

Figs. 32–40. *Rhyncopelta concentrica* sp.n., all from 21°N.—32–34. Holotype shell, exterior and interior (anterior at top) and lateral (right side) views. Length 11.0 mm.—35, 36. Ventral and lateral (right side) views of paratype body in shell.—37. Early juvenile showing ridged protoconch and operculum, scale bar 100 μ m.—39. SEM view of radular ribbon, scale bar 100 μ m.—40. SEM view showing rachidian, 4 inner laterals and tips of marginals, scale bar 20 μ m.

genus differs from the other peltospirid limpet genera in having the following unique characters: periostracum with slight wrapping around shell edge, apex displaced to left of midline and hollow spines. The epipodial development is most like that of *Peltospira*, although the epipodial processes are far less prominent. Intact protoconchs have not been observed.

The generic name is a Latin compound meaning spiny-shield.

Echinopelta fistulosa sp.n. (Figs. 41–48)

“Archaeogastropod limpet”; Turner & Lutz 1984, p. 61, fig. 10.

“Tube-spine tapersnout limpet”; McLean 1985, p. 160.

“Limpet”; Baross & Deming 1985, p. 359, figs. 6a, b.

Type locality. East Pacific Rise at 21°N (20°50.0'N, 105°06.0'W), 2615–2622 m. Associated with *Alvinella* on black smokers.

Holotype. LACM 2321, *Alvin* dive 982 at type locality, 6 November 1979.

Paratypes. From 3 *Alvin* dives at type locality: dive 982, 9 specimens, LACM 2322, USNM 859950, MNHN; dive 1223, 12 specimens, LACM 2323, USNM 859951, MNHN; dive 1226, 4 juvenile specimens, LACM 2324, USNM 859952.

Description. Shell (Figs. 41–43) of limpet form, produced through one half whorl of growth, size medium for family (maximum length 8.8 mm). Outline of aperture elongate oval, sides nearly parallel, anterior slightly narrower than posterior; margin of aperture nearly in same plane, sides slightly raised relative to ends. Apex left of center, close to posterior margin. Protoconch scar (Fig. 46) dark brown, right side exposed, protoconch sculpture unknown. Early teleoconch growth lacking on posterior (columellar) slope until shell length of 2 mm; subsequent growth along posterior margin raises apex slightly above margin. Periostracum thin, only slightly extending over growing edge; large specimens coated with rust colored iron deposits. Background sculpture arising after shell length of 2 mm, of concentric growth ridges that produce crescent-shaped swellings aligned obliquely. Sculpture of spines arising at teleoconch length of 0.5 mm; spines twice as high as basal diameter, spaced 0.5 mm apart, obliquely aligned. Spines appear early on juvenile shell with nearly same strength as those produced at growing edges of large shells. Shell interior deeply pitted at position of major spines, indicating that spines are hollow. Shell interior with angular ridge posteriorly. Muscle scar narrow throughout, close to shell margin; narrowed but not interrupted posteriorly, anterior tips expanded inwardly, inserting on inner surface of angular ridge posteriorly; left arm of scar slightly longer than right. Dimensions of holotype: length 5.9, diameter 4.4, height 1.6 mm.

External anatomy (Fig. 44). Foot oval, with opening of anterior pedal gland, bluntly tapered posteriorly. Snout tapered, cephalic tentacles equal in size, thick at base (contracted in all specimens). Mantle edge unmodified. Epipodial ridge extending anteriorly to position of muscle extension, projecting, bearing numerous elongate tentacles. Mantle cavity extending to 1/3 depth of shell muscle, ctenidium with afferent and efferent membranes.

Radula (Figs. 47, 48) as described above for genus.

Remarks. *Echinopelta fistulosa* is not easily confused with any other hydrothermal vent limpet. It is unique in its sculpture of hollow spines, absence of the inturned periostracum and the left of center position of the apex in mature shells. In juvenile shells (Fig. 45), the apex is positioned to the right of center, as is true of mature shells in other species in the family.

Baross & Deming (1985, p. 359, figs. 6a, b) illustrated the shell of *Echinopelta fistulosa*, noting in the caption that this is the “most common limpet on outer face of active ‘black smoker’ at 21°N.” This agrees with the finding that specimens are choked with iron sulfide particles (Fig. 44). They also noted that the exterior surfaces of these limpets were heavily colonized by microorganisms, which they illustrated in their figs. 7a–e.

This is the only peltospirid limpet known only from the East Pacific Rise at 21°N. The name means ‘full of pipes’, referring to the hollow spines.

Hirtopelta gen.n.

Type species. *Hirtopelta hirta* sp.n.

Diagnosis. Shell of limpet form with laterally compressed sides; sides raised relative to ends; apex posterior. Periostracum shaggy, not enveloping shell edge. Background sculpture finely pustular, with larger, scattered collabral imbrications. Operculum multispiral, large.

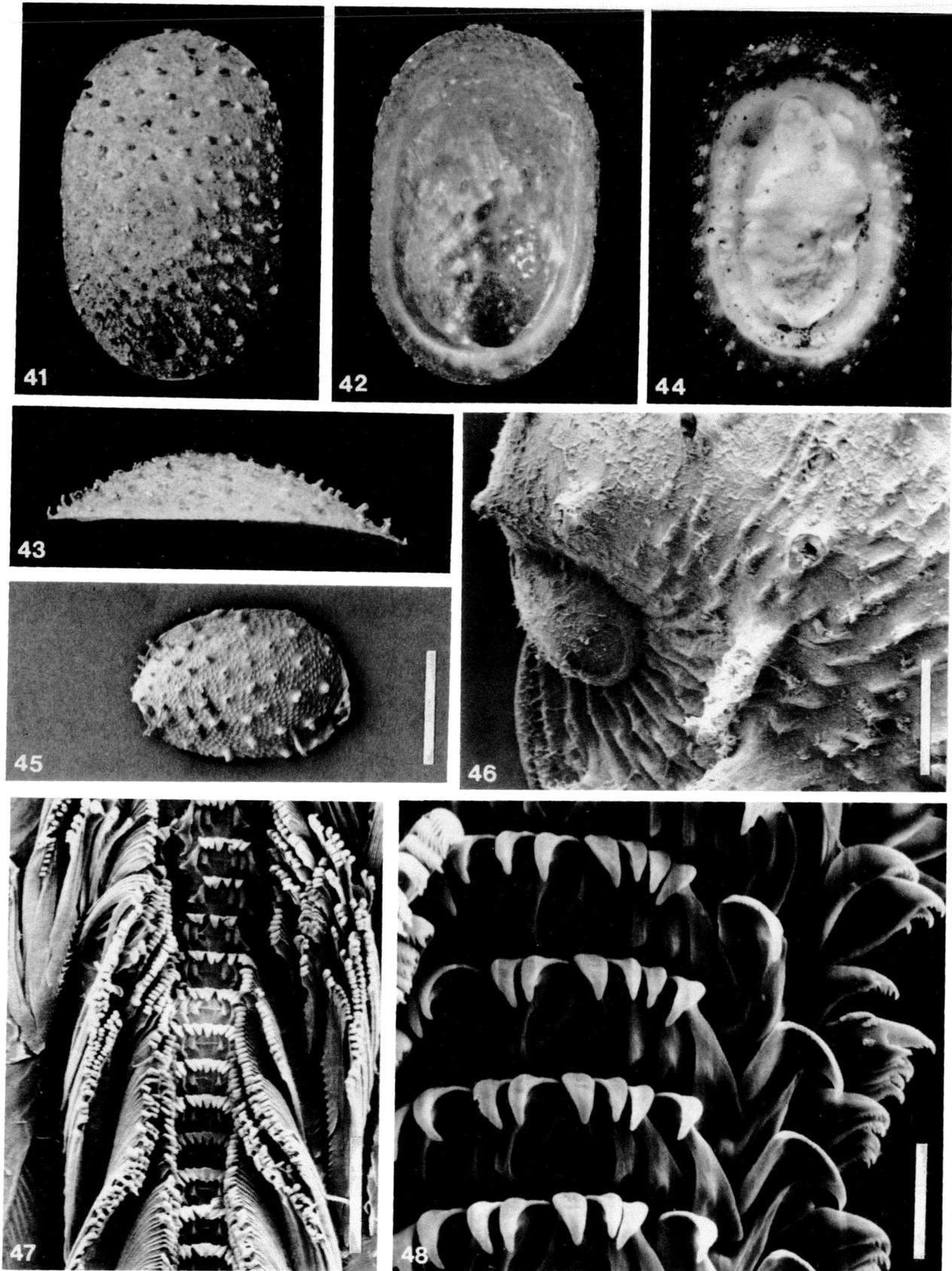
External anatomy. Mantle edge simple, epipodial ridge projecting, extending to head, bearing low tubercles. Snout not tapered, terminating in oral disc. Ctenidium exceptionally large.

Radula unusual for family, cusps of rachidian and laterals long, finely and sharply serrated on inner and outer edges; marginals with fine denticulation to match serration of laterals. Nub on shaft of laterals not evident.

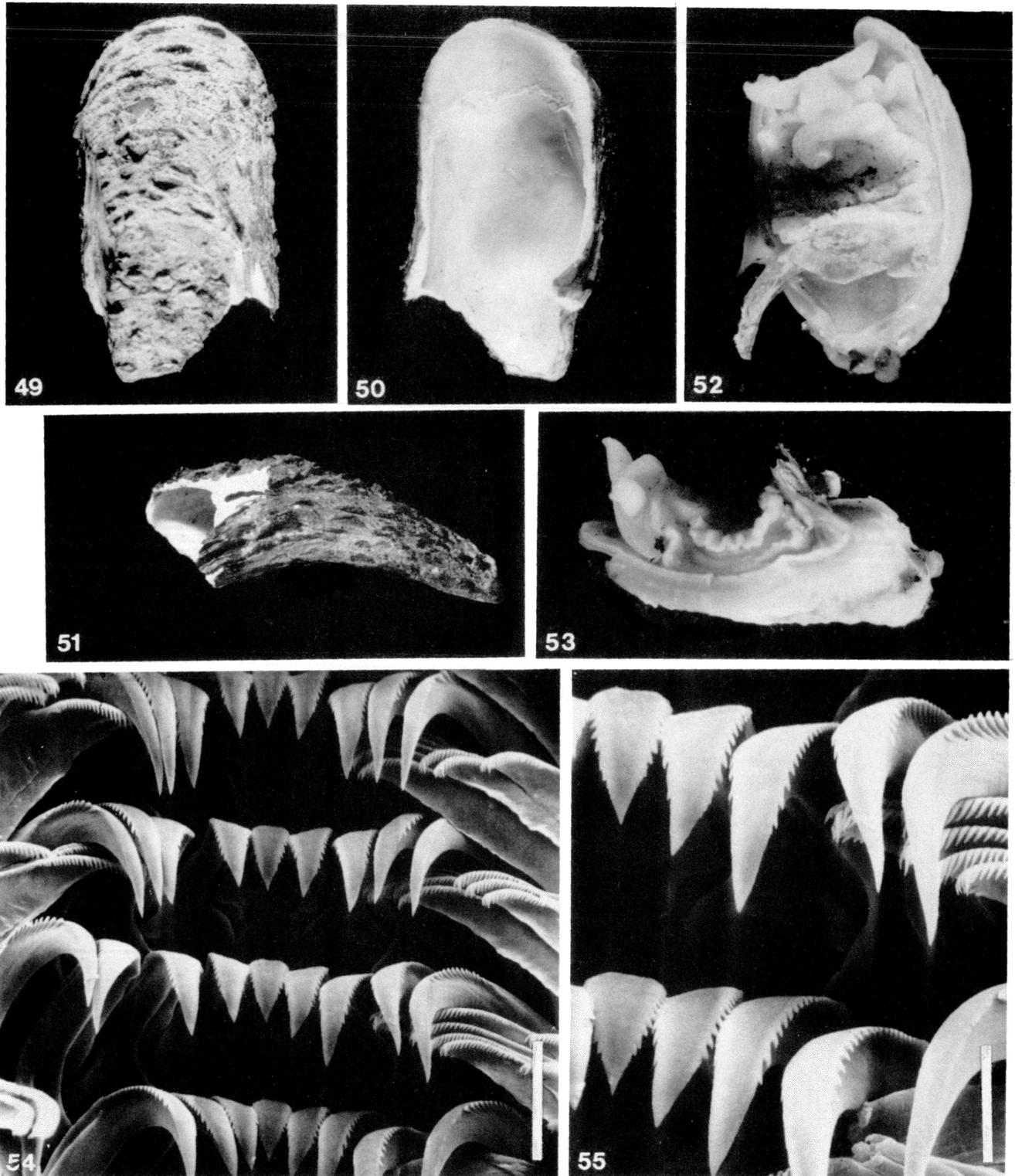
Remarks. This monotypic genus is based on an imperfectly known species, as shells of the two known specimens were badly damaged. Although one other species, *Peltospira operculata*, has a relatively large operculum, *Hirtopelta* has a much simpler development of the epipodium and a completely different mode of shell sculpture. *Hirtopelta* is also unique in having laterally compressed sides, although there is a possibility that the incomplete holotype is deformed.

The radula has the basic features of the peltospirid plan, but is the most unusual among the peltospirid limpets in having the cusps of the rachidian and laterals sharply serrate on both edges, with the marginals displaying a similar pattern. This radula is comparable to that illustrated by Warén & Bouchet (1989, figs. 28, 29) for *Pachydermia laevis* and undoubtedly indicates a close relationship between the two species, although shells seem to have no features in common.

This species also differs from the other peltospirid limpets in having a broad tip to the snout, rather than the tapered tip that led to the vernacular name ‘tapersnout’ for the family. The snout of *Pachydermia laevis* is shown



Figs. 41–48. *Echinopelta fistulosa* sp.n., from 21°N.—41–43. Holotype shell, exterior and interior (anterior at top) and lateral (right side) views. Length 5.9 mm.—44. Ventral view of paratype body in shell.—45. SEM view of juvenile shell showing early sculpture, scale bar 1 mm.—46. Apical area of same specimen showing protoconch scar, scale bar 100 μ m.—47. SEM view of radular ribbon, scale bar 100 μ m.—48. SEM view showing rachidian, 4th lateral and inner marginals folded back, scale bar 20 μ m.



Figs. 49–55. *Hirtopelta hirta* sp.n., from 13°N.—49–51. Holotype shell, exterior and interior (anterior at top) and lateral (right side) views. Length 11.5 mm (incomplete).—51, 52. Ventral and right side views of holotype prior to sectioning, note torn operculum.—54. SEM view of central portion of radular ribbon, scale bar 20 μ m.—55. SEM view of rachidian, 4 laterals and inner marginals, scale bar 10 μ m.

relatively broad by Warén & Bouchet (1989, fig. 34). However, *P. laevis* is said to have a relatively small gill, unlike the large gill of *H. hirta*. Differences in snout morphology and radular morphology are indicative of feeding differences between this genus and other peltospirid genera. Anatomical studies may show that this is a family level difference.

The name means shaggy-shield, referring to the coarseness and irregularity of the sculptural elements.

***Hirtopelta hirta* sp.n. (Figs. 49–55)**

“Halioform tapersnout limpet”; McLean 1985, p. 160.

Type locality. East Pacific Rise at 13°N (12°48.6'N, 103°56.7'W), 2630–2635 m.

Holotype and paratype. MNHN, *Cyana* dive 82-35 at type locality, 12 March 1982. 2 broken specimens only; the larger holotype specimen preserved with nearly intact body (Figs. 52, 53), subsequently sectioned for study by V. Fretter; body of the smaller specimen the head end only (used for radular preparation).