

somewhere within California or northern Mexico, indicating that the Lee Canyon section was deposited in tropical seas.

I conclude that the Lee Canyon section was deposited in clear, shallow, warm marine water of normal salinity and with full access to the open sea.

#### COLLECTIONS AND METHODS

Morphological terminology is from Hill (1981), with a few additional terms that are in widespread use. Locality and type numbers are from the Natural History Museum of Los Angeles County, Invertebrate Paleontology Section (abbreviated LAC-MIP). Locality descriptions are given in the appendix. All specimens are deposited in LACMIP. The University of California Museum of Paleontology is abbreviated UCMP.

#### SYSTEMATIC PALEONTOLOGY

Subclass RUGOSA Milne-Edwards and Haime, 1850

Order STAUROIDA Verrill, 1865

Suborder CANININA Wang, 1950

Family CYATHOPSIDAE Dybowski, 1873

Genus FOMICHEVELLA Fedorowski, 1975

FOMICHEVELLA NEVADENSIS n. sp.

Figure 3.1–3.3

*Diagnosis.*—A species of *Fomichevella* characterized by the combination of large corallites, very abundant septa, short to moderately long minor septa, and a wide dissepimentarium.

*External description.*—Corallum phaceloid, hemispheroidal, maximum observed diameter 14 cm; corallite diameter up to 23 mm; corallites closely crowded, most touching; epitheca and calices not observed.

*Transverse section description.*—Corallites circular to subcircular, diameters 13–23 mm, very closely spaced, generally touching to a few mm apart; septa of two orders, 25–36 each, straight to somewhat sinuous, generally thin in dissepimentarium, many dilate in tabularium, attenuate axially; major septa 6–7 mm long, protruding 2–3 mm into tabularium, except some cardinal septa 1–2 mm shorter; minor septa well developed, 2–3 mm long, generally crossing half-diameter of dissepimentarium, none penetrating tabularium; dissepimentarium regular, wide, with angular, concentric, and herringbone dissepiments; false wall stereozone present in some corallites; tabularium open, 8–16 mm wide, open space beyond tips of septa up to 12 mm wide; corallite wall about 0.3 mm wide.

*Longitudinal section description.*—Dissepimentarium of 3–9 ranks of steeply dipping, small and cystose or large and elongate dissepiments; tabulae flat to domed with flat tops and downturned edges, irregularly spaced, 10–14/cm, broken into tabellae in few places.

*Collections.*—LACMIP holotype 8367. Eight thin sections and 30 polished sections from one well-preserved corallum from LACMIP locality 1263 were studied.

*Discussion.*—*Fomichevella nevadensis* n. sp. falls into the group of species in the genus that have large corallites, numerous septa, and minor septa that do not cross the dissepimentarium. It shares these characters with *F. waltersi* n. sp. from much lower in the same section, but *F. nevadensis* has longer minor septa, more abundant major septa, and smaller corallites. Of the 16 other taxa referred (Fedorowski, 1975; Stevens and Rycerski, 1989) to the genus, only five are similar to *F. nevadensis* in some features. *Fomichevella uralicum* (Dobrolyubova, 1936), from Russia, has somewhat similar size corallites but more abundant septa and longer minor septa. *Fomichevella septentrionale* (Heritsch, 1939), from Spitsbergen, has similar size corallites and a somewhat similar number of septa, but much longer minor septa. *Fomichevella magna* Stevens and Rycerski,

1989, from British Columbia, has a similar number of septa and similar size corallites, but much longer minor septa and a much more obvious shortened cardinal septum. *Fomichevella southeri* Stevens and Rycerski, 1989, also from British Columbia, has a similar number of septa and similar size corallites, but the minor septa are much shorter than those of *F. nevadensis* and the shortened cardinal septum is more obvious. *Fomichevella bamberi* Stevens and Rycerski, 1989, likewise from British Columbia, also has a similar number of septa and similar size corallites, but its minor septa are longer than those of *F. nevadensis* and its shortened cardinal septum more obvious.

*Etymology.*—The species is named for the state of Nevada.

#### FOMICHEVELLA WALTERSI n. sp.

Figures 3.4–3.5, 4.1–4.4

*Diagnosis.*—A species of *Fomichevella* characterized by the combination of very large corallites, moderately abundant septa, short or moderately long minor septa confined to dissepimentarium, and a very wide dissepimentarium.

*External description.*—Corallum phaceloid, hemispheroidal, maximum observed diameter 20 cm; corallite diameter up to 33 mm, closely crowded, most touching; epitheca and calices not observed.

*Transverse section description.*—Corallites circular to subcircular, diameters 18–28 mm, very closely spaced, generally touching to a few mm apart; septa of two orders, 24–28 each, straight, thin in dissepimentarium, thin or somewhat dilate in tabularium; major septa 4–8 mm long, protruding 1–4 mm into tabularium, except some cardinal septa 1–2 mm shorter; minor septa extremely short or few extending to less than one-half diameter of dissepimentarium, never reaching tabularium; dissepimentarium regular, very wide, with angular, concentric, and herringbone dissepiments; false wall stereozone only slightly developed, if at all; tabularium open, 13–16 mm wide, with open space beyond tips of septa up to 5 mm wide; corallite wall about 0.3 mm wide.

*Longitudinal section description.*—Dissepimentarium of 3–8 ranks of different sized, mostly globose (some elongate) dissepiments; tabulae flat, with or without downturned edges, irregularly spaced, 10–16/cm; tabellae uncommon.

*Collections.*—LACMIP holotype 8368, LACMIP paratypes 8369–8378. Seven thin sections and 45 polished sections from two coralla (holotype, paratype 8369) from LACMIP locality 1255 and four thin sections and 37 polished sections from nine coralla (paratypes 8370–8378) from LACMIP locality 5645 were studied.

*Discussion.*—*Fomichevella waltersi* n. sp., like *F. nevadensis*, belongs in the group of species that have large corallites, numerous septa, and minor septa that do not cross the dissepimentarium. It is distinguished from *F. nevadensis* in the discussion for that species. The following species can be distinguished from *F. waltersi* as noted: *F. uralicum* (Dobrolyubova, 1936) has many more septa and longer minor septa; *F. septentrionale* (Heritsch, 1939) has smaller corallites and longer minor septa; *F. magna* Stevens and Rycerski, 1989, has a greater number of septa, smaller corallites, and longer minor septa; *F. southeri* Stevens and Rycerski, 1989, has somewhat more septa, smaller corallites, and more obvious shortened cardinal septa; *F. bamberi* Stevens and Rycerski, 1989, has somewhat more septa, somewhat smaller corallites, and much longer minor septa.

It should be noted that *F. waltersi* is the lowest colonial rugose coral in the Permian part of the Lee Canyon section, and that no colonial rugose corals were found in the underlying Pennsylvanian.

*Etymology.*—The species is named for Larry Walters, a volunteer field assistant on the April, 1969, field trip.

Suborder LITHOSTROTIONIA

Spassky and Kachanov, 1971

Family DURHAMINIDAE Minato and Kato, 1965

Genus KLEOPATRINA McCutcheon and Wilson, 1963

KLEOPATRINA (KLEOPATRINA) FTATEETA

(McCutcheon and Wilson, 1961)

Figure 5.1–5.2

*Ptolemaia ftateeta* McCutcheon and Wilson, 1961, p. 1025, Pl. 123, figs. 1–6; Wilson and Langenheim, 1962, Pl. 87, figs. 1, 2.

*Kleopatrina wilsoni* Minato and Kato, 1965, p. 69.

*Documentation.*—LACMIP hypotype 8379. Two thin sections and 26 polished sections from one corallum from LACMIP loc. 1264 were studied.

*Discussion.*—This elegant little coral is widespread in eastern Nevada at least from the Egan Range in east-central Nevada to the Arrow Canyon Range in southeast Nevada. The Spring Mountains occurrence extends the geographic range to the southwest part of the state. In east-central Nevada it occurs only in the narrow stratigraphic interval with *Thysanophyllum princeps* and *Syringopora mcutcheonae*. In the Arrow Canyon Range it occurs in the same unit with *Syringopora mcutcheonae* (Langenheim and Langenheim, 1965). In the Spring Mountains these three species occur in separate units, all of which are in a limestone sequence below thick sandstone beds, as in east-central Nevada.

Minato and Kato (1965) erected *Kleopatrina (K.) wilsoni* for a paratype of *K. ftateeta* from Arrow Canyon, noting that McCutcheon and Wilson (1961) considered morphological features of this paratype to be variants within the species. At the same time, Minato and Kato (1965) referred figure 5 of McCutcheon and Wilson (1961) to *K. ftateeta*, clearly noting that it was a photograph from a thin section of UCMP paratype 30268, their holotype of *K. wilsoni*. This demonstrates that features of the two species occur in the same corallum, invalidating the concept of *K. wilsoni*.

Family HERITSCHIOIDAE Sando, 1985

Genus PARAHERITSCHIOIDES Sando, 1985

PARAHERITSCHIOIDES RICHI n. sp.

Figure 5.3–5.8

*Diagnosis.*—A species of *Paraheritschioides* characterized by the combination of relatively small corallite diameters; minor septa generally confined to dissepimentarium; axial ends of major septa dilated; generally thick false wall; and generally small dissepiments in longitudinal section.

*External description.*—Corallum phaceloid, hemispheroidal, maximum observed diameter 12 cm; corallites to 10 mm diameter, touching to 15 mm apart; epitheca and calices not observed.

*Transverse section description.*—Corallites circular to subcircular, diameters 7–10 mm; septa of two orders, 19–23 each,

thin in dissepimentarium, moderately dilate in tabularium; major septa 2–4 mm long, protruding 1–3 mm into tabularium; major septa 2–4 mm long, protruding 1–3 mm into tabularium, except some cardinal septa 1–2 mm shorter, and counter septa that may be attached to axial structure; minor septa extremely short, generally confined to dissepimentarium, few entering tabularium as nubs; dissepimentarium generally regular, incompletely circling some corallites, lonsdaleoid in small parts of some corallites, about 1 mm wide, with angular, concentric, herringbone, and pseudoherringbone dissepiments; false wall stereozone pronounced in most corallites; axial structure generally simple, clisiophylloid, consisting of somewhat dilate medial plate and one or few more septal lamellae, may be attached to counter septum and, in some, a few other septa; corallite wall about 0.3 mm wide.

*Longitudinal section description.*—Dissepimentarium of 1–5 ranks of dissepiments, different sizes, generally small and globose, steeply inclined; tabellae of two generally poorly defined ranks, axial and periaxial; axial tabellae of 1–2 ranks, steeply inclined inwards and upwards to medial plate; periaxial tabellae straight to somewhat domed, horizontal or gently inclined inwards and upwards to periaxial tabellae; medial plate continuous, somewhat sinuous.

*Collections.*—Holotype, LACMIP 8380; paratypes, LACMIP 8381–8387. Seven thin sections and 45 polished sections from eight coralla from LACMIP locs. 1264 (paratypes 8384–8387) and 1268 (holotype, paratypes 8381–8383) were studied.

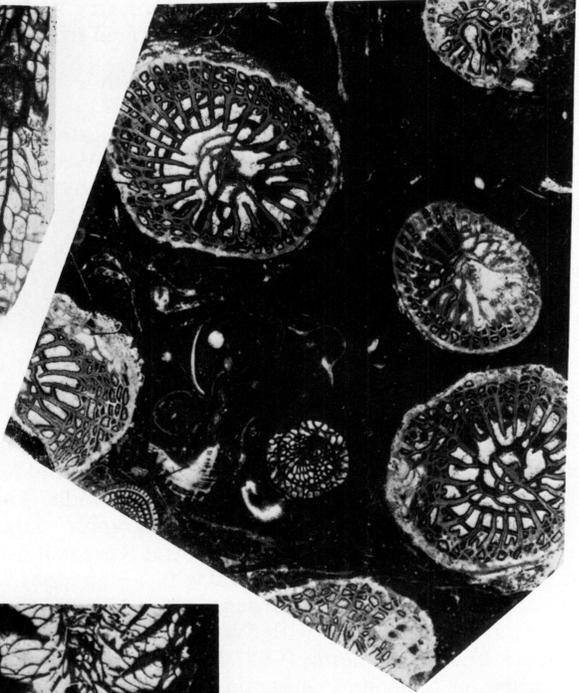
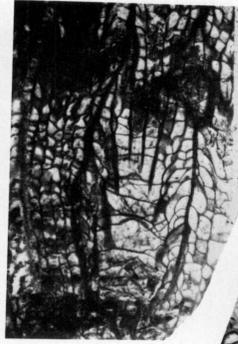
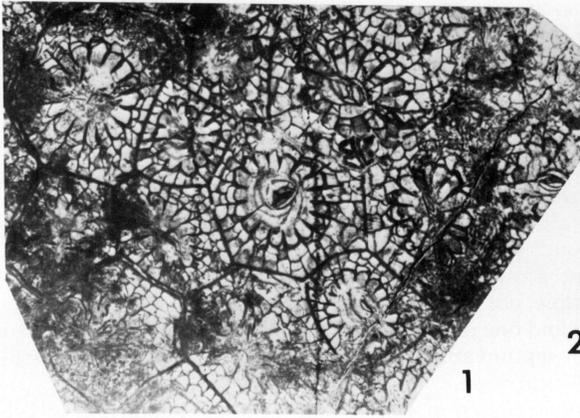
*Discussion.*—Species of *Paraheritschioides* have previously been reported from the Upper Pennsylvanian Oquirrh Formation of Idaho, the Lower Permian McCloud Formation of northern California (Sando, 1985), and unnamed Lower Permian formations from the Stikine River area of British Columbia (Stevens and Rycerski, 1989). The species form a morphologically similar group with corallite diameters ranging from 6.8 to 12.5 mm and major septa numbering from 18 to 28. Speciation is largely confined to the size and complexity of the axial structure and some characters that would seem rather minor in many other genera. *Paraheritschioides richi* fits into this group and is distinguished by similar characters.

*Paraheritschioides richi* has smaller corallites than *P. grandis* Sando, 1985, and *P. jennyae* Stevens and Rycerski, 1989, from the Upper Pennsylvanian Oquirrh Formation of Idaho and the Lower Permian of British Columbia, respectively. It has a simpler axial structure than *P. complexa* Sando, 1985, from the Upper Pennsylvanian Oquirrh Formation of Idaho. It has a simpler axial structure and much shorter minor septa than *P. wickenae* Stevens and Rycerski, 1989, from the Lower Permian of British Columbia. *Paraheritschioides richi* is most similar to *P. stevensi* (Wilson, 1982) from the Lower Permian McCloud Limestone of northern California, but *P. richi* has much more dilate septa in the tabularium, a thicker false wall stereozone, and generally less inflated dissepiments. *Paraheritschioides richi* also appears to have more lonsdaleoid parts to the predominantly regular dissepimentarium than other species.

*Etymology.*—The species is named for Mark Rich.

FIGURE 5—1, 2, *Kleopatrina ftateeta* (McCutcheon and Wilson), hypotype, LACMIP 8379. 1, transverse section; 2, longitudinal section. 3–8, *Paraheritschioides richi* n. sp. 3, 4, transverse sections, holotype, LACMIP 8380; 5, 6, transverse sections, paratype, LACMIP 8381; 7, 8, longitudinal sections, paratypes, LACMIP 8382, 8383. 9, 10, *Diphyphyllum connorsensis* (Easton), hypotype, LACMIP 8388. 9, transverse section, 10, longitudinal section. All figures  $\times 3$ .

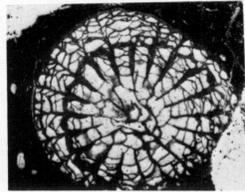
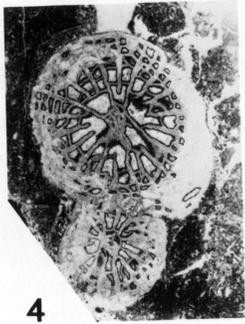
FIGURE 6—1–4, *Mccloudius parvus* n. sp. 1, 2, transverse sections, holotype, LACMIP 8390; 2,  $\times 6$ ; 3, longitudinal section, paratype, LACMIP 8391; 4, transverse section, paratype, LACMIP 8392. 5, 6, *Thysanophyllum princeps* (Easton), hypotype, LACMIP 8389. 5, transverse section; 6, longitudinal section. Figures  $\times 3$  unless otherwise noted.



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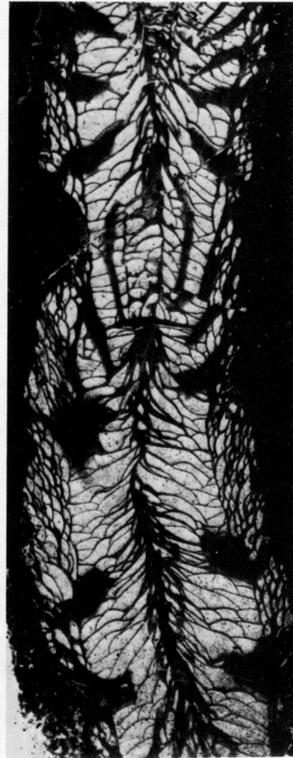


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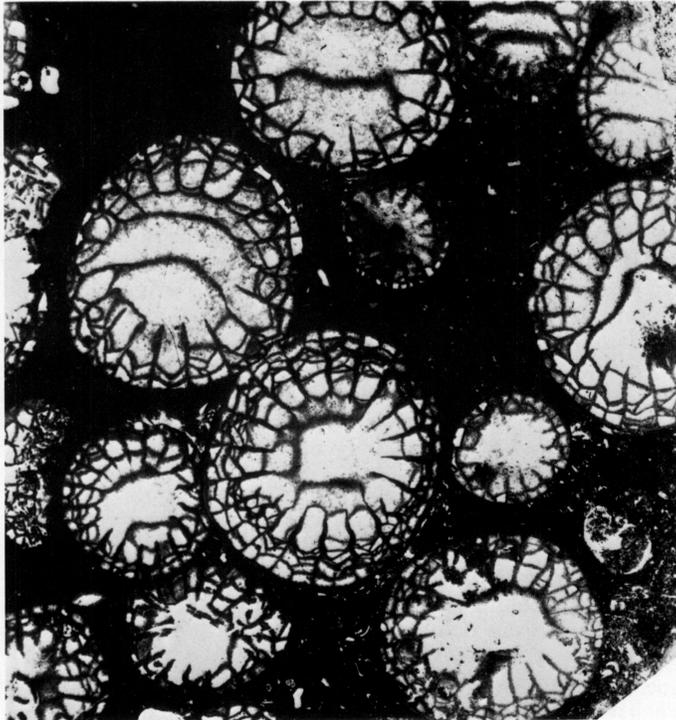
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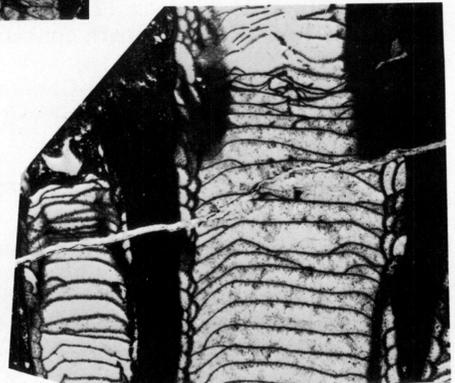
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