

4. DATA REPORT: LATE OLIGOCENE AND EARLY MIOCENE RADIOLARIANS, SITES 1218 AND 1219, CENTRAL PACIFIC¹

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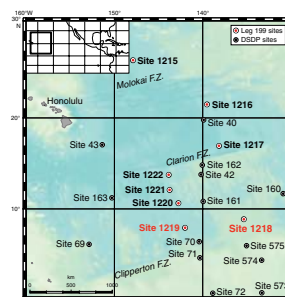
INTRODUCTION

During Ocean Drilling Program (ODP) Leg 199, sediments were recovered from eight sites in the Central Pacific. Late Oligocene and early Miocene radiolarians are common to abundant and moderately well preserved in Cores 199-1218A-8H through 11H and 199-1219A-5H through 9H. More than 110 radiolarian species were encountered during this study. Of these species, 100 are identifiable forms and the rest are undescribed or unfamiliar forms. This report presents the relative abundances of described forms from the upper Oligocene to lower Miocene sediments.

MATERIAL AND METHODS

A series of upper Oligocene to lower Miocene calcareous ooze was drilled at Sites 1218 (8°53.378' N, 135°22.00' W) and 1219 (7°48.019' N, 142°00.940' W) during Leg 199 (Fig. F1). The water depths at these sites are 4828 m and 5063 m, respectively. Sediments recovered from these sites are predominantly nannofossil ooze with planktonic foraminifers, radiolarians, and clay. We analyzed 75 samples from Site 1218 and 147 samples from Site 1219. Sample preparation for microscopic examination followed the standard techniques described by Sanfilippo et al. (1985). All samples were treated with hydrogen peroxide and hydrochloric acid and sieved at 63 µm. Remaining residues were removed and dried. The clean sample was divided into subsamples using a plankton

F1. Locations of Central Pacific sites, p. 11.



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splitter to attain an optimal concentration. A strewn slide of all particles in the split sample was prepared. Several drops of Canada balsam were placed on top of the slide, and a cover glass was mounted to the slide. All radiolarians were counted under a light microscope with a magnification of 250× until the total exceeded 500.

RESULTS

More than 110 radiolarian species were encountered during this study. Of these species, 100 are identifiable forms (see the “Appendix,” p. 7; Tables T1, T2) and the rest are undescribed or unfamiliar forms. The zonal scheme of Sanfilippo and Nigrini (1998) was adopted for this biostratigraphic study. Abbreviations used in this study to express events include the following:

- ET = evolutionary transition.
- FO = first occurrence.
- LO = last occurrence.

The concept of evolutionary transition follows that of Sanfilippo and Nigrini (1998).

Hole 1218A

The *Stichocorys delmontensis* Zone (Zone RN2) is defined by the interval from the FO of *Stichocorys wolffii* (top) to the LO of *Theocyrtis annosa* (base) (17.92–20.53 Ma). Zone RN2 was recognized between Sample 199-1218A-8H-2, 25–27 cm (uppermost sample in this study; 66.95 meters below seafloor [mbsf]), and 8H-6, 25–27 cm (72.95 mbsf). The *Cyrtocapsella tetrapera* Zone (Zone RN1) is the interval from the LO of *T. annosa* (top) to the FO of *C. tetrapera* (base) (20.53–23.62 Ma). Zone RN1 was identified from Sample 199-1218A-8H-6, 78–80 cm, to 9H-5, 72–74 cm (73.48–81.42 mbsf). The *Lychnocanoma elongata* Zone (Zone RP22) is defined as the interval from the FO of *C. tetrapera* (top) to the FO of *L. elongata* (base) (23.62–24.6 Ma). Zone RP22 was identified from Sample 199-1218A-9H-5, 122–124 cm, to the lowermost sample in this study (81.92–103.42 mbsf).

The most abundant species throughout the core is *Tholospyris anthophora*, which occurs in all samples at highly fluctuating abundances between 17.0% and 48.0% (average = 26.5%). *T. anthophora* has high abundances in the upper part of Zone RN1 (73.95–76.92 mbsf) and the middle part of Zone RP22 (93.43–95.92 mbsf). Next in relative abundance are *Lithocampe subligata*, *Lophocyrtis nomas*, and *C. tetrapera*. *L. subligata* varies between 0% and 22.6% (average = 7.4%). *L. nomas* constitutes 0%–35.4% (average = 13.4%). *C. tetrapera* occurs during Zones RN1 and RN2 and varies between 8.6% and 24.4% (average = 16.7%).

Hole 1219A

Zone RN2 was recognized between Sample 199-1219A-5H-1, 30–32 cm (uppermost sample in this study; 34.80 mbsf), and 5H-4, 130–132 cm (40.30 mbsf). Zone RN1 was found from Sample 199-1219A-5H-5, 30–32 cm, to 6H-3, 125–127 cm (40.80–48.25 mbsf). Zone RP22 was identified from Sample 199-1219A-6H-3, 130–134 cm, to 8H-2, 30–32 cm (48.30–64.80 mbsf). The *Dorcadospyris ateuchus* Zone (Zone RP21) is

T1. Relative abundances of select radiolarian species, Site 1218, p. 12.

T2. Relative abundances of select radiolarian species, Site 1219, p. 13.

the interval between the FO of *L. elongata* and the ET of *D. ateuchus* (base) (24.6–28.8 Ma). Zone RP21 was identified from Sample 199-1219A-8H-2, 77–79 cm, to the lowermost sample in this study (9H-7, 30–32 cm) (65.27–81.80 mbsf).

The relative abundances of the dominant species show large fluctuations. The most abundant species throughout the core is *T. anthophora*, which occurs in all samples at highly fluctuating abundances between 8.4% and 51.2% (average = 25.4%). *T. anthophora* has high abundances in Zone RN2 to the upper part of Zone RN1 (34.80–43.80 mbsf) and the middle part of Zone RP22 (55.60–59.64 mbsf). Next in relative abundance are *L. subligata*, *L. nomas*, *C. tetrapera*, and *Stichocorys delmontensis*. *L. subligata* varies between 0% and 38.6% (average = 12%). *L. nomas* constitutes 0%–37.4% (average = 13.5%). *L. subligata* has peaks in the upper part of Zone RP22 (50.77–50.80 mbsf). *L. nomas* has high abundances in the lowermost part of Zone RP21 (81.30–81.80 mbsf). *C. tetrapera* occurs during Zones RN1 and RN2 and varies between 5.2% and 27.6% (average = 16.4%). *C. tetrapera* has peaks in the upper part of Zone RN2 (36.30 mbsf). *S. delmontensis* was recognized in the upper part of Zone RN2 (34.80–35.80 mbsf), ranging from 0.6% to 29.0%.

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APPENDIX

Species List

- Acrobotrys disolenia* Haeckel, 1887, p. 1114, pl. 96, fig. 10.
- Acrocubus octopylus* Haeckel, 1887, p. 993, pl. 82, fig. 9.
- Acrosphaera spinosa echinoides* Haeckel: Bjørklund and Goll, 1979, p. 1311, pl. 1, figs. 12, 13 (non figs. 7, 10, 11); pl. 4, figs. 1–4, 7, 8.
- Amphistylus angelinus* (Campbell and Clark): Chen, 1975, p. 453, pl. 21, figs. 3, 4.
- Amphymenium amphistylium* Haeckel, 1887, p. 520, pl. 44, fig. 9.
- Anthocyrtidium adiaphorum* Sanfilippo and Riedel, 1992, p. 25, pl. 1, figs. 14, 15; pl. 4, figs. 1, 2.
- Anthocyrtidium marieae* O'Connor, 1997b, p. 109, pl. 2, figs. 5–8; pl. 5, figs. 9–13.
- Artophormis gracilis* Riedel, 1959, p. 300, pl. 2, figs. 12, 13.
- Axoprunum bispiculum* (Popofsky): Takemura, 1992, p. 741, pl. 1, figs. 1, 2.
- Bathropyramis woodringi* Campbell and Clark: Motoyama, 1996, p. 256.
- Botryocyrtis scutum* (Harting): Nigrini, 1967, p. 52, pl. 6, figs. 1a–1c.
- Botryopyle dictyocephalus* Haeckel group: Riedel and Sanfilippo, 1971, p. 1602, pl. 1J, figs. 21–26; pl. 2J, figs. 16–18; pl. 3F, figs. 9–12.
- Botryostrobus hollisi* O'Connor, 1997b, p. 105, pl. 1, figs. 9–12; pl. 5, figs. 1–4.
- Calocyclas monumentum* Haeckel, 1887, p. 1385, pl. 73, fig. 9.
- Calocyclella robusta* Moore, 1971, p. 743, p. 10, figs. 5, 6.
- Calocyclella serrata* Moore, 1972, p. 148, pl. 2, figs. 1–3.
- Calocyclella virginis* (Haeckel): Riedel and Sanfilippo, 1970, p. 535, pl. 14, fig. 10.
- Carpocanium rubyae* O'Connor, 1997b, p. 107, pl. 2, figs. 1–4; pl. 5, figs. 5–8.
- Carpocanopsis cingulata* Riedel and Sanfilippo: Sanfilippo and Riedel, 1973, p. 531.
- Carpocanopsis favosa* (Haeckel): Sanfilippo and Riedel, 1973, p. 531.
- Centrobotrys petrushevskayae* Sanfilippo and Riedel, 1973, p. 532, pl. 36, figs. 12, 13.
- Clathrocanium sphaerocephalum* Haeckel, 1887, p. 1211, pl. 64, fig. 1.
- Cornutella profunda* Ehrenberg: Riedel, 1958, p. 232, pl. 3, figs. 1, 2.
- Cycladophora conica* Lombardi and Lazarus, 1988, p. 105, pl. 3, figs. 1–16.
- Cyrtocapsella cornuta* (Haeckel) in Nigrini and Lombardi, 1984, p. N101, pl. 23, fig. 1.
- Cyrtocapsella tetrapera* (Haeckel): Nigrini and Lombardi, 1984, p. N109, pl. 23, fig. 5.
- Dendrospyris binapertonis* Goll, 1968, p. 1420, pl. 173, figs. 5, 6, 10, 11; text-fig. 8.
- Dendrospyris bursa* Sanfilippo and Riedel: Sanfilippo et al., 1973, p. 217, pl. 2, figs. 9–13.
- Dendrospyris inferispina* Goll, 1968, p. 1421, pl. 174, figs. 5–8, 10; text-fig. 8.
- Dendrospyris megalcephalis* Chen, 1975, p. 455, pl. 14, figs. 3–5.

- Dendrospyris pannosa* Goll, 1968, p. 1421, pl. 173, figs. 13–15, 19; text-fig. 8.
- Dendrospyris pododendros* (Carnevale): Goll, 1968, p. 1422, pl. 174, figs. 1–4, text-fig. 8.
- Dictyocoryne profunda* Ehrenberg, 1860, p. 767.
- Didymocyrtis bassanii* (Carnevale): Sanfilippo and Riedel, 1980, p. 1010.
- Didymocyrtis prismatica* (Haeckel): Sanfilippo and Riedel, 1980, p. 1010.
- Dorcadospyris ateuchus* (Ehrenberg): Riedel and Sanfilippo, 1970, pl. 15, fig. 4.
- Dorcadospyris forcipata* (Haeckel): Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 7.
- Dorcadospyris papilio* (Riedel): Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 5.
- Dorcadospyris platyacantha* (Ehrenberg): Sanfilippo and Riedel, 1973, p. 528, pl. 17, figs. 1–15; pl. 33, fig. 2.
- Dorcadospyris praeforcipata* Moore, 1971, p. 738, pl. 9, figs. 4–7.
- Dorcadospyris simplex* (Riedel): Riedel and Sanfilippo, 1970, p. 523, pl. 15, fig. 6.
- Drupptractus coronatus* (Ehrenberg): Haeckel, 1887, p. 326.
- Eucyrtidium anomalum* (Haeckel): Haeckel, 1862, p. 323, pl. 7, figs. 11–13.
- Eucyrtidium diaphanes* Sanfilippo and Riedel: Sanfilippo et al., 1973, p. 221, pl. 5, figs. 12–14.
- Eucyrtidium hexagonatum* Haeckel, 1887, p. 1489, pl. 80, fig. 11.
- Excentrococcus annulatus* Dumitrica, 1978, p. 238, pl. 2, fig. 12; pl. 5, figs. 19, 23.
- Excentrosphaerella sphaeroconcha* Dumitrica, 1978, p. 238, pl. 5, figs. 17, 18, 22.
- Giraffospyris annulispina* Goll, 1969, p. 331, pl. 57, figs. 11, 12, 15–17.
- Giraffospyris circumflexa* Goll, 1969, p. 332, pl. 60, figs. 1–4; text-fig. 2.
- Giraffospyris laterispina* Goll, 1969, p. 334, pl. 58, figs. 15, 16, 20, 21.
- Heliodiscus echiniscus* Haeckel, 1887, p. 448, pl. 34, fig. 5.
- Lamprocyclas margatensis* (Campbell and Clark): Sugiyama and Furutani, 1992, p. 207, pl. 18, fig. 7.
- Lamprocyrtis hannai* (Campbell and Clark): Motoyama, 1996, p. 258, pl. 7, fig. 3.
- Lipmanella hister* (Petrushevskaya): Sugiyama and Furutani, 1992, p. 209, pl. 13, figs. 7, 8.
- Liriospyris geniculosa* Goll, 1968, p. 1427, pl. 175, figs. 21–24.
- Liriospyris globosa* Goll, 1968, p. 1427, pl. 176, figs. 1–3, 5; text-fig. 9.
- Liriospyris longicornuta* Goll, 1968, p. 1428, pl. 176, figs. 8, 10, 12; text-fig. 9.
- Liriospyris mutuarua* Goll, 1968, p. 1428, pl. 175, figs. 6, 10, 11, 14; text-fig. 9.
- Lithelius minor* Jørgensen, 1899, p. 65, pl. 5, fig. 24.
- Lithocampe subligata* Stöhr, 1880, p. 102, pl. 4, fig. 1.
- Lithomelissa gelasinus* O'Connor, 1997a, p. 71, pl. 2, figs. 3–6; pl. 6, figs. 6–9.
- Lophocyrtis (Apoplanius) nomas* Sanfilippo and Caulet, 1998, p. 15, pl. 3A, figs. 1–4; pl. 3B, figs. 3, 4; pl. 6, figs. 1a, 1b–5a, 5b.
- Lophocyrtis (Cyclampterium) pegetrum* Sanfilippo and Riedel: Sanfilippo, 1990, p. 307, pl. II, figs. 3–5.
- Lophophaena tekopua* O'Connor, 1997a, p. 73, pl. 2, figs. 11–14; pl. 7, figs. 7–10.

- Lophospyris pentagona pentagona* (Ehrenberg): Goll, 1976, p. 398, pl. 10, figs. 1–7; pl. 11, figs. 1–3, 5.
- Lychnocanoma apodora* Sanfilippo: Sanfilippo and Nigrini, 1995, p. 280, pl. IV, figs. 5–10.
- Lychnocanoma grande* (Campbell and Clark): Kling, 1973, p. 637, pl. 10, figs. 10–14.
- Lychnocanoma elongata* (Vinassa de Regny): Sanfilippo et al., 1973, p. 221, pl. 5, figs. 19, 20.
- Lychnodictyum audax* Riedel, 1953, p. 810, pl. 85, fig. 9.
- Periphaena decora* Ehrenberg: Sanfilippo and Riedel, 1973, p. 523, pl. 8, figs. 8–10.
- Peripyramis circumtexta* Haeckel, 1887, p. 1162, pl. 54, fig. 5.
- Petalospyris bulbosa* Mahapatra and Sharma, 1994, p. 162, pl. 3, figs. 1–4.
- Phormocyrtis alexandrae* O'Connor, 1997b, p. 110, pl. 2, figs. 9–12; pl. 6, figs. 1–4, 6.
- Phormospyris stabilis stabilis* (Goll): Goll, 1976, p. 390, pl. 1, figs. 1–13; pl. 2, figs. 7–14.
- Phormospyris tricornis* Haeckel, 1887, p. 1089, pl. 83, fig. 13.
- Phormostichoartus fistula* Nigrini, 1977, p. 253, pl. 1, figs. 11–13.
- Phortidium pylonium* Haeckel, 1887, p. 709, pl. 49, fig. 10.
- Prunopyle titan* Campbell and Clark, 1944, p. 20, pl. 3, figs. 1–3.
- Psychospyris parva* Riedel and Sanfilippo, 1971, p. 1591, pl. 5, figs. 8–10.
- Saturnalis circularis* Haeckel: Nigrini, 1967, p. 25, pl. 1, fig. 9.
- Siphocampe lineata* (Ehrenberg) group: Nigrini, 1977, p. 256, pl. 3, figs. 9, 10.
Siphonosphaera patinaria Haeckel, 1887, p. 105, pl. 6, figs. 7, 8.
- Siphostichartus corona* (Haeckel): Nigrini, 1977, p. 257, pl. 2, figs. 5–7.
- Siphostichartus praecorona* Nigrini, 1977, p. 258, pl. 2, figs. 8, 9.
- Sphaeropyle robusta* Kling: Foreman, 1975, p. 618, pl. 9, figs. 24–26.
- Spirocyrtis subtilis* Petrushevskaya: Petrushevskaya and Kozlova, 1972, p. 540, pl. 24, figs. 22–24.
- Spongasteriscus marylandiscus* Martin, 1904, p. 453, pl. 130, fig. 10.
- Spongocore puella* Haeckel, 1887, p. 347, pl. 48, fig. 6.
- Spongodiscus klingi* Caulet, 1986, p. 849, pl. 2, figs. 2, 3.
- Spongotrochus glacialis* Popofsky group: Petrushevskaya, 1975, p. 575, pl. 5, fig. 8; pl. 35, figs. 1–6.
- Stichocorys delmontensis* (Campbell and Clark): Sanfilippo and Riedel, 1970, p. 451, pl. 1, fig. 9.
- Stylatractus neptunus* Haeckel, 1887, p. 328, pl. 17, fig. 6.
- Stylatractus santaenmae* (Campbell and Clark): Petrushevskaya and Kozlova, 1972, p. 520, pl. 11, fig. 10.
- Stylodictya multispina* Haeckel, 1860, p. 842.
- Stylodictya validispina* Jørgensen, 1905, p. 119, pl. 10, fig. 40.
- Theocorys bianulus* O'Connor, 1997a, p. 84, pl. 4, figs. 1–4; pl. 10, figs. 1–4; pl. 11, fig. 5.

Theocorys spongoconum Kling: Riedel and Sanfilippo, 1971, pl. 2f, fig. 4; pl. 3c, fig. 3.

Theocyrtis annosa (Riedel): Nigrini and Lombardi, 1984, p. N171, pl. 30, fig. 5.

Tholospyris anthophora (Haeckel): Goll, 1969, pl. 324, pl. 55, figs. 1–4; text-fig. 1.

Tympanomma binoclonum (Haeckel): Petrushevskaya and Kozlova, 1972, p. 533, pl. 39, figs. 23, 24.

Valkyria pukapuka O'Connor, 1997a, p. 74, pl. 2, figs. 15, 16; pl. 3, figs. 1, 2; pl. 7, figs. 11, 12; pl. 8, figs. 1, 2.

Figure F1. Locations of Leg 199 sites and other DSDP sites studied in the Central Pacific. F.Z. = fracture zone.

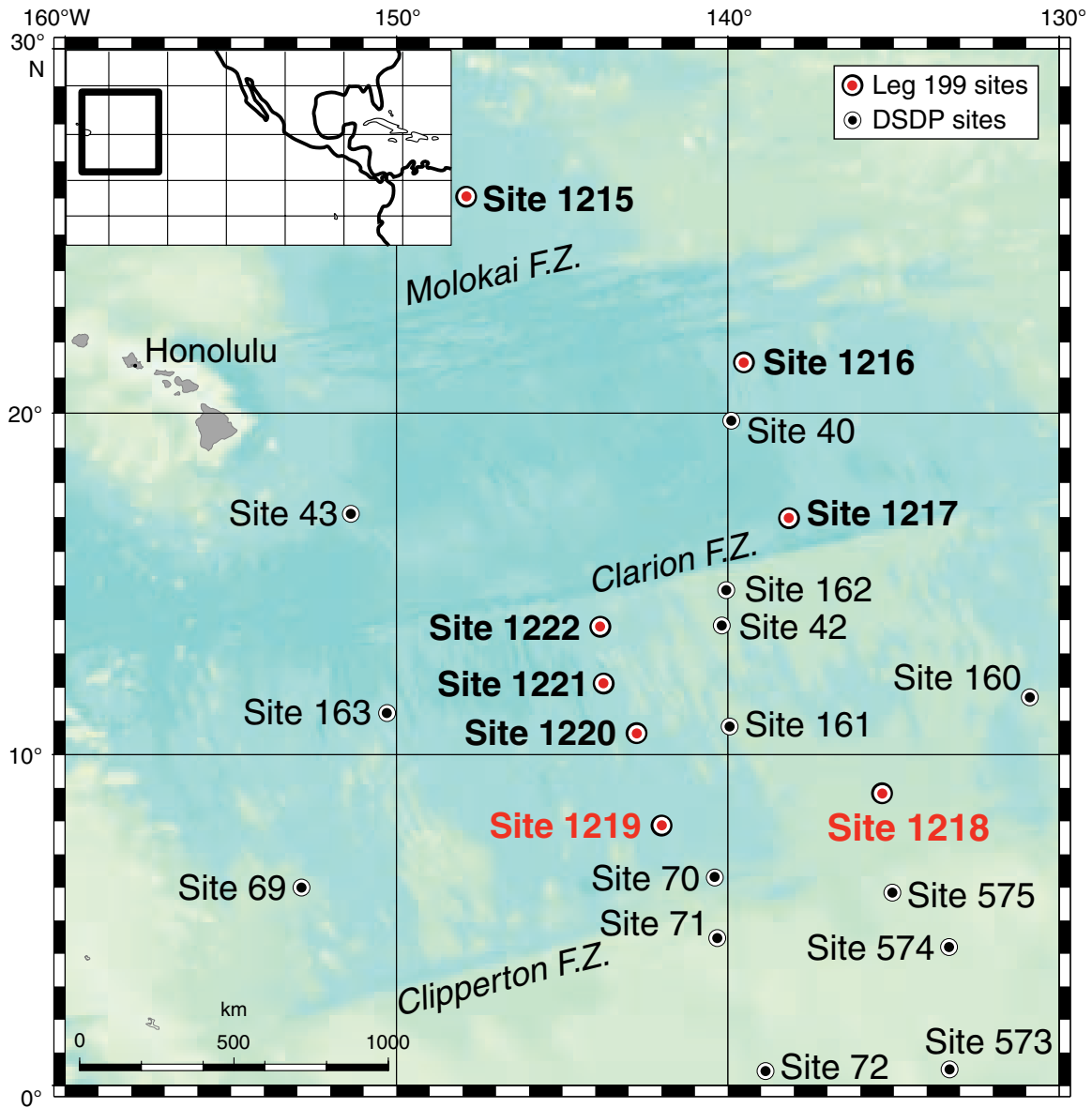


Table T1. Relative abundance of selected radiolarian species, Site 1218. (This table is available in an [over-sized format](#).)

Table T2. Relative abundance of selected radiolarian species, Site 1219. (This table is available in an [over-sized format](#).)