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Data Article

Radiolarian data from the submarine Vityaz Ridge, Northwest Pacific, for biostratigraphic and paleoceanographic reconstructions

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ABSTRACT

Radiolaria are marine siliceous microfossils used to reconstruct paleoceanographic and paleoclimatic events. This report presents a dataset obtained from radiolarian analysis for the biostratigraphic and paleoceanographic reconstructions of the submarine Vityaz Ridge and the Kuril-Kamchatka Trench paraxial zone. Data were obtained from dredge samples collected during the 4th cruise of the R/V Akademik A. Nesmeyanov in 1984 and during the 37th, 41st, and 52nd cruises of the R/V Akademik M. A. Lavrentyev in 2005, 2006, and 2010, respectively. Both new and previously published data on distribution of the Pleistocene radiolarian zones in the North Pacific are presented in this report.

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Specifications Table

Subject	Earth and Planetary Science
Specific subject area	Biostratigraphic and paleoceanographic reconstructions of the submarine Vityaz Ridge and the Kuril-Kamchatka Trench paraxial zone.
Type of data	Tables Figures Plate images
How data were acquired	The samples were obtained by dredging during the 4th cruise of the R/V Akademik A. Nesmeyanov and during the 37th, 41st, and 52nd cruises of the R/V Akademik M. A. Lavrentyev. The data were acquired by examining 25 glass slides containing radiolarian skeletons. The radiolaria were examined using a light microscope (LOMO Mikmed 6) at 300 × magnification and photographed using a Touptek photonics camera (FMA050). The skeletal morphology of the Radiolaria was studied using a JEOL JSM9064LV scanning electron microscope at the Laboratory of Micro- and Nano-research of the Analytical center of the Far East Geological Institute, Far East Branch of the Russian Academy of Science in Vladivostok, Russia.
Data format	Raw Analyzed
Parameters for data collection	The radiolarian diversity (number of species) and the species richness (composition, percentage of each species) were determined in the slides. The parameters of three morphologically different groups of radiolaria (Spumellaria, Nassellaria, and Collodaria) were calculated.
Description of data collection	The taxonomic composition of the Radiolaria and total radiolarian abundance were determined in the slides. Pleistocene radiolarian zone assemblages *Cycladophora sphaeris, Eucyrtidium matuyamai, Stylatractus universus*, and *Lychnocanoma sakaii* were determined [1]. The distribution of these zones in the North Pacific was determined based on published data from deep-water drilling sites and sediment cores, and our data were obtained from dredge samples.
Data source location	Institution: V. I. Il'ichev Pacific Oceanological Institute FEB RAS City: Vladivostok Country: Russian Federation Latitude and longitude: 43°12′ N, 131°55′ E
Data accessibility	With the article Repository name: Mendeley Data Data identification number: DOI: 10.17632/6knkwdcxb6.3 Direct link to the dataset: https://data.mendeley.com/datasets/6knkwdcxb6/3
Related research article	L.N. Vasilenko, Yu.P. Vasilenko, Pleistocene radiolarian biostratigraphy of the submarine Vityaz Ridge, Northwest Pacific, Marine Micropaleontology. 2021. Vol. 169, 102,040. P. 1–27. 10.1016/j.marmicro.2021.102040

Value of the Data

- This dataset provides quantitative data on high-rank Radiolaria taxa for studying changes in the paleoenvironment during the Pleistocene.
- The data can be helpful to paleontologists, geologists, and oceanologists studying the history of the development and evolution of the North Pacific.
- The presented data of the genera and species of radiolaria can be used to design a biostratigraphic radiolarian analysis and paleoceanographical reconstruction of the submarine Vityaz Ridge and the Kuril-Kamchatka Trench paraxial zone.

1. Data Description

Table 1 shows the dredge samples in which the assemblages of Pleistocene radiolarian zones were identified [1]. These dredge sample assemblages have been dated by comparing them to independently dated assemblages from other sources on the basis of similarity of them taxonomic

Table 1
Total radiolarian abundance (skeletons/$g_{dry\ sediment}$) and quantitative analysis of the high-rank Pleistocene radiolarian taxa (%) in the studied dredge samples.

Radiolarian zones	Dredge samples	Location	Total radiolarian abundance (skeletons/$g_{dry\ sediment}$)	Spumellaria (%)	Nassellaria (%)	Collodaria (%)	Unidentified radiolaria (%)
Lychnocanoma	LV52–5–2v-1	s.p	2950	24.0	69.5	–	6.5
sakaii	LV52–5–2b-1	s.p	1732	24.6	70.1	–	5.1
Stylatractus	LV52–1–7	s.p	few	*	–	–	–
universus	LV52–1–7a	s.p	few	*	–	–	–
	LV52–1–8a	s.p	few	*	*	–	–
	LV37–13–5	n.p	736	34.0	62.0	2.0	2.0
Eucyrtidium	LV37–32–1	B.G	1827	31.5	55.5	1.4	12.2
matuyamai	LV37–32–2a	B.G	2014	34.6	52.4	–	13.3
	LV37–32–2b	B.G	1972	32.8	55.5	–	11.5
	LV37–32–2v	B.G	1009	50.5	46.1	1.5	1.5
	N4–21/2–3	KKT p.z	2745	54.7	41.9	1.1	2.3
	LV52–9a	s.p	1596	57.4	15.3	19.2	7.7
	LV37–12–3	n.p	2966	61.1	29.8	1.7	6.7
	LV37–12–2	n.p	2636	64.3	29.6	5.3	2.6
	LV37–13–1	n.p	574	60.3	36.4	–	3.0
	LV37–13–3	n.p	few	*	*	*	*
	LV37–12–4	n.p	few	*	*	*	–
	LV37–12–4a	n.p	few	*	–	–	–
	LV41–1	s.p	few	*	–	*	–
	LV37–13–2	n.p	few	*	–	–	*
Cycladophora	LV37–20–1a	n.p	few	*	*	–	–
sphaeris	LV37–12–1c	n.p	413	*	*	–	–
	LV37–12–1a	n.p	few	*	*	–	*
	LV37–12–1	n.p	426	*	*	–	*

Note: *– presence of sporadic radiolarian taxa. Location of the dredge samples: s.p: southern plateau of the SVR, n.p: northern plateau of the SVR, B.G: Bussol Graben, and KKT p.z.: Kuril-Kamchatka Trench paraxial zone.

composition, presence of index specimens, and the quantitative characteristics of the radiolarians in the dredge samples. The total radiolarian abundance, quantitative analysis of high-rank radiolarian taxa (Spumellaria, Nassellaria, and Collodaria), and other unidentified radiolaria are also noted in this table.

Table 2 provides a taxonomic list of radiolaria identified in the dredge samples of the submarine Vityaz Ridge (SVR) and the Kuril-Kamchatka Trench paraxial zone. The genera and species richness of Spumellaria, Nassellaria, and Collodaria are also indicated.

Table 3 provides information on the distribution of the *Cycladophora sphaeris* Zone, *Eucyrtidium matuyamai* Zone, *Stylatractus universes* Zone, and *Lychnocanoma sakaii* Zone in the North Pacific. The table shows the deep-water drilling sites, sediment core, and dredge sites at which these zones were found.

Fig. 1 shows the content of radiolarian nine species (*Echimomma leptodermum* Jørgensen, *Stylatractus universus* Hays, *Streblacantha circumtexta* Jørgensen, *Spongopyle osculosa* Dreyer, *Spongotrochus glacialis* Popofsky, *Lychnocanoma sakaii* Morley et Nigrini, *Cycladophora davisiana* Ehrenberg, *Eucyrtidium matuyamai* Hays, and *Ceratospyris borealis* Bailey) in the Pleistocene sediments of the SVR and the Kuril-Kamchatka Trench paraxial zone. These species are of great stratigraphic and paleoceanographical significance.

Fig. 2 shows graphs based on data obtained from Table 1. It shows the change in total radiolarian abundance and the quantity of high-rank radiolarian taxa in the Pleistocene sediments of the southern and northern plateaus of the SVR, Bussol Graben, and the Kuril-Kamchatka Trench paraxial zone. Because the radiolarian microfauna sharply react to changes in salinity and water temperature, the presented data can be used for reconstructing paleoceanographic and paleoclimatic events.

Plate 1 modified from [1]. It shows the morphotypes and some taxa determined only up the genus.

Table 2
List of radiolarian taxa in the studied dredge samples.

Genus No.	Taxa No.	Taxon Name
		Collodaria
1.	1.	*Acrosphaera arktios* (Nigrini) F.1
	2.	*Acrosphaera arktios* (Nigrini) F.2
2.	3.	*Collosphaera* cf. *polygona* Haeckel
	4.	*Collosphaera elliptica* Chen et Tan
	5.	*Collosphaera* sp. F.1
	6.	*Collosphaera* sp. F.2
		Spumellaria
1.	1.	*Actinomma boreale* Cleve
2.	2.	*Amphytholonium* sp.
3.	3.	*Cenosphaera cristata* Haeckel
	4.	*Cenosphaera* sp.
4.	5.	*Cromydruppocarpus* cf. *esterase* Campbell et Clark
5.	6.	*Cromyechinus antarctica* (Dreyer)
6.	7.	*Cromyomma villosum* Haeckel
7.	8.	*Druppatractus ostracion* Haeckel
	9.	*Druppatractus pyriformis* (Bailey)
	10.	*Druppatractus birostractus praecursor* Gorbunov
8.	11.	*Echimomma leptodermum* Jørgensen
	12.	*Echinomma delicatulum* (Dogiel)
	13.	*Echimomma* sp.
9.	14.	*Euchitonia* sp.
10.	15.	*Haliomma* spp.
11.	16.	*Hexacontium pachydermum* Jørgensen
	17.	*Hexacontium* sp.
12.	18.	*Lithelius minor* Jørgensen
	19.	*Lithelius* sp.
13.	20.	*Ommatartus* sp.
14.	21.	*Prunopyle* spp.
15.	22.	*Rhizoplegma boreale* Cleve
16.	23.	*Sphaeropyle langii* Dreyer
17.	24.	*Spirema melonia* Haeckel
	25.	*Spirema* sp.
18.	26.	*Spirotunica spiralis* (Haeckel)
	27.	*Spirotunica* sp.
19.	28.	*Spongodiscus biconcavus* (?) Haeckel
	29.	*Spongodiscus gigas* Campbell et Clark
	30.	*Spongodiscus resurgens* Ehrenberg
	31.	*Spongodiscus* spp.
20.	32.	*Spongopyle osculosa* Dreyer
	33.	*Spongopyle setosa* Dreyer
21.	34.	*Spongotrochus glacialis* Popofsky
22.	35.	*Spongurus pylomaticus* Riedel
23.	36.	*Streblacantha circumtexta* Jørgensen
24.	37.	*Stylacontarium acquilonium* (Hays)
	38.	*Stylacontarium bispiculum* Popofsky
	39.	*Stylacontarium pachydermum* Chen, Zhang, Zhang, Liu
25.	40.	*Stylatractus neptunus* Haeckel
	41.	*Stylatractus universus* Hays
	42.	*Stylatractus* sp. F.1
	43.	*Stylatractus* sp. F.2
26.	44.	*Stylochlamidium bensoni* Kamikuri
	45.	*Stylochlamidium venustum* Bailey
27.	46.	*Stylodictya stellata* Bailey
	47.	*Stylodictya validispina* Jørgensen
28.	48.	*Stylosphaera* sp.
29.	49.	*Stylotrochus sol* Campbell et Clark
	50.	*Stylotrochus bipedius* Vasilenko
	51.	*Stylotrochus tripedius* Vasilenko
	52.	*Stylotrochus* sp.

(*continued on next page*)

Table 2 (*continued*)

Genus No.	Taxa No.	Taxon Name
30.	53.	*Tetrapyle* sp.
31.	54.	*Thecosphaera dedoensis* Nakaseko
	55.	*Thecosphaera* cf. *japonica* Nakaseko
	56.	*Thecosphaera microsphaera* Nakaseko
	57.	*Thecosphaera pseudojaponica* Nakaseko
	58.	*Thecosphaera tochigiensis* Nakaseko
32.	59.	*Tholospyra* sp. F.1
	60.	*Tholospyra* sp. F.2
		Nassellaria
1.	1.	*Androspyris* cf. *reticulidisca* Takahashi
2.	2.	*Arachnocorys* aff. *circumtexta* Haeckel
3.	3.	*Archipilium tanorium* Chen, Zhang, Zhang, Liu
4.	4.	*Artostrobium botryocyrtium* (Haeckel)
5.	5.	*Artostrobus annulatus* (Bailey)
6.	6.	*Bathropyramis ramosa* Haeckel
7.	7.	*Botryocampe inflata* (Bailey)
8.	8.	*Botryopera* spp.
9.	9.	*Botryostrobus aquilonaris* (Bailey)
	10.	*Botryostrobus auritus* (Ehrenberg)
	11.	*Botryostrobus* sp.
10.	12.	*Ceratocyrtis* sp.
11.	13.	*Ceratospyris borealis* Bailey
	14.	*Ceratospyris* sp.
12.	15.	*Cornutella hexagona* Haeckel
13.	16.	*Cycladophora davisiana* Ehrenberg
	17.	*Cycladophora* cf. *sphaeris* (Popova)
	18.	*Cycladophora cornuta (Bailey)*
	19.	*Cycladophora* spp.
14.	20.	*Dictyophimus* aff. *longipes* Haeckel
	21.	*Dictyophimus* cf. *hertwigii* Haeckel
	22.	*Dictyophimus macropterus* (Ehrenberg)
15.	23.	*Eucecryphalus* sp.
16.	24.	*Eucoronis nephrospyris* Haeckel
17.	25.	*Eucyrtidium matuyamai* Hays
	26.	*Eucyrtidium* cf. *teucherii* Haeckel
18.	27.	*Lamprocyclas* sp.
19.	28.	*Lithomelissa* cf. *campanulaeformis* Campbell et Clark
20.	29.	*Lithomitra hyperboreum* (Bailey)
	30.	*Lithomitra lineata* Ehrenberg
21.	31.	*Lophophaena* sp.
22.	32.	*Lychnocanoma grande brevis* (Campbell et Clark)
	33.	*Lychnocanoma sakaii* Morley et Nigrini
23.	34.	*Phormostichoartus* cf. *pitomorphus* Caulet
24.	35.	*Plectopyramis dodecomma* Haeckel
	36.	*Plectopyramis polypleura* Haeckel
25.	37.	*Pseudodictyophimus* cf. *crisae* (Ehrenberg)
	38.	*Pseudodictyophimus gracilipes* (Bailey)
26.	39.	*Pterocanium* cf. *bicorne* Haeckel
	40.	*Pterocanium* sp.
27.	41.	*Pterocodon* cf. *ornatus* Haeckel
28.	42.	*Pterocorys columba* Haeckel
	43.	*Pterocorys hirundo* Haeckel
	44.	*Pterocorys* sp. F.1
	45.	*Pterocorys* sp. F.2
29.	46.	*Sethocorys* sp.
30.	47.	*Stichopilium bicorne* Haeckel
31.	48.	*Theoconus* sp.
32.	49.	*Tripocyrtis* sp.
33.	50.	*Zugocyrcus* sp.
67	116	Total

Table 3
Distribution of the Pleistocene radiolarian zones in the North Pacific.

Radiolarian Zone	Sea of Japan and Japan Trench	Sea of Okhotsk	Kuril-Kamchatka Trench	Detroit Guyot	Meiji Guyot	Bering Sea	The Gulf of Alaska	Northwest Pacific	Shatsky Rise	Hess Rise	Northeast Pacific	Refs.
Lychnocanoma sakaii	DSDP Site 302; IODP Sites U1422–U1427 and U1430	Cores MD01–2415, LV28–42–4	Dredge site LV52–5		ODP Site 192	ODP Sites 188, 190, and 191						[1–4]
Stylatractus universus	DSDP Site 434–436 and 438; ODP Sites 1150 and 1151; IODP Sites 1422–1427 and 1430	MD01–2415	Dredge sites LV52–1 and LV37–13	ODP Site 884	ODP Site 192	ODP Sites 188, 190, and 191; IODP Site U1341	IODP Site U1417	DSDP Sites 193, 576, 579, 580, and 581; ODP Site 881A; dredge site B12–39	DSDP Sites 47, 49, 50, 305, 577, and 578	DSDP Site 310	DSDP Sites 173, 175, 177–179, 182, 183, and 186; ODP Site 887	[1–14]
Eucyrtidium matuyamai	DSDP Sites 302, 434–436, and 438; ODP Sites 1150 and 1151; IODP Sites 1423, 1424, 1425, and 1426	Core MD01–2415; dredge site 2356	Dredge sites N4–21/2–3, LV37–12, LV37–13, LV37–32, LV41–1, and LV52–9	ODP Site 884	ODP Site 192	ODP Sites 188, 190, and 191; IODP Sites U1340 and U1341; Core V21–156	IODP Site U1417	DSDP Sites 579 and 580; ODP Site 881A; Cores V20–119, V21–148, RC10–181, and RC10–182	DSDP Sites 47, 51, 305, 577, and 578; Core V21–145	DSDP Site 310	DSDP Sites 173 and 177–179; ODP Site 887; Cores V20–104, V20–105, V20–107, V20–108, V20–109, V21–172, and V21–173; RC10–203, RC10–206, RC11–170, and RC11–171	[1–15]
Cycladophora sphaeris (=*Cycladophora sakaii*)	DSDP Sites 302 and 438; ODP Sites 1150 and 1151; IODP Sites 1422–1426 and 1430	Dredge sites 2230 and 2362	Dredge sites LV37–12 and LV37–20	ODP Site 884	ODP Site 192	IODP Site U1341					ODP Site 887	[1,6,10–12]

Note: DSDP – Deep Sea Drilling Project, ODP – Ocean Drilling Program, IODP – Integrated Ocean Drilling Program, LV – cruises of the R/V Akademik M. A. Lavrentyev, N – cruise of the R/V Akademik A. Nesmeyanov, MD – cruise of the R/V Marion Dufresne, V – cruises of the R/V Vema, RC – cruises of the R/V Robert D. Conrad.

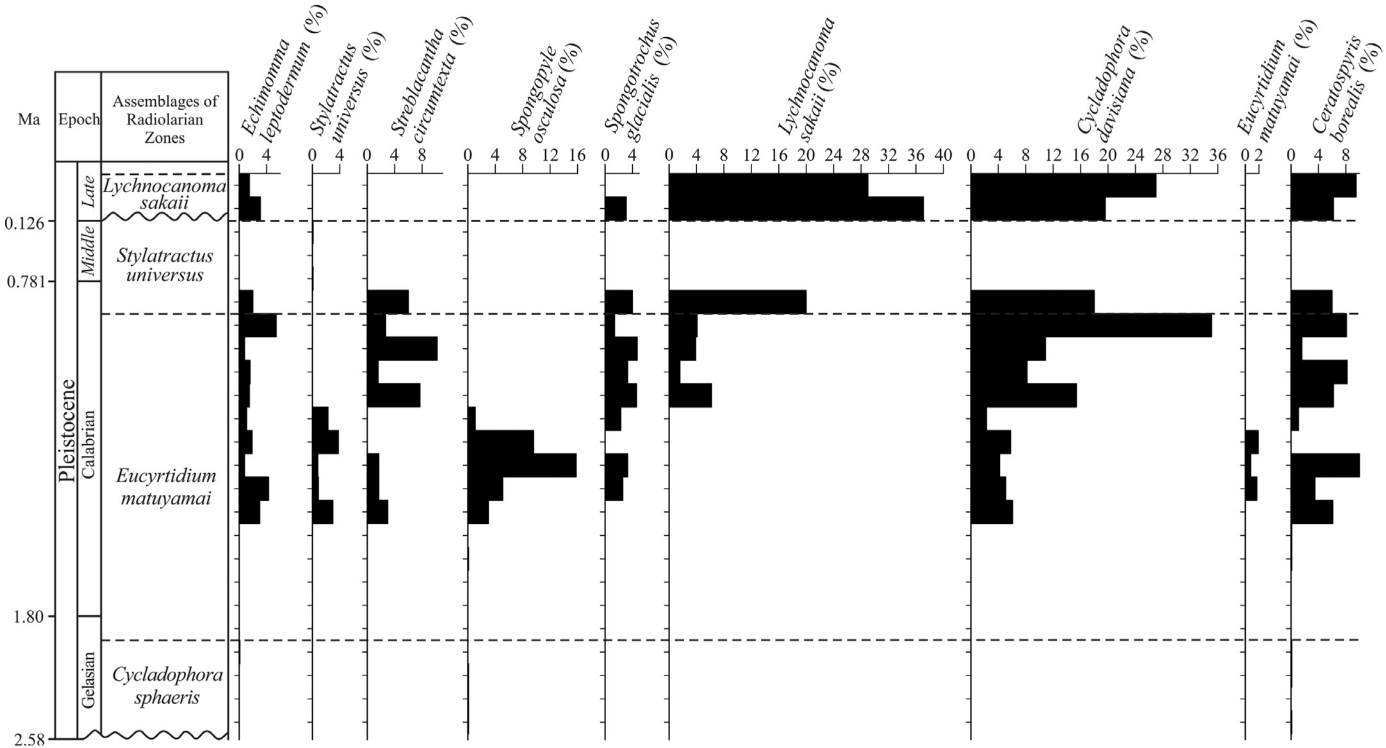

Fig. 1. Temporal changes in the relative abundance of selected radiolarian species in the studied deposits. The vertical sequence of dredge samples is shown in Table 1.

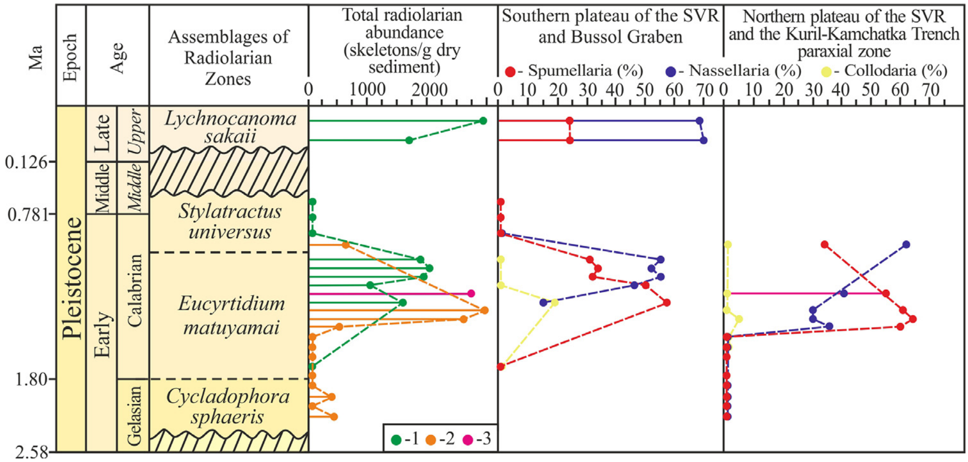

Fig. 2. Changes in the total radiolarian abundance and quantitative ratios of high-rank radiolarian taxa (Spumellaria, Nassellaria, and Collodaria) in Pleistocene sediments: −1 southern plateau of the SVR and Bussol Graben, −2 northern plateau of the SVR, and −3 the Kuril-Kamchatka Trench paraxial zone.

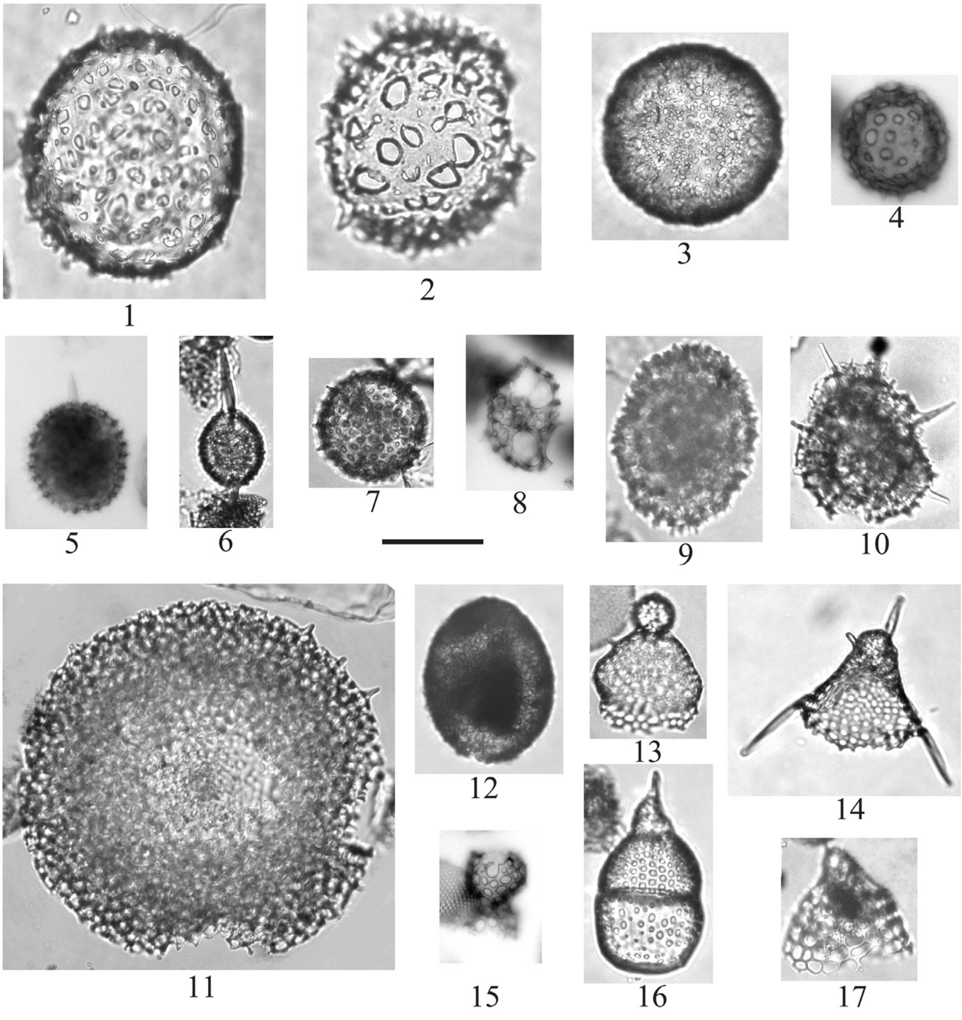

Plate 1. Pleistocene radiolarians from the studied deposits modified from [1] with additions. Scale bars = 100 μm. **1.** *Acrosphaera arktios* (Nigrini) F.1; Sample LV37–12–2. **2**. *Acrosphaera arktios* (Nigrini) F.2; Sample LV37–12–2. **3**. *Collosphaera* sp. F.1; Sample LV37–12–2. **4**. *Collosphaera* sp. F.2; Sample N4–21/2–3. **5**. *Stylatractus* sp. F.1; Sample N4–21/2–3. **6**. *Stylatractus* sp. F.2; Sample N4–21/2–3. **7**. *Haliomma* spp.; Sample LV37–32–2a. **8**. *Tetrapyle* sp.; Sample N4–21/2–3. **9.** *Tholospyra* sp. F.1; Sample LV52–5–2b-1. **10.** *Tholospyra* sp. F.2; Sample LV52–5–2b-1. **11.** *Stylotrochus* sp.; Sample LV37–12–3. **12**. *Prunopyle* spp.; Sample LV37–32–2v. **13.** *Pterocorys* sp. F.1; Sample LV37–12–2. **14**. *Pterocorys* sp. F.2; Sample LV37–32–2v. **15.** *Lophophaena* sp.; Sample N4–21/2–3. **16.** *Theoconus* sp.; Sample LV37–32–2v. **17.** *Eucecryphalus* sp.; Sample LV52–5–2v-1.

2. Experimental Design, Materials and Methods

2.1. Experimental design

The aim of this study was to design a Pleistocene biostratigraphic scheme based on radiolarians for the submarine Vityaz Ridge. The research plan included the following intems:

(1) Analysis of the radiolarian fauna in dredging samples;
(2) Analysis of the previously developed radiolarians biostratigraphic schemes for adjacent areas of the northwestern Pacific to the studied region.
(3) Comparison of radiolarian assemblages identified in samples with assemblages of radiolarian zones established in previous studies in the northwestern Pacific.
(4) To design of a radiolarians biostratigraphic scheme for the studied region.
(5) Verification of the designed radiolarians scheme by correlation with schemes using other biostratigraphic methods (diatoms, silicoflagellates) for the region.
(6) On the basis of the designed scheme and radiolarian assemblages, identify the features of the evolution of the Vityaz Ridge in the Pleistocene.

2.2. Materials

In this study, 25 dredge samples were analyzed from the SVR (24 samples) and the southern part of the Kuril-Kamchatka Trench paraxial zone opposite the Bussol Strait (1 sample) (Table 1). These samples were collected during the 4th cruise of the R/V Akademik A. Nesmeyanov in 1984 and during the 37th, 41st, and 52nd cruises of the R/V Akademik M.A. Lavrentyev in 2005, 2006, and 2010, respectively.

2.3. Preparation and counting

We prepared the slides according to the methods described by Tochilina [2]:

(1) Each bulk sediment sample was weighed on high-precision scales (WAGA TORSYJNA -WT).
(2) It sediment sample was disaggregated by boiling in a 0.002 M solution of sodium pyrophosphate for 15–20 min.
(3) After boiling, the samples were washed through a sieve a 40 μm mesh.
(4) The fraction with >40 μm diameter was dried and weighed.
(5) Of this fraction, an aliquot of approximately 20 mg was separated and weighed too.
(6) This aliquot was placed on a glass slide (25 mm × 75 mm × 1.2 mm), added two drops of Canada balsam on top, and covered with a cover glass (24 mm × 24 mm × 0.17 mm).
(7) The finished slide was placed under a fume hood for 24 h.

We examined the radiolaria on the slides using a light microscope (LOMO Mikmed 6) at 300 × magnification. We determined diversity of radiolaria (i.e., the number of species) and species richness of radiolaria (i.e., composition, as percentage of each species) in each slide. Then, we calculated the total radiolarian abundance (TRA) (i.e., the number of skeletons) as follows [1]:

$$\mathrm{TRA} = \left(\mathrm{n_{total}} \times \mathrm{w_{fraction}}\right) / \left(\mathrm{w_{sample}} \times \mathrm{w_{portion}}\right)$$

where n_{total} is the total number of skeletons on the slide; $w_{fraction}$ is the weight of the >40 μm fraction (g); w_{sample} is the weight of the dry sediment sample (g); and $w_{portion}$ is the weighed portion of the >40 μm fraction (g). The unit of TRA is [skeleton/$g_{\mathrm{dry\ sediment}}$]

We ranked of the radiolarian preservation as follows:

poor – > 50% of the skeletons were broken and/or exhibited signs of dissolution;

moderate – 25–50% of the skeletons were broken and/or exhibited signs of dissolution;
good – $<$ 25% of the skeletons were broken and/or exhibited signs of dissolution.

Poorly preserved radiolarians were classified as "Unidentified radiolaria" (Table 1).

We photographed the radiolarian skeletons using the microscope (LOMO Mikmed 6) with a Touptek photonics camera (FMA050).

Also the skeletal morphologies of the radiolarians were studied using a JEOL JSM9064LV scanning electron microscope at the Laboratory of Micro- and Nano-research of the Analytical center of the Far East Geological Institute, Far East Branch of the Russian Academy of Science in Vladivostok, Russian Federation. For this, radiolarian skeletons were selected from dry sediment using a metal needle and attached on special posts (1×1 cm) to carbon tape, 10–15 skeletons in a row. The samples were sputtered with carbon. A total of about 100 radiolarian skeletons were selected and examined using a scanning electron microscope.

Collections of radiolarian skeletons are kept in Laboratory of Geological Formations, V. I. Il'ichev Pacific Oceanological Institute FEB RAS, Vladivostok, Russian Federation.

2.4. Radiolarian zonation and datum levels

The dredge sample radiolarian assemblages have been dated by comparing them to independently dated assemblages from other sources on the basis similarity of them taxonomic composition: presence of index specimens, and other species - stratigraphic markers and also the quantitative characteristics of the radiolarians in the dredge samples. These assemblages mainly agreed with radiolarian zones proposed by Hays [5], Motoyama [6], and Kamikuri et al. [4]: *Cycladophora sphaeris, Eucyrtidium matuyamai, Stylatractus universus*, and *Lychnocanoma sakaii* zones. Kamikuri et al. [11] and Matul [3] established the age boundaries of these zones.

Supplementary

https://data.mendeley.com/datasets/6knkwdcxb6/3

Ethics Statement

Not applicable.

Declaration of Competing Interest

The author declares that they have no known competing financial interests or personal relationships which have or perceived to have influenced the work reported in this article.

Data Availability

Radiolarian data from the submarine Vityaz Ridge, Northwest Pacific, for biostratigraphic and paleoceanographic reconstructions_Tables (Original data) (Mendeley Data).

CRediT Author Statement

Lidiya Nikolaevna Vasilenko: Visualization, Writing – original draft.

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