



intercalated rib; four spiral ribs on spire and five on posterior part of last whorl. Sculpture on basal part of last whorl consisting of weak axial ribs and closely spaced, five to six spiral ribs (three posterior ones strongest), commonly beaded or occasionally unbeaded, and broader than interspaces. Aperture oval; inner lip callused, smooth; anterior end of aperture thickened and slightly produced anteriorly.

Dimensions of holotype: Incomplete specimen of 5.5 whorls, height 12.8 mm, diameter 5.9 mm.

Holotype: LACMIP 12994.

Type locality: LACMIP loc. 24246, 40°37'45"N, 122°04'50"W.

Paratypes: LACMIP 12995 to 12996.

Geologic age: Late Cretaceous (Santonian).

Distribution: Redding Formation, Members V and VI of Popenoe (1943), east of Redding, Shasta County.

Discussion: The new species is based on 20 specimens. About half show good preservation, but the apices are usually broken off. The other specimens are mostly internal molds. The spiral ribs on the base of the last whorl of *Belliscala petra* are more closely spaced than elsewhere on the shell, and this close spacing, along with usually weaker axial ribs than elsewhere on the shell, imparts a weak, basal disklike appearance.

Belliscala petra is most similar to *Belliscala suciense* (Whiteaves, 1879) and differs from Whiteaves's species by having a narrower pleural angle; axial ribs that are more numerous, more swollen, more closely spaced, and not obsolete on the base of the last whorl; as well as by having swollen nodes rather than pointed nodes where the axial and spiral ribs intersect, and a stronger spiral interrib.

Belliscala petra differs from *Belliscala meta*, sp. nov. by having a less variable pleural angle, a less stout shell, non-subtabulate whorls, fewer axial ribs that are more widely spaced and not obsolete on the base of the last whorl, stronger spiral ribs, more swollen nodes weaker at intersections of axial and spiral ribs, as well as having a good development of spiral ribs with an interrib.

Etymology: The specific name *petra* is Greek, meaning stone.

Belliscala meta Squires & Saul, sp. nov.

(Figures 26–32)

Bittiscala suciense (Whiteaves, 1879). Elder & Saul, 1993: pl. 2, fig. 9.

Not *Cerithium lallierianum*, var. *suciense* Whiteaves, 1879: 122–123, pl. 15, figs. 10, 10a.

Diagnosis: A *Belliscala* with stout shell, whorls subtabulate. Approximately 22 to 25 axial ribs on last whorl.

Axial and spiral ribs closely spaced and swollen. Axial ribs on shoulder of whorls usually almost nodular. Approximately seven to eight closely spaced spiral ribs on most of shell, spiral interrib development uncommon. Axial ribs obsolete on base of last whorl.

Description: Shell small (up to 17.5 mm high), stout and conical, with moderately high spire. Pleural angle approximately 34°. Protoconch unknown. Teleoconch whorls approximately seven to eight (estimated), flatly rounded medially, and narrowly subtabulate posteriorly; suture moderately impressed. Upper spire whorls with cancellate sculpture, remaining whorls (except for base of last whorl) with subcancellate sculpture, axial ribs stronger than spiral sculpture, intersections of ribs almost nodular at shoulder, lowly noded elsewhere on shell. Axial ribs round-topped, closely spaced, extending from suture to suture, not usually aligned from whorl to whorl, straight, slightly prosocline, and slightly reflexed leftward near posterior suture. Axial ribs becoming less prominent, more irregular, and numerous near outer lip. Axial ribs on immature specimens (less than 13 mm in height) 17 to 20 on last whorl, and approximately 17 on penultimate and ante-penultimate whorls. Axial ribs on mature specimens 22 to 25 on last whorl, and 17 to 19 on penultimate and ante-penultimate whorls. Spiral ribs, moderately spaced, crossing axial ribs, on spire consisting of seven to eight, flat-topped spiral ribs narrower than interspaces; on some specimens (immature or mature) finer intercalated rib (usually on anterior medial portion of last whorl) occasionally present, and, on most specimens intercalated ribs approaching other spiral ribs in strength. Sculpture on basal part of last whorl consisting of approximately seven spiral ribs (three posterior ones strongest), beaded or unbeaded, and broader than interspaces; axial ribs obsolete. Aperture ear-shaped, pointed posteriorly with broad shallow anterior notch at base of columella; outer lip broadly arched apparently without varix, inner lip well defined, callused, smooth, and somewhat reflexed anteriorly.

Dimensions of holotype: Incomplete specimen of five whorls, height 16.3 mm, diameter 8.9 mm.

Holotype: LACMIP 12997.

Paratypes: LACMIP 12998 and 12999.

Type locality: LACMIP loc. 23635, 39°51'06"N, 121°42'40"W.

Geologic age: Late Cretaceous (latest Santonian to early Campanian, middle? Campanian).

Distribution: UPPERMOST SANTONIAN: Chico Formation, uppermost part of Musty Buck Member, Chico Creek, Butte County, northern California. LOWER CAMPANIAN: Chico Formation, Ten Mile Member, Chico Creek, Butte County, northern California; Ladd For-

mation, middle part of the Holz Shale Member, Santa Ana Mountains, Orange County, southern California. PROBABLE LOWER MIDDLE CAMPANIAN: Pigeon Point Formation, southern sequence, San Mateo County, northern California (Elder & Saul, 1993).

Discussion: Specimens are abundant at most localities, but they are usually somewhat weathered. The species is represented by approximately 100 variously preserved specimens, and nearly all are from the Chico Formation. The stratigraphic interval encompassed by these localities, all of which are in either the Musty Buck or the Ten Mile members of this formation, is approximately 600 m, and the age is near the Santonian/Campanian boundary.

Only a single specimen of the new species is known from the Pigeon Point Formation specimen (slightly crushed). This specimen was illustrated by Elder & Saul (1993) and is also illustrated here, as two new views (Figures 29, 30). The age of the southern sequence of this formation, from which the specimen of *B. meta* was obtained, is problematic because of limited exposures, faulting, and a paucity of age-diagnostic fossils. Elder & Saul (1993) concluded that the age is probably middle Campanian.

Belliscala meta is most similar to *Belliscala lirata* Dockery (1993:86, pl. 26, fig. 6) from the Chapelville fossiliferous horizon within the Tupelo Tongue of the Coffee Sand in northeast Mississippi. According to Dockery (1993), the geologic age of this fossiliferous horizon is near the early/middle Campanian boundary. *Belliscala meta* differs from *B. lirata* by being smaller and by having many more axial ribs on the last whorl (22 to 25 rather than 15).

Belliscala meta differs from *Belliscala petra* by having subtabulate whorls, more numerous axial and spiral ribs that are also more closely spaced, almost nodular axial ribs at shoulder, much narrower interspaces between spiral ribs, only rare development of intercalated spiral ribs, and obsolete axial ribs on base of last whorl.

Belliscala meta differs from *Belliscala suciense* (Whiteaves, 1879) by having a narrower pleural angle, whorls that are subtabulate posteriorly, more numerous axial and spiral ribs that are more closely spaced, more swollen axial ribs, much narrower interspaces between spiral ribs, only rare development of intercalated spiral ribs, intersections of axial and spiral ribs with low nodes rather than projecting nodes, and obsolete rather than occasionally weak axial ribs on base of last whorl.

Etymology: The specific name *meta* is Latin, meaning a conical column.

Belliscala suciense (Whiteaves, 1879)

(Figures 33–38)

Cerithium lallierianum, var. *suciense* Whiteaves, 1879:122–123, pl. 15, figs. 10, 10a.

Mesostoma suciense Whiteaves, 1903:359–360, pl. 44, fig. 7.

Bitiscala sp. Dailey & Popenoe, 1966:fig. 3 [= a faunal list].

? "*Potamides tenuis*" *nanaimoensis* (Whiteaves, 1879). Elder & Saul, 1996:392, figs. 5–28.

Diagnosis: A *Belliscala* with whorls bearing a weak ramp. Approximately 15 to 17 axial ribs on last whorl. Axial ribs and spiral ribs moderately spaced but narrow. Strong development of a finer interrib between spiral ribs on most of shell. Intersections of axial and spiral ribs with projecting nodes. Axial ribs weak to obsolete on base of last whorl.

Supplemental description: Shell small (up to 15.6 mm high), conical to turriculate, with moderately high spire. Pleural angle approximately 40°. Protoconch unknown. Teleoconch whorls approximately eight (estimated), rounded, with a weak subsutural ramp and glossy surface; suture slightly impressed. Upper spire whorls cancellate, remaining part of shell subcancellate, axial ribs stronger than spiral sculpture, intersections of ribs with projecting nodes. Axial ribs narrow, moderately to widely spaced, extending from suture to suture, not usually aligned from whorl to whorl, straight, orthocline on early whorls, prosocline on later whorls, and very slightly reflexed leftward near posterior suture. Axial ribs becoming less prominent, more irregular, and numerous near outer lip. Axial ribs on immature specimens (less than 13 mm in height) approximately 13 on last whorl, penultimate, and ante-penultimate whorls. Axial ribs on mature specimens approximately 15 to 17 on last whorl, and approximately 13 on penultimate and ante-penultimate whorls. Spiral ribs moderately widely spaced, crossing axial ribs. On spire, spiral sculpture of four, flat-topped spiral ribs much narrower than interspaces with occasionally one finer intercalated rib; anterior basal portion of last whorl with approximately six very fine spiral ribs (two posterior ones strongest), and narrower than interspaces. Sculpture on basal part of last whorl consisting of several widely spaced, weak to moderately strong, spiral ribs usually with one or more, finer intercalated spiral ribs; axial ribs weak or obsolete. Aperture ovate; inner lip smooth.

Dimensions of lectotype: Incomplete specimen of seven whorls, height 9.5 mm, diameter 5.2 mm.

Lectotype: GSC 5764b, designated here.

Paralectotypes: GSC 5764, 5764a, 5764c–h, designated here.

Type locality: Sucia Island, San Juan County, Washington.

Geologic age: Late Cretaceous (Middle to early late Campanian).

Distribution: MIDDLE CAMPANIAN: Cedar District Formation, Sucia Island, San Juan County, Washington