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Pleistocene Molluscan Fauna of the Sakishima Formation, Shima Peninsula, Central Japan

Junji Itoigawa* and Hidefumi Ogawa**

Abstract

The paleoecology of the molluscan fauna of the Pleistocene Sakishima Formation has been investigated. One hundred and fifty-eight species of fossil mollusks have been found in the sandy silt of the new outcrop at Kiba, Isobe-cho, Mie Prefecture, as listed in Table 1. The molluscan fauna consists of one main assemblage and three subordinate ones. The former is the *Clathrofenella-Varicorbula* assemblage which is composed mainly of inhabitants of a muddy or sandy-muddy bottom and is autochthonous in origin. The three subordinate assemblages are *Pygmaerota-Striarca* (main components: inhabitants of rocky or gravelly shores), *Anisocorbula-Babylonia* (main components: sand bottom dwellers) and *Sinusicola* (main components: estuary dwellers), and the conditions of their occurrences indicate that they are allochthonous.

The analysis of the molluscan fauna indicates that the sedimentary environment had the following properties:

1. Basin: bay with estuary.
2. Bottom character: mainly mud and sand in part; rocky or gravelly shore and estuary with muddy bottom in the vicinity of this area.
3. Salinity: normal salinity of sea water in the bay; brackish water in the estuary.
4. Depth: sublittoral, shallower than 30 m.
5. Water and current: coastal sea water predominant at bottom but oceanic water (warm current) present near the shore line.

INTRODUCTION AND ACKNOWLEDGMENTS

In 1967, the junior writer collected many molluscan fossils from the Pleistocene Sakishima Formation (Otuka 1927) exposed in a new outcrop made during road construction in the vicinity of Kiba, Isobe-cho, Mie Prefecture. The collections contained a larger number of molluscan species than were reported in previous studies (Matsushita 1932, Oinomikado 1933, Yamada 1963). In this paper, the molluscan fauna of the Sakishima Formation is discussed from the view point of paleoecology referring to other data on microfossils (Makiyama and Nakagawa 1941, Miki 1948, Shimakura 1969).

The writers are indebted to Dr. Jun Yamada of Mie University for providing information about the geology of the Sakishima Formation and to Dr. Samuel M. Savin of Case Western Reverse University for reading the manuscript.

GENERAL GEOLOGY

The Sakishima Formation, which has been named the Ugata Formation (Iizuka 1929) or Kiba Silt (Yamada 1963), forms the highest of the three Pleistocene terraces developed in the Shima Peninsula. The fossil locality is shown in Fig. 1, and Fig. 2 is the geologic columnar section showing the stratigraphic sequence at the outcrop. The lowermost siltstone bed in the outcrop yielded the molluscan fossils.

Two opinions concerning the age of the Sakishima Formation have been expressed recently. One is that of Nakagawa (1961) who states that the Sakishima Formation is of the Riss-Würm Interglacial age and belongs to his III terrace. The other opinion is that the Sakishima Formation is Mindel-Riss Interglacial age and correlates with the Atsumi

* Department of Earth Sciences, Nagoya University
** Biko Shaen Co. Ltd.

Formation of the Atsumi Peninsula (Quaternary Research Nagoya Group 1969). The writers support the latter idea on the basis of its stratigraphic position in the Shima Peninsula and also on the basis of the distinctive topography developed during erosion and dissection of the high level terrace. It may be necessary to check the properties of the volcanic ash layer in the formation tephrochronologically to make an age determination.

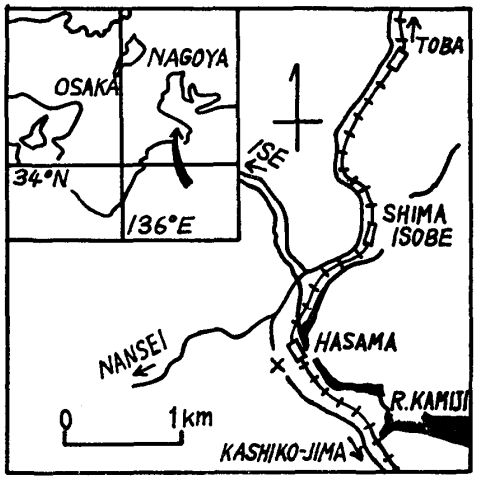

Fig. 1. Locality map.

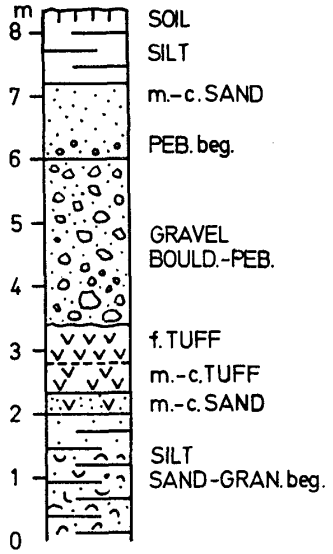

Fig. 2. Geologic columnar section.

MOLLUSCAN FAUNA

A. Faunal list

The list of species obtained from the Sakishima Formation is shown in Table 1 with the number of individuals, occurrences, and predominant, characteristic and extinct species. In this table, specific determination of minute shells, especially of the families Turridae and Pyramidellidae, was reserved.

The list of molluscan species is summarized below:

	number of species	number of specimens
specimens separated as identified species	123	5706
Pelecypoda	39	737
Scaphopoda	1	26
Gastropoda	83	4943
specimens separated as unidentified species	35	804
Pelecypoda	10	43
Scaphopoda	1	8
Gastropoda	24	753
specimens for which separation by species could not be made		417
Pelecypoda		6
Gastropoda		409
Polyplacophora		2
total	158	6927
other animals	5	
Solitary coral	1	1
Polychaeta	1	1
Balanid	1	1
Echinoid spine	1	1
Otolith	1	1

Table 1. Faunal list of mollusks from the Sakishima Formation. Abbreviations: A: autochthonous origin, C: characteristic species, E: extinct species, P: predominant species

Species name	Number of individuals	Occurrence	Characteristic
Nucula paulula A. Adams	2		
Barbatia (*Abarbatia*) *decussata* (Sowerby)	3		
Anadara (*Scapharca*) *broughtonii* (Schrenck)	4		
A. (*Tegillarca*) *granosa* Linné	2		C
Striarca (*Galactella*) *symmetrica* (Reeve)	16		
S. (*Spinearca*) *interplicata* (Grabau & King)	6		
S. (*Didimarca*) *tenebrica* (Reeve)	1		
Mabellarca hiratai Habe	2		C,E
Modiolus sp.	2		
Mytilus sp.	1		
Musculus (s.s.) sp.	1		
Pecten (*Notovola*) aff. *excavatus* (Anton)	14		
Ostrea denselamellosa Lischke	7		
Cardita leana Dunker	3		
Alvenius ojianus (Yokoyama)	150	A	P
Anisodonta (*Fulcrella*) *gouldi* (A. Adams)	1		
Cycladicama cumingii (Hanley)	13	A	
Anodontia stearnsiana (Oyama)	2		
Lucinoma annulata (Reeve)	13		
Pillucina pisidium (Dunker)	30		
Kellia aff. *minutissima* Habe	15		
Borniopsis tsurumaru Habe	2		
Mysella japonica (Yokoyama)	1		
M. sp. 1	1		
M. sp. 2	6		
Nipponomysella oblongata (Yokoyama)	1		
N. subtruncata (Yokoyama)	2		
Chama reflexa Reeve	2		
Vasticardium sp.	1		
Fulvia mutica (Reeve)	64	A	
Dinocardium braunsi (Tokunaga)	1		C,E
Circe sp.	1		
Microcirce dilecta (Gould)	4		
Saxidomus purpuratus (Sowerby)	9		
Sunetta (*Cyclosunetta*) sp.	1		
Dosinia (*Dosinella*) *penicillata* (Reeve)	27	A	
D. (*Phacosoma*) *japonica* (Reeve)	1		
Tapes (*Amygdala*) *philippinarum* (A. Adams & Reeve)	7		
Paphia (s.s.) *vernicosa* (Gould)	2		
Atactodea stricta (Gmelin)	19		C
Theora lata (Hinds)	1	A	
Pinguitellina pinguis (Hanley)	2		
Semelangulus miyatensis (Yokoyama)	1		
Macoma tokyoensis Makiyama	15		
Varicorbula yokoyamai Habe	230	A	P

Table 1. Continued

Species name	Number of individuals	Occurrence	Characteristic
Anisocorbula venusta (Gould)	50		
Venatomya truncata (Gould)	1		
Cryptomya busoensis Yokoyama	23		
Barnea (Umitakea) japonica Yokoyama	4		
Dentalium (Paradentalium) octangulatum Donovan	26		
"*Siphonodentalium*" sp.	8		
Nordotis gigantea (Gmelin)	1		
Scissurella staminea (A. Adams)	2		C
"*Acmaea*" sp.	2		C
Diodora mus (Reeve)	1		
Tegula rustica (Gmelin)	4		
Monodonta labio (Linné)	1		
Lunella granulata (Gmelin)	7		C
Astralium haematragum (Menke)	1		
Pictoneritina oualaniensis (Lessen)	14		
Littorina brevicula (Philippi)	5		
Sinusicola yendoi (Yokoyama)	32		
Assiminea castanea Westerlund	2		
A. estuarina Habe	2		
Paludinella sp.	81		P
Costalynia costulata (Dunker)	71		P
Pygmaeorota cingulifera (A. Adams)	200		P
P. duplicata (Lischke)	3		
Pseudoliotia pulchella (Dunker)	21		
Turritella kurosio Ida	209		P,C,E
Brochina glabella (A. Adams)	29		C
Batillaria multiformis (Lischke)	15		
Clathrofenella asperulata (A. Adams)	1200		P
Eufenella pupoides (A. Adams)	700		P
Scaliola bella A. Adams	3		
S. glareosa A. Adams	56		
Diala varia A. Adams	133		P
Australaba picta A. Adams	2		
Contumax kobelti (Dunker)	24		
Bittium alutraceum Gould	75		P
B. craticulatum Gould	4		
Neverita (Glossaulax) didyma (Röding)	7		
N. (G.) hosoyai Kira	5		
N. (G.) reiniana (Dunker)	21		
Tectonatica adamsiana (Dunker)	5		
Crepidula aff. *gravispinosa* Kuroda & Habe	1		
Siphopatella walshi (Reeve)	1		
Semicassis sp.	1		
Bedevina birileffi (Lischke)	36		
Rapana venosa (Valenciennes)	3		
Mancinella luteostoma (Holten)	2		

Table 1. Continued

Species name	Number of individuals	Occurrence	Characteristic
Mitrella bicincta (Gould)	3		
M. tenuis (Gaskoin)	2		
Mitroprifex collinsoni (A. Adams)	5		
Zafra pumilia (Dunker)	17		
Siphonalia sp. aff. *cassidariaeformis* (Reeve)	1		
Siphonalia sp.	1		
Enginopsis menkeana (Dunker)	1		
Babylonia japonica (Reeve)	5		
Hinia festiva (Powys)	2		
Niotha livescens (Philippi)	12		
Reticunassa japonica (A. Adams)	96		P
Sydaphera spenglerina (Deshayes)	1		
Inquisitor jeffreysii (Smith)	2		
Pseudotrema fortilirata (Smith)	1		
Paradrillia inconstans (Smith)	1		
Mangelia (*Rissomangelia*) *deshayesii* (Dunker)	40		
Cythara sp.	3		
Granuliterebra bathyraphe (Smith)	2		
"*Triphora*" sp. 1	4		
"*T.*" sp. 2	12		
"*T.*" sp. 3	26		
Turbiniscala replicata (Sowerby)	1		
Laeviscala angusta (Dunker)	8		
Cuspeulima ozawai (Yokoyama)	4		
Balcis cumingii (A. Adams)	1		
B. sp. 1	15		
B. sp. 2	13		
B. sp. 3	270		P
Mucronala exilis A. Adams	4		
Egilina mariellaeformis (Nomura)	1		
Chrysallida sp.	110		
Numaegilina gloria (Nomura)	2		
N. sp.	4		P
Miralda gemma (A. Adams)	11		
M. sp. 1	2		
M. sp. 2	3		
Oscilla circincta (A. Adams)	1		
O. lirata (A. Adams)	26		
Leucotina dianae (A. Adams)	1		
Actaeopyramis lauta (A. Adams)	26		
"*Odostomia*" sp.	55		
Syrnola subsinctella Nomura	126		P
S. aff. *kurumana* Yokoyama	9		C, E
Cingulina cingulata (Dunker)	2		
Turbonilla sp. 1	9		

Table 1. Continued

Species name	Number of individuals	Occurrence	Characteristic
T. sp. 2	2		
Sulcoturbonilla quantoana Nomura	19		
Chemnitzia sp. 1	22		
Ch. sp. 2	62		
Ch. sp. 3	6		
Paramormula sp.	48		
Dunkeria shigeyasui (Yokoyama)	70		
Tiberia dunkerii (Dall & Bartsch)	5		
Strigopupa strigosa (Gould)	300		P
Ringicula (Ringiculina) yokoyamai Takeyama	480		P
R. (R.) shimaensis Takeyama	108		P,C,E
Cylichnatys angusta (Gould)	53		
Coelophysis succincta (A. Adams)	51		
C. (Sulcoretusa) minima (Yamakawa)	250		P
C. concentrica (A. Adams)	39		
Pyrunculus tokyoensis Habe	6		
P. phialus (A. Adams)	4		
Rhizorus radiolus (A. Adams)	23		
Eocylichna braunsi (Yokoyama)	18		
Philine argentata (Gould)	4		
Acteocina exilis (Dunker)	4		
Decorifer yamakawai (Yokoyama)	200		P

B. Characteristics of the molluscan fossils

It is evident from the data in Table 1 that the molluscan fauna is comprised of four molluscan groups, each of which is different in its habitat and especially in the character of the bottom it inhabits. These four groups, listed in order of decreasing diversity are: muddy or sandy-muddy bottom dwellers (59 species); rocky or gravelly shore dwellers (32 species); sandy bottom dwellers (11 species); and estuary inhabitants (4 species). This analysis and the following ones concerning the bathymetric and geographical distribution are based on the ecologic studies of living populations done by Kuroda, Habe, Oyama and Inaba. The results are compared with those obtained from a study of the Kozakai and Hekkai faunas (Itoigawa 1964, Itoigawa and Nakayama 1968)

Bottom character	mud~sandy mud	sand	rock and gravel
Sakishima fauna			
number of species	59	11	31
percent of species	58.5	10.8	30.7
Kozakai fauna			
percent of species	62.1	15.1	22.8
Hekkai fauna			
percent of species	50.8	24.2	25.0

The bathymetric and geographic distributions of the fauna is considered both from the point of view of the whole fossil assemblage (W) and from the point of view of the two

main subassemblages, the muddy and sandy-muddy bottom dwellers (MS) and the rocky and gravelly bottom dwellers (RG).

Bathymetric distribution

(a) Range of distribution

		T	T_3~N_1	N_1	N_1~N_2	N_1~N_{3-4}
Sakishima fauna		4.5	40.6	22.5	25.2	7.2
〃	(W)	1.7	22.3	27.0	39.0	10.0
〃	(MS)	6.5	58.1	32.2	3.2	0.0
〃	(RG)	10.3	35.1	26.1	22.8	5.7
Kozakai fauna		8.5	35.8	22.7	23.6	9.4
Hekkai fauna						(in %)

(b) Maximum and minimum depth of distribution of each species

Maximum depth		T_0~T_2 T_3	N_1	N_2	N_3~N_4
Sakishima fauna	(W)	1.8	60.0	28.4	9.8
〃	(MS)	1.7	45.8	40.7	11.8
〃	(RG)	6.5	90.3	3.2	0.0
Kozakai fauna		8.1	61.7	24.2	5.8
Hekkai fauna		6.8	58.6	25.0	9.7

Minimum depth		T_0~T_2	T_3	N_1
Sakishima fauna	(W)	4.5	40.0	55.3
〃	(MS)	1.7	21.0	76.3
〃	(RG)	6.5	58.1	35.4
Kozakai fauna		8.1	36.0	55.9
Hekkai fauna		6.8	36.5	56.7

(in %)

Abbreviations:
T: tidal zone, T_0: supralittoral zone, T_1: upper intertidal subzone, T_2: middle intertidal subzone, T_3: lower intertidal subzone, N_1: euneritic zone (0~20–30 m), N_2: mesoneritic zone (20–30~50–60 m), N_3: subneritic zone (50–60~100–120 m), N_4: bathyneritic zone (100–120~200–250 m)

Geographic distribution

(a) Median of midpoint (Schenck and Keen, 1932)

			Pelecypoda
Sakishima fauna	(W)	33°31′N	33°30′N
〃	(MS)	33°57′N	34°13′N
〃	(RG)	30°48′N	–
Kozakai fauna		33°45′N	33°42′N
Hakkai fauna		33°00′N	32°42′N

(b) Distribution pattern

	JK_1	JK_2	J	W
Sakishima fauna				
number of species	32	26	54	7
percent of species	26.8	22.8	45.5	5.9
Kozakai fauna				
percent of species	19.8	31.4	40.0	5.8
Hekkai fauna				
percent of species	23.5	30.0	37.3	9.2

Abbreviations:
JK_1: Japonic-Kuroshio type-1 (0–36), JK_2: Japonic-Kuroshio type-2 (0–42), J: Japonic type (30–42), W: widely distributed type (~36–42~). Numerals indicate the geographic range north of the equator given in degrees of latitude along the Pacific coast area of Japan.

(c) Asiatic continental fauna (Miyadi, Kuroda and Habe, 1953)
18 species and about 15%
(Kozakai fauna: 25%, Hekkai fauna: 30%)

MOLLUSCAN ASSEMBLAGES AND THE SEDIMENTARY ENVIRONMENT

The foregoing analysis indicates that the Sakishima fauna consists of four assemblages, *Clathrofenella-Varicorbula*, *Pygmaeorota-Striarca*, *Anisocorbula-Babylonia* and *Sinusicola* assemblages. The following are the main elements in each assemblage, listed in order of abundance.

Clathrofenella-Varicorbula assemblage
Clathrofenella asperulata, Eufenella pupoides, Ringicula yokoyamai, Strigopupa strigosa, Coelophysis minima, Varicorbula yokoyamai, Turritella kurosio, Decorifer yamakawai, Alvenius ojianus, Syrnola subsinctella, Ringicula shimaensis, Reticunassa japonica, Dunkeria shigeyasui, Fulvia mutica, Scaliola glareosa, Cylichnatys angusta, Coelophysis succincta, Pillucina pisidium, Dosinia penicillata, Cryptomya busoensis.

Pygmaeorota-Striarca assemblage
Pygmaeorota cingulifera, Bittium alutraceum, Costalynia costulata, Mangelia deshayesii, Bedevina birileffi, Brochina glabella, Contumax kobelti, Zafra pumilia, Striarca symmetrica, S. interplicata, Ostrea denselamellosa.

Anisocorbula-Babylonia assemblage
Anisocorbula venusta, Atactodea stricta, Tapes philippinarum, Babylonia japonica, Microcirce directa, Eulima ozawai, Rapana venosa.

Sinusicola assemblage
Sinusicola yendoi, Assiminea castanea, A. estuarina.

The conclusions regarding the sedimentary environment are summarized in Table 2. The *Clathrofenella-Varicorbula* assemblage seems to be autochthonous in origin for a number of reasons. This assemblage is characteristic of the upper sublittoral (10 to 30 m depth) zone of a bay with a sandy or sandy-muddy bottom, and this is in accord with the muddy matrix in which the fossils are found. In addition, this is the main assemblage of the fauna and its constituents have well preserved shells. There is a complete spectrum of maturity represented in the shells of each species, ranging from immature to adult individuals.

Table 2. Sedimentary environment assumed by molluscan assemblage.

	Clathrofenella-Varicorbula A.	*Pygmaeorota-Striarca* A.	*Anisocorbula-Babylonia* A.	*Sinusicola* A.
Basin	bay upper sublittoral	seashore of bay littoral ~ upper sublittoral	bay up. sublittoral ~ (littoral)	estuary littoral
Bottom character	mud ~ sandy mud	rock or gravel	sand	mud ~ sandy mud
Salinity	normal salinity	normal salinity	normal salinity	brackish
Depth	N_1-(N_2) 20–30 m	T_3-N_1 0–10 m	N_1-(T_3) 10–20 m	T 0 m ±
Influenced water	coastal seawater	coastal ~ oceanic (warm current) seawater	coastal seawater	river water

In contrast, the other assemblages appear to be allochthonous in origin. The assemblages do not characteristically live in muddy bottom, but are found in a matrix indicative of deposition in such a bottom. Furthermore, they are neither abundant nor well preserved. Thus they are undoubtedly derived from nearby biotopes.

In conclusion, the sedimentary environment of the basin in which the siltstones of the Sakishima Formation was deposited had the following characteristics:

1. Basin: bay with estuary.
2. Bottom character: mainly mud or sandy-mud and sand in part; rocky or gravelly shore and estuary with muddy bottom in the vicinity of this area.
3. Salinity: normal salinity of sea water in the bay; brackish water in the estuary.
4. Depth: sublittoral, shallower than 30 m.
5. Water and current: coastal sea water predominant at bottom but oceanic water (warm current) present near the shore line.

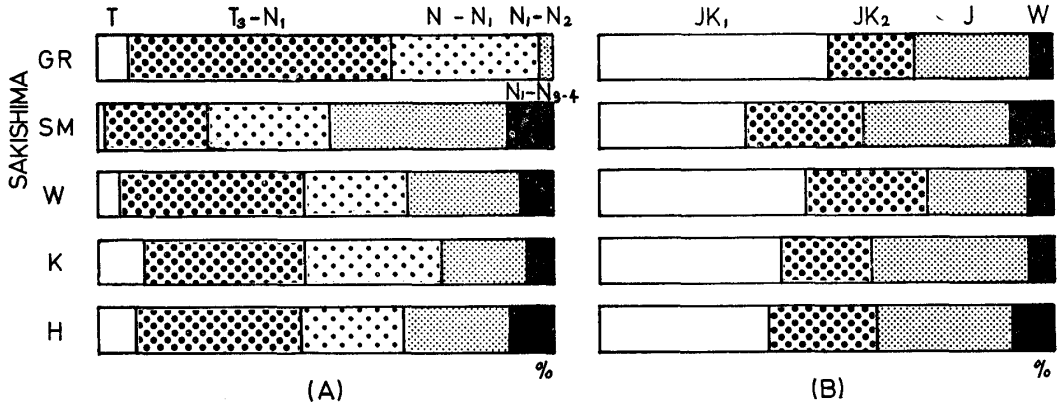

Fig. 3. Bathymetric distribution (A) and geographic distribution (B) in the Sakishima, Kozakai and Hekkai faunas.
Abbreviations: K: Kozai fauna, H: Hekkai fauna, other, abbreviations are shown in text.

COMPARISON WITH THE QUATERNARY AND LIVING MOLLUSCAN FAUNA IN THE OTHER DISTRICTS IN JAPAN

The degrees of taxonomic resemblance of the Sakishima fauna, and some Quaternary and living ones have been investigated using Simpson's method (Simpson, 1960). Table 3 shows the results of these calculations and the degrees of resemblance on the basis of Simpson's indices $R_{(1a)}$ and $R_{(2)}$. These indices are defined below.

$$R_{(1a)} = \frac{C}{N_1+N_2-C} \times 100$$

$$R_{(2)} = \frac{C}{N_1} \times 100$$

C : Total number of taxa found simultaneously in both one and the other faunas
N_1: Number of taxa only in one fauna
N_2: Number of taxa only in the other fauna

The following conclusions may be drawn from the data of Table 3.

Table 3. Taxonomic resemblance.
Abbreviations, W: whole fauna, P: Pelecypoda, G: Gastropoda

Formation	Age	Characteristic species	Division (Matrix, Bed etc.)	$R_{(1a)}$ S	K	H	$R_{(2)}$ S	K	H
Sakishima	Middle Pleist.	*Mabellarca hiratai* *Dinocardium braunsi* *Atactodea stricta* *Turritella kurosio* *Ringicula shimaensis*	W		29	24		54	39
			P		32	24		55	32
			G		26	22		53	50
Kozakai	Upper Pleist.	*Trisidos t. kiyonoi* *Anadara granosa*	W	29		34	54		46
			P	32		28	55		33
			G	26		39	53		63
Hekkai	Upper Pleist.	*Nipponarca bistrigata* *Trisidos t. kiyonoi* *Volachlamys h. awajiensis* *Crassostrea pes-tigris* *Standella capillacea*	W	24	34		39	57	
			P	24	28		32	68	
			G	22	39		50	51	
Atsumi	Middle Pleist.	*Trisidos t. kiyonoi*, *Chlamys halimensis*, *Ostrea pes-tigris*, *Volachlamys h. awajiensis*, *Paphia naganumana*, *Dinocardium braunsi*, *Cancellaria kobayashii*	Akasawa Silt	6	11	14	30	41	63
			Dosinia Bed	31	10	9	46	69	77
			Takamatsu Bed	14	15	26	23	21	39
Uemachi	Upper Pleist.	*Nipponarca bistrigata*, *Anadara granosa*, *Trisidos t. kiyonoi*, *Dinocardium braunsi*, *Standella capillacea*, *Turritella kurosio*, *Capulus yokoyamai*	W	21	26	40	30	33	48
			Matrix c.sand	17	25	38	29	34	51
			Matrix f.sand	22	30	38	36	41	53
Takinokawa	Upper Pleist.	*Dinocardium braunsi*	W	10	9	15	22	15	27
Tanabe Bay	Recent		P	10	9	18	10	9	20

1. The faunas of Sakishima and Kozakai have a strong taxonomic resemblance in spite of their different ages suggesting that the sedimentary environments of the two faunas were similar.

2. There is a greater resemblance of the fauna of the *Dosinia* bed of the Atsumi Formation to the Sakishima fauna than to any of the other faunas of the Atsumi Formation which are similar in age to the Sakishima.

3. There is lower degree of resemblance between the Sakishima fauna and the other faunas than between the Kozakai or Hekkai faunas and the others.

More extensive use of a test of this type would require closer control of the ages and exact natures of the faunas of the different districts.

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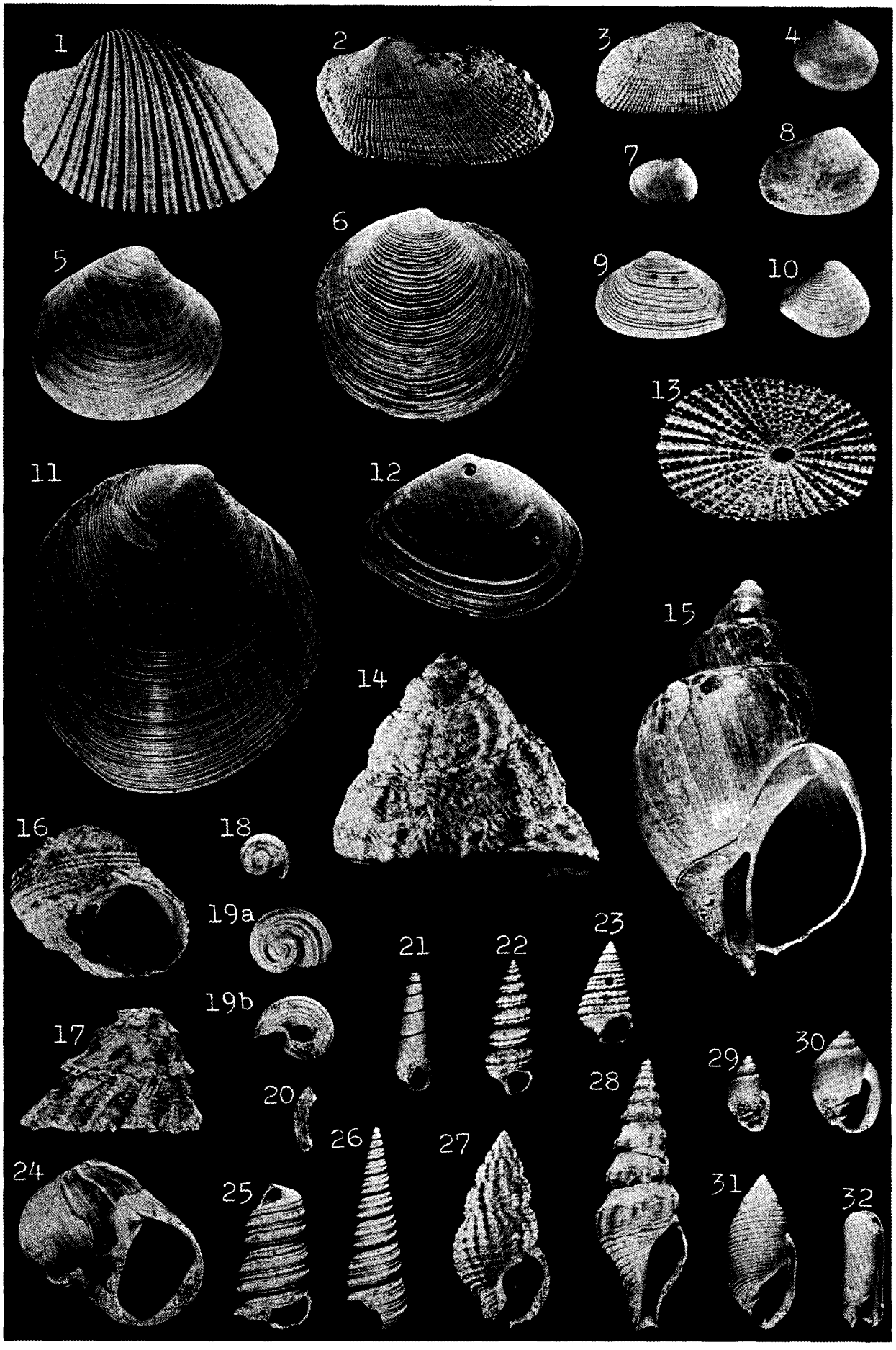
Plate 5

(All figures in natural size unless stated otherwise)

Fig. 1. *Mabellarca hiratai*
Fig. 2. *Barbatia decussata*
Fig. 3. *Striarca symmetrica* ×3
Fig. 4. *Kellia* aff. *minutissima* ×5
Fig. 5. *Cycladicama cumingii*
Fig. 6. *Lucinoma annulata*
Fig. 7. *Borniopsis tsurumaru* ×5
Fig. 8. *Atactodea stricta* ×5
Fig. 9. *Anisocorbula venusta* ×3
Fig. 10. *Varicorbula yokoyamai* ×5
Fig. 11. *Dosinia penicillata*
Fig. 12. *Macoma tokyoensis*
Fig. 13. *Diodora mus* ×3
Fig. 14. *Tegula rustica*
Fig. 15. *Babylonia japonica*
Fig. 16. *Lunella granulata*
Fig. 17. *Astralium haematragum*
Fig. 18. *Scissurella staminea* ×5
Figs. 19a, 19b. *Pygmaeorota cingulifera* ×5
Fig. 20. *Brochina glabella* ×5
Fig. 21. *Sinusicola yendoi* ×5
Fig. 22. *Clathrofenella asperulata* ×5
Fig. 23. *Bittium alutraceum* ×5
Fig. 24. *Neverita reiniana*
Figs. 25, 26. *Turritella kurosio* ×3
Fig. 27. *Reticunassa japonica* ×3
Fig. 28. *Inquisitor jeffreysii*
Fig. 29. *Ringicula shimaensis* ×5
Fig. 30. *Ringicula yokoyamai* ×5
Fig. 31. *Strigopupa strigosa* ×5
Fig. 32. *Eocylichna braunsi* ×3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