



FIGURE 4—Graph of measured height (mm) versus diameter (mm) of two Mesozoic species of *Retiskenea?*, the Cenozoic species, *Retiskenea statura*, and modern *R. diploura*. Trend lines are shown for each species. Open squares, *R.? kieli*, Cold Fork of Cottonwood Creek (CFCC); black triangles, *R.? tuberculata*, Wilbur Springs (WS); open triangles, *R.? tuberculata*, Rice Valley (RV); +, *R. statura* (Goedert and Benham, 1999), Washington (WA); black circles, *R. diploura*, Japan Trench (Okutani and Fujikura, 2002); open circle, *R. diploura* holotype, Aleutian Trench (Warén and Bouchet, 2001). Also shown is the approximate height and diameter measurement for the single specimen of a neomphalid? from Paskenta, California (black diamond), which has not been prepared from the carbonate matrix (cf. Fig. 7).

by *Retiskenea* and *Retiskenea?* *Retiskenea? kieli* has a lower mean shell height (1.81 mm) than measurements for the other three species attributed to *Retiskenea* (Table 2). *R.? kieli* differs from *R. diploura* Warén and Bouchet, 2001 in its somewhat more compressed shell profile, more obliquely rounded aperture, and slightly larger mean diameter of complete shells (Fig. 4, Table 2). *Retiskenea? kieli* differs from *R. statura* in possessing a lower spire, shallower apical angle, less globose lateral body profile, more deeply incised sutures, and more obliquely rounded aperture. Recently, Kiel (2006, fig. 3.7–3.9) illustrated well-preserved protoconchs of *R. statura* from the Lincoln Creek Formation, showing relatively deep polygonal pits. By contrast, the protoconch ornament of *R.? kieli* (Fig. 3.4, 3.8) is more net-like and similar in overall form to the living *Retiskenea* species, with irregular low ridges separating shallow depressions of variable size and shape. *Retiskenea? kieli* differs from *R.? tuberculata* n. sp., described below, by smaller size, possession of a smaller, net-like protoconch rather than a larger, tuberculate protoconch, a slightly more obliquely rounded aperture profile, and finer growth lines.

RETISKENEAE? TUBERCULATA new species Figure 5

Diagnosis.—A skeneiform neomphalid, thin shelled, low spired, with a coarsely reticulate to granular protoconch, to ~400

µm diameter; body whorl inflated, relatively wide, with distinct beaded growth lines in first 1/3 of teleoconch; remainder of teleoconch displays fine evenly spaced growth lines, with sinuous labial notch; prosocline aperture flared and almost circular; umbilicus deep and narrow.

Description.—Shell small, thin-walled, low spired, skeneiform (Fig. 5.1, 5.4, 5.6–5.8, 5.10, 5.11); protoconch measuring two-thirds of a whorl, knob-like, inflated in its initial area, tuberculate, vaguely reticulate and becoming less distinct toward the peristome (Fig. 5.2, 5.9). Teleoconch of two and a half convex whorls with deeply incised sutures, and evenly spaced, coarsely beaded, sinuous growth lines in its initial portion (1/3 of whorl past the protoconch; Fig. 5.2, 5.3). Body whorl inflated, with a well-rounded shoulder, gently flared approaching the aperture (Fig. 5.10), with fine evenly spaced growth lines. Aperture prosocline, nearly round, with shallowly sinuous labial notch (Fig. 5.4), tangential to the body whorl, in narrow contact with the preceding whorl. The umbilicus is deep and narrow.

Etymology.—Latin *tuber* for bump, swelling, alluding to the coarse granular protoconch, vague reticulation, and beading of the early teleoconch growth lines.

Types.—Holotype CAS specimen 69192 (2.85 mm diameter; 2.16 mm height) was recovered from the main Wilbur Hot Springs Resort limestone deposit, in the lower Cretaceous Stony Creek Formation, comprising Great Valley Group slope-turbidites and intercalated sedimentary serpentinites (CAS locality 68061; detailed below). Also designated were paratypes CAS 69193–69200 and UCMP type no. 154112 (Fig. 5.11), collected from lower Cretaceous white limestones at Wilbur Springs (Colusa County, CAS locality 68061) and Rice Valley (Lake County, CAS location 68079, USGS locality M6010), respectively. Height and diameter measurements are listed in Tables 1 and 2 and depicted in Figure 4 for these 10 individual type specimens.

Other material examined.—One specimen of *Retiskenea? cf. tuberculata* (2.80 mm diameter; 2.55 mm height) was recognized in a small collection from UCMP locality A-4658, a volumetrically minor limestone deposit exposed near the main Wilbur Springs Resort Limestone (CAS locality 68061, see below). The collection also contains two indeterminate microgastropods and one broken larger gastropod in recrystallized micrite. It was made by the Fall 1948 Paleo 103 class from the University of California, Berkeley. The locality description card for UCMP A-4658 reads: "Colusa County, about 0.8 km south (S 10°W) of Wilbur Hot Springs Resort, and 100 m from top-of-hill float boulders of whitish fossiliferous limestone located near Digger pine tree on fence line; in basal Paskenta Formation, 39°N, 122.1°W, SE 1/4 of NW 1/2 of sec. 28, T14N, R5W, 15-minute Wilbur Springs Quadrangle (1944 edition)."

Occurrence.—*Retiskenea? tuberculata* was recovered from quarried float blocks of a hydrocarbon-seep carbonate deposit (Campbell et al., 2002) enclosed in Lower Cretaceous slope turbidites and foliate serpentine breccias of the Great Valley Group at Wilbur Springs (Colusa County, CAS 68061; Fig. 2.4). It also has been found in a Lower Cretaceous seep limestone surrounded by Great Valley-equivalent siliciclastic strata and serpentinite of the Rice Valley outlier, situated in the eastern belt of the Franciscan Group (Lake County, CAS 68079; Fig. 2.5). A Hauterivian age (~133 m.y.) was assigned to both limestone deposits based on co-occurrence of the brachiopod, *Pereggrinella whitneyi* Gabb, 1869, and stratigraphic position above *Buchia pacifica* Lawton, 1856 (Berkland, 1973; Carlson, 1984a), although this age is not certain (discussed in Campbell and Bottjer, 1995a). Wilbur Springs, CAS locality 68061, Colusa County: white limestone on hill 1.5 km south/southeast of Wilbur Hot Springs Resort (= "Resort limestone"), above Sulphur Creek, lat. 39°N, long. 122°W, 1,000 ft. N, 300 ft. east of the southwest corner of sec. 28, T14N, R5W, U.S. Geological Survey 7.5-minute Wilbur Springs Quadrangle (USGS, 1989). The main Wilbur Springs white limestone deposit of this study is the same location as USGS M7012. Rice Valley CAS locality 68079, Lake County: white limestone in Rice Valley (= "SW Rice Valley Wall"), 650 m north, 530 m west of the southeast corner of sec. 10, T17N, R9W, U.S. Geological Survey 7.5-minute Potato Hill Quadrangle (USGS, 1967). The Rice Valley limestone deposit of this study is the same location as USGS M6010.

Associated fauna.—Taxa associated with *R.? tuberculata* include worm tubes, a moderately globose gastropod with squamose ornament (Fig. 5.11).

FIGURE 5—*Retiskenea? tuberculata* n. sp., scanning electron micrographs. 1–3, Holotype CAS specimen 69192 from main Resort limestone at Wilbur Springs (lower Cretaceous, CAS locality 68061): 1, apical view; 2, detail view of tuberculate, vaguely reticulate protoconch; 3, detail view of granular, beaded texture of early teleoconch. 4–6, paratype CAS specimen 69193 from Rice Valley limestone deposit (lower Cretaceous, CAS locality 68079): 4, apertural view; 5, umbilical view; 6, protoconch area. 7–9, Paratype CAS specimen 69194 from main Resort limestone at Wilbur Springs (CAS locality 68061): 7, oblique apertural view; 8, apical view; 9, detail of granular protoconch. 10, Paratype CAS specimen 69195 from CAS locality 68061 at Wilbur Springs, side view. 11, Paratype UCMP specimen 154112, closely associated with a larger gastropod with squamose ornament (UCMP specimen 154113), at its folded aperture, from Rice Valley limestone deposit (USGS locality M6010 = CAS locality 68079).