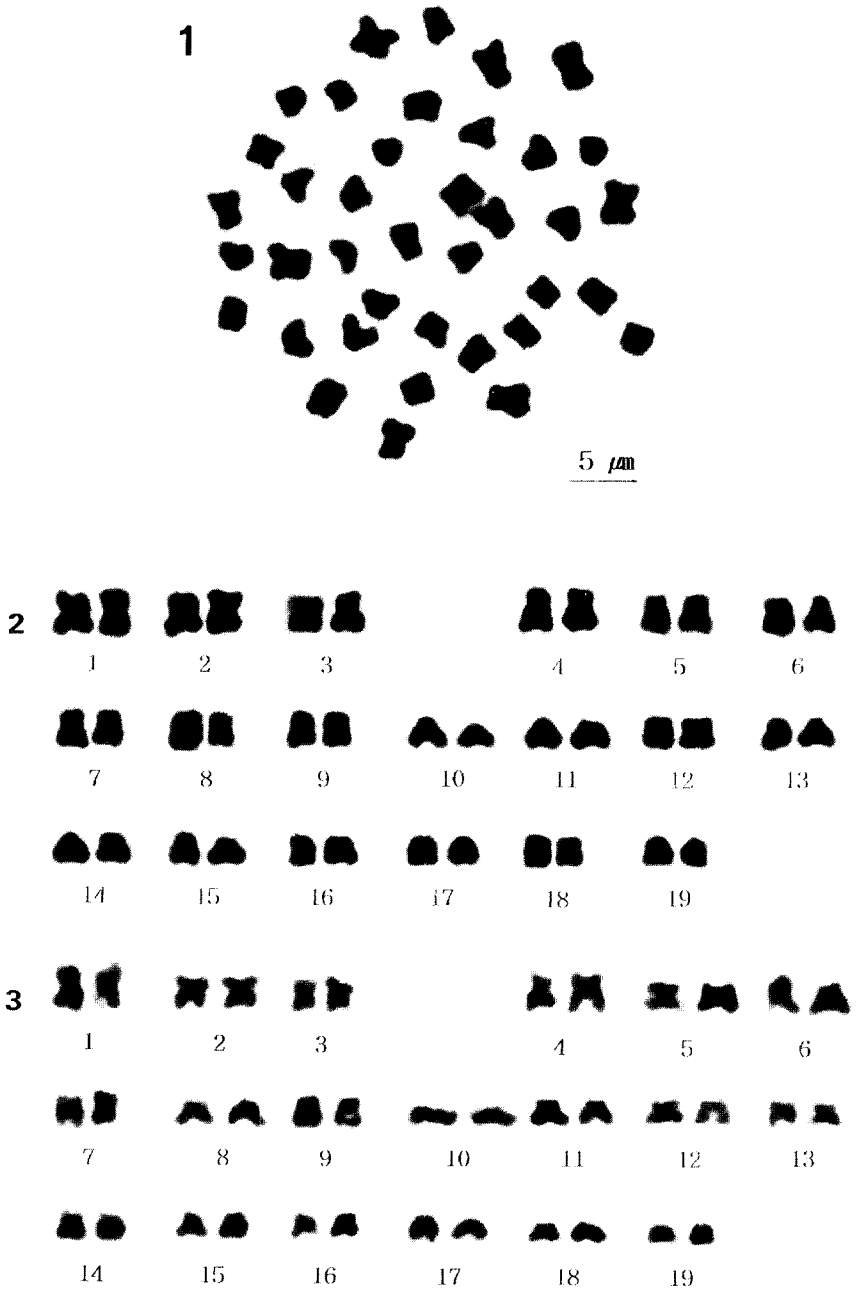
DISCUSSION

1. Chromosome numbers

A few chromosome studies of marine pelecypod mollusks have been done so far. In the venerid family, the chromosome numbers of 16 species are now available. Table 1 shows former investigations on the chromosomes of Veneridae. Early works of molluscan cytogenetics generally aimed only for counting chromosome numbers, often using meiotic preparations from various species. Chromosome numbers for Veneridae ranged from n=14 for *Tapes philippinarum* in Japan (Nishikawa & Hisatomi, 1959) and n=15 for *Venus gallina* in Italy (Rosotto *et al.*, 1981) to n=19 for most venerid species (Corni & Trentini, 1990; Ieyama, 1980, 1985; Menzel, 1968; Rosotto *et al.*, 1981). Nishikawa and Hisatomi (1959) reported the chromosomes in *Tapes japonica* (=*Ruditapes philippinarum*) based on the paraffin-sectioned materials of testes. Studies on chromosomes of molluscs date from the early studies, but due to inferior optical equipment and methods many of the early reports were inaccurate (Patterson, 1969). In this study, The one Korean species of family Veneridae, *Gomphina veneriformis*, had chromosome numbers of n=19 and 2n=38. This is the first chromosome study on this species. The great constancy of chromosome number has been pointed out for many molluscan groups (Burch, 1965) and has been assumed within families or superfamilies of the Bivalvia (Menzel, 1968; Patterson, 1969; Nakamura, 1985). Menzel (1968) has remarked that the chromosome number within a family is constant on the basis of the chromosome number of 23 species of marine pelecypod mollusks. Even though the chromosome number might be identical, it has been indicated that karyological approach is effective even on the lower taxa of mollusks.

2. Karyotypes

The studies of karyotype analysis of mollusks are very few. Burch(1968) has stated that the rarity of molluscan karyotype analyses is not due to lack of their value, but rather to the technical difficulties in obtaining adequate chromosome preparations. The karyotype is expected to serve even for the systematic analysis on the generic and the species levels in mollusks. Karyological investigation have



Figs. 1-3. Karyotypes of *Gomphina* (*Macridiscus*) *veneriformis*.

Fig. 1. Spermatogonial metaphase.

Fig. 2. Diploid karyotype in Fig. 1.

Fig. 3. Diploid karyotype of female chromosomes.

Table. 1. Chromosome numbers of the venerid bivalves reported previously to the present study

Species	Chromosome No./ arm number(FN) n	2n		Karyotype	Sources
Tapes philippinarum	14	28			Nishikawa & Hisatomi(1959)
Mercenaria mercenaria	19	38			Menzel & Menzel(1965)
M. campechiensis	19	38			Menzel & Menzel(1965)
Saxidomus giganteus	19	38			Ahmed & Sparks (1967)
S. nuttalli	19	38			Ahmed & Sparks (1967)
Chione cancellata	19	38			Menzel (1968)
Ruditapus decussatus		38			Gerard (1978)
R. philippinarum		38			Gerard (1978)
Circe scripta		38	76	19 M	Ieyama (1980)
Irus mitis	19	38	76	15 M + 4 SM	Ieyama (1980)
Paphia vernicosa	19	38	76	19 M / SM	Ieyama (1980)
Pitaria chione	19				Rosotto *et al.*, (1981)
Venerupis aurea	19				Rosotto *et al.*, (1981)
V. decussata	19	38			Rosotto *et al.*, (1981)
Venus gallina	15				Rosotto *et al.*, (1981)
V. verrucosa	19				Rosotto *et al.*, (1981)
Ruditapes philippinarum	19	38			Ieyama (1985)
Chamelea gallina	19	38			Corni & Trentini (1986)
Venerupis aurea	19	38	76	19 M / SM	Corni & Trentini (1990)
Ruditapes philippinarum	19	38	76	19 M / SM	Corni & Trentini (1990)

Remarks: M; metacentric chromosomes, SM; submetacentric

been previously carried out on 5 species in the Veneridae (Ieyama, 1980; Corni & Trentini, 1990). All of the chromosomes of family Veneridae have reported to be metacentric or meta/submetacentric chromosome in *Circe scripta, Irus mitis* and *Paphia vernicosa* in Japan (Ieyama, 1980) and *Venerupis aurea* and *Ruditapes philippinarum* in Italy (Corni & Trentini, 1990). White(1973) mentioned that metacentric chromosomes were generally belived to be stable components of the karyotypes whereas telocentric and/or acrocentrics as unstable. Nakamura (1985) suggested that in a family where several subtelocentric/telocentric chromosomes are found in the karyotype of many species the chromosomes are usually characterized by variation in their numbers. So, it is needed to make sure this points with further some more species in the Veneridae.

SUMMARY

The numbers of chromosome and karyotype in one species of Veneridae, *Gomphina veneriformis*, were analyzed. In this species, collected in the East

Table 2. Measurements of total length(㎛) and relative mean length(%) of metaphase chromosome pairs of *Gomphina veneriformis*

Chromosome pair	Total length	Relative length	Type
1	3.03±0.12	6.76±1.88	M
2	2.94±0.15	6.56±1.03	M
3	2.38±0.44	5.31±1.30	M
4	3.12±0.08	6.96±1.73	SM
5	2.79±0.12	6.22±1.20	SM
6	2.72±0.10	6.07±0.09	SM
7	2.59±0.31	5.77±1.59	SM
8	2.53±0.26	5.64±1.28	SM
9	2.36±0.35	5.26±1.68	SM
10	2.19±0.19	4.88±0.73	SM
11	2.14±0.08	4.78±1.71	SM
12	2.11±0.50	4.71±0.77	SM
13	2.10±0.41	4.69±0.45	SM
14	2.09±0.22	4.66±1.13	SM
15	2.06±0.28	4.60±0.18	SM
16	1.97±0.19	4.40±2.34	SM
17	1.94±0.06	4.33±1.39	SM
18	1.90±0.11	4.24±0.12	SM
19	1.85±0.14	4.13±0.54	SM

Based on measurements from 2 sets of karyotyped cells.

coast at the Kangweon-Do of Korea, chromosome numbers of 38 (2n) was observed. The chromosome complement of this species consists of three pairs of metacentric and 16 pairs of submetacentric chromosomes.

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