

FIRST REPORT OF THE LATE CRETACEOUS (CAMPANIAN) HETEROMORPH AMMONITE *HARESICERAS (HARESICERAS) MONTANAENSE* (REESIDE, 1927) FROM NEW MEXICO

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Two specimens of *Haresiceras (Haresiceras) montanaense* (Reeside, 1927) were recovered from the Satan Tongue of the Mancos Shale on the eastern side of the San Juan Basin in Rio Arriba County in northern New Mexico. An early form and a late form of the species were found in the lower Campanian *Scaphites leei* III and *S. hippocrepis* I zones, respectively.

The early form, a partial shell, has one lateral half preserving most of the outer whorl and the other half preserving a complete, septate inner whorl. The whorl section is well-compressed, and coiling is very involute with a very small umbilicus exposed on the inner whorl. The venter and flanks are flattened, and, on the inner whorl, they meet to form a sharp, angular ventrolateral shoulder. On the latter half of the inner whorl, sigmoidal ribs strengthen and arch forward on the outer flank, bend slightly backward before the ventrolateral shoulder, connect to tiny ventrolateral nodes, then cross the venter with forward arching. On the body chamber, ornament changes to strong, straight, sharp-edged primaries that connect to small, nodate ventrolateral tubercles and are separated by four straight secondaries. The late form, an inner whorl, is similar to the early form, except for its smaller ventrolateral nodes.

The NMMNH specimen that is the early form is best assigned to *Haresiceras (H.) montanaense* because the inner whorl is identical to that species, and the chronologic age is the same as the early form of that species. However, the suture is closer to *Haresiceras (Mancosiceras) mancosense* (Reeside) in the symmetrical trifold lateral lobe and the less extended second lateral saddle. Also, the shape of the body chamber seems more similar to *H. (M.) mancosense* than to *H. (H.) montanaense*. It may be an intermediate form low in the *Scaphites leei* III Zone, or simply a form resulting from intraspecific variation.

Haresiceras is a rare ammonite that is known only from the Western Interior of the United States. Initially, two specimens, one the holotype of *Haresiceras (Mancosiceras) mancosense* from the uppermost Santonian *Desmoscaphtes bassleri* Zone in the Mancos Shale in San Juan County, were the only known occurrences of the genus from New Mexico (Cobban, 1964). *Haresiceras (Mancosiceras)* sp., likely *H. (M.) mancosense*, was later reported from the *D. bassleri* Zone in the Smoky Hill Member of the Niobrara Formation in Colfax County (Scott et al., 1986). This is the first report of *Haresiceras (H.) montanaense* from New Mexico.

Stage	European guide fossils	Western Interior guide fossils
Lower Campanian	<i>Scaphites hippocrepis</i> , <i>S. aquisgranensis</i> , <i>S. binodatus</i> , and <i>Goniatites quadrata</i> .	<i>Haresiceras natronense</i> , <i>H. fisheri</i> , and fine-ribbed forms of <i>Scaphites hippocrepis</i> and <i>S. aquisgranensis</i> .
		<i>Haresiceras placentiiforme</i> and coarse-ribbed forms of <i>Scaphites hippocrepis</i> and <i>S. aquisgranensis</i> .
Lower part	<i>Diplacoceras bidoretum</i> , <i>Haresiceras pseudogardeni</i> , and <i>Goniatites granulata</i> (typical form).	<i>Haresiceras montanaense</i> (late form) and coarse-ribbed forms of <i>Scaphites hippocrepis</i> and <i>S. aquisgranensis</i> .
Upper Santonian	<i>Placenticeras syrtale</i> , <i>Marsupites</i> spp., <i>Utiaricus</i> spp., and <i>Goniatites granulata</i> (early form).	<i>Haresiceras mancosense</i> (early form) and <i>Scaphites leei</i> .

Figure 3. Chart showing correlation of zones where species of *Haresiceras* occur in the Western Interior and correlation to faunal zones in Europe. Note that the early form of *Haresiceras montanaense* occurs with *Scaphites leei* in the lowermost Campanian and the late form of *H. montanaense* with the earliest form of *Scaphites hippocrepis* (modified from Cobban, 1964, table 2).

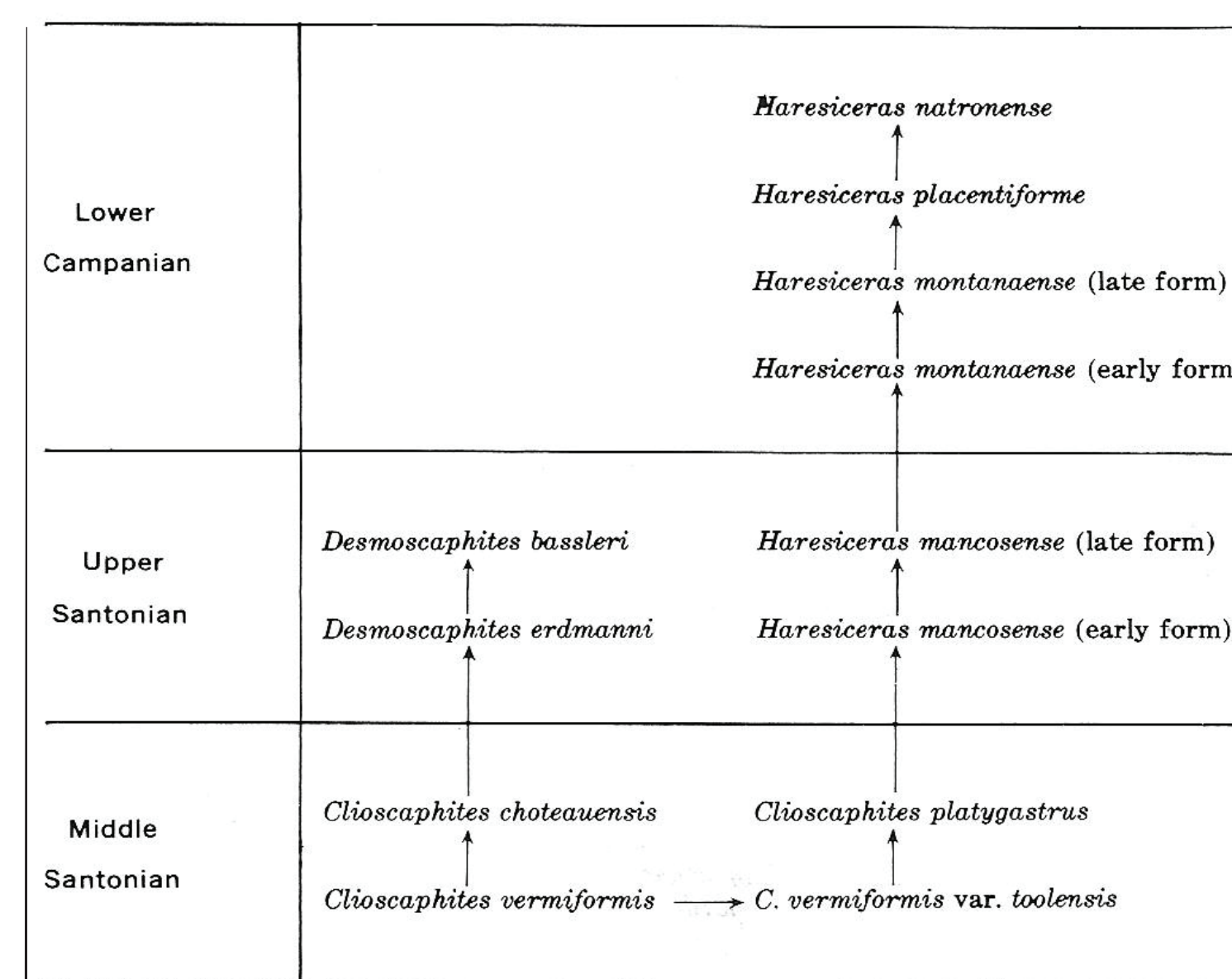


Figure 4. Chart showing lineages of *Haresiceras* and its possible origin from *Clioscaphtes* (modified from Cobban, 1964, fig. 5).

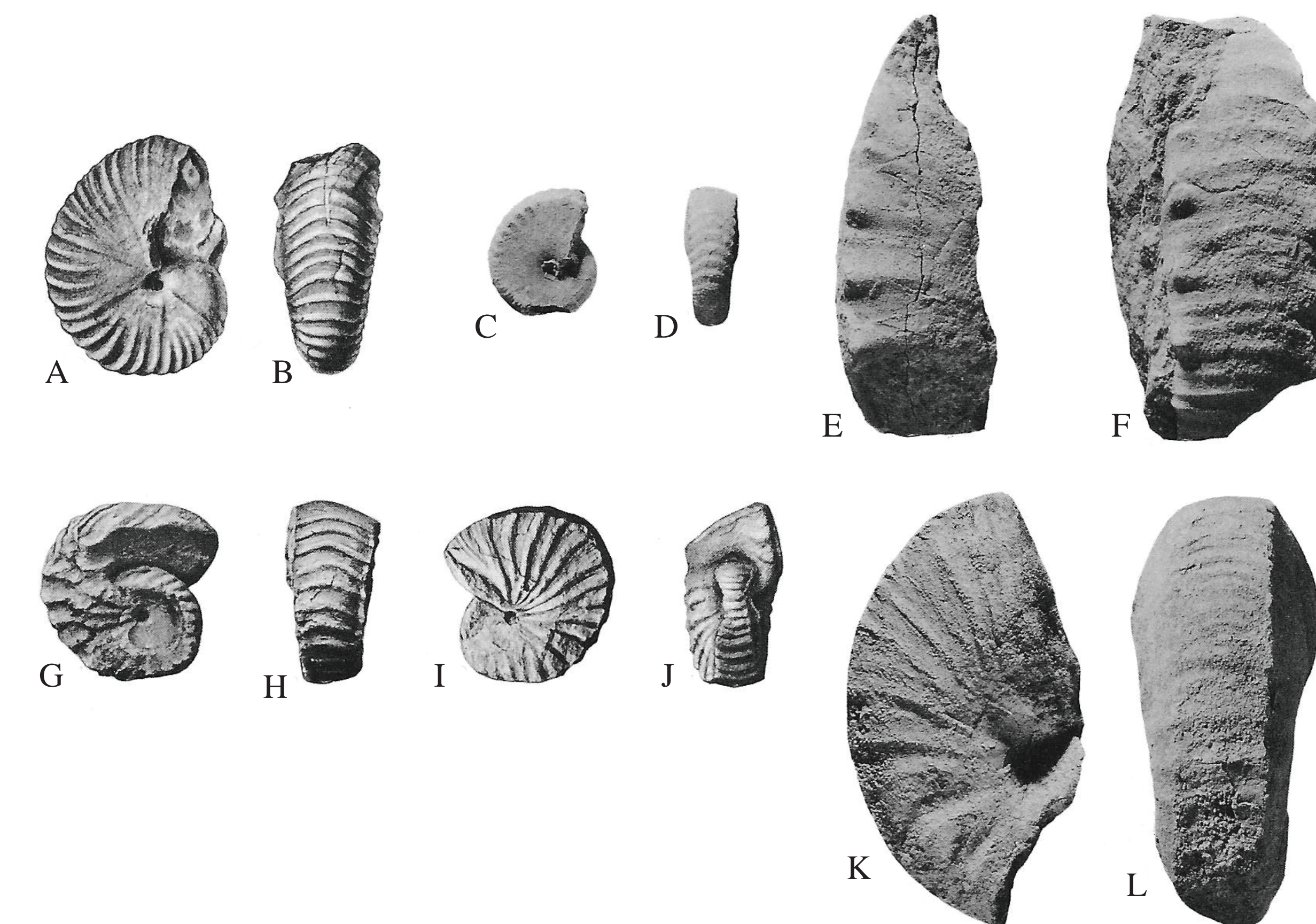


Figure 7. Comparison of *Haresiceras (Mancosiceras) mancosense* and *Haresiceras (Haresiceras) montanaense* showing the more rounded venter in the former and the flattened venter in the latter. A-B, holotype of *H. (M.) mancosense*, early form; C-D, *H. (H.) montanaense*, very slender early form (compare to Fig. 6B-C); E-F, *H. (M.) mancosense*, body chamber of late form; G-J, holotype of *H. (H.) montanaense* (compare Fig. 7H to Fig. 6E); K-L, *H. (H.) montanaense*, body chamber of late form (modified from Cobban, 1964, pls. 1-2). Sizes are relative to each other but not to scale.

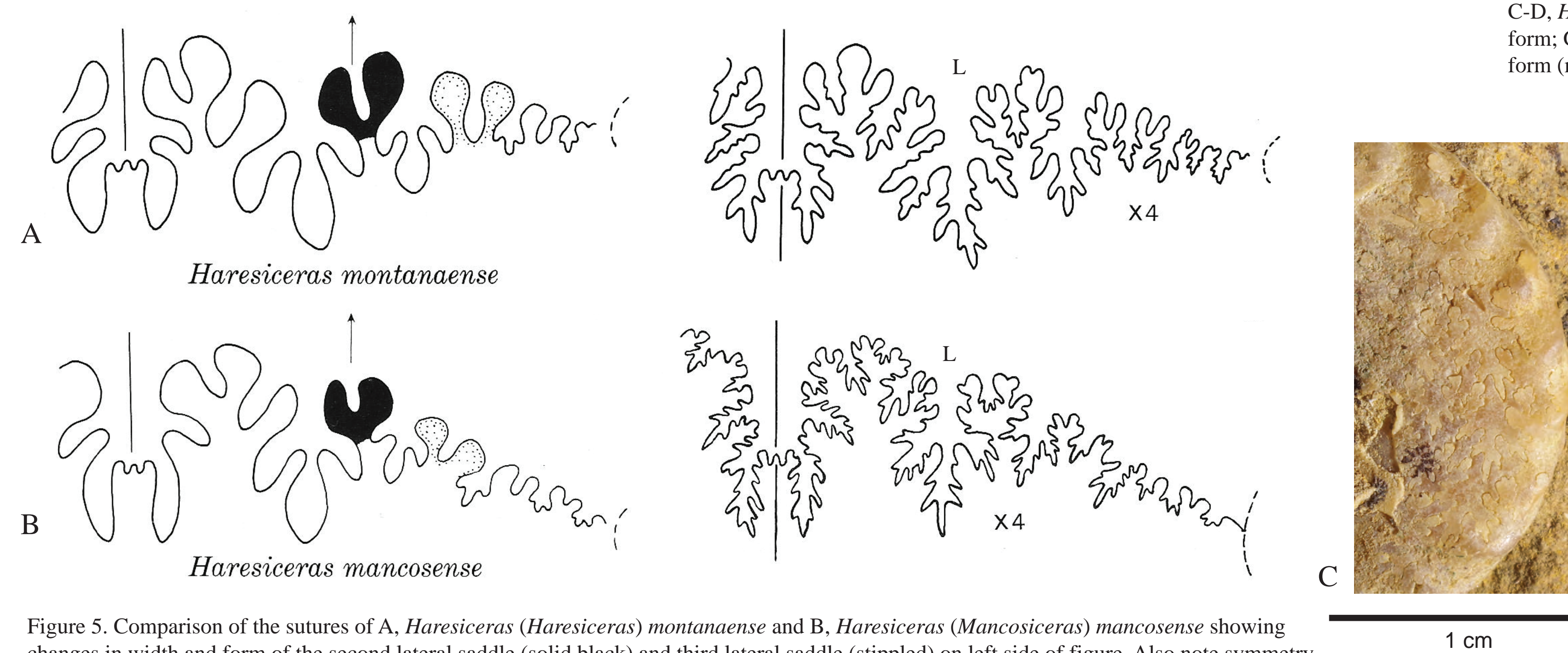


Figure 5. Comparison of the sutures of A, *Haresiceras (Haresiceras) montanaense* and B, *Haresiceras (Mancosiceras) mancosense* showing changes in width and form of the second lateral saddle (solid black) and third lateral saddle (stippled) on left side of figure. Also note symmetry of first lateral lobe (L) in *Haresiceras (Mancosiceras) mancosense* on right side of figure (modified from Cobban, 1964, fig. 6, pl. 1, fig. 21, pl. 2, fig. 28); C, Close-up of suture of NMMNH specimen of the early form of *Haresiceras (Haresiceras) montanaense* (compare with figures A-B).



Figure 1. Uppermost part of the Satan Tongue of the Mancos Shale and overlying Point Lookout Sandstone on the east side of the Llaves Hogback. The late form of *Haresiceras (Haresiceras) montanaense* (Reeside, 1927) was found in the uppermost part of the Satan Tongue in this area.

Stage	substage	Ammonite Zone	Inoceramid Zone	Age (Ma)
Campanian (pars)	Lower	<i>Baculites</i> sp. (weak flank ribs)	" <i>Inoceramus</i> " <i>azerbaydjanensis</i>	
		<i>Baculites</i> sp. (smooth)	<i>Cataceramus balticus</i>	
		<i>Scaphites hippocrepis</i> III		
		<i>Scaphites hippocrepis</i> II		81.86 ± 0.36
		<i>Scaphites hippocrepis</i> I		
Santonian	Upper	<i>Scaphites leei</i> III	<i>Sphenoceramus lundbreckensis</i>	
		<i>Desmoscaphtes bassleri</i>		84.30 ± 0.34
		<i>Desmoscaphtes erdmanni</i>		
		<i>Clioscaphtes choteauensis</i>	<i>Cordiceramus muelleri</i>	
		<i>Clioscaphtes vermiformis</i>	<i>Cordiceramus bueltenensis</i>	
		<i>Clioscaphtes saxitanianus</i>	<i>Cladoceramus undulatopticatus</i>	

Figure 2. Zonal chart showing the *Scaphites leei* III Zone where the early form of *Haresiceras (Haresiceras) montanaense* occurred and the *Scaphites hippocrepis* I Zone where the late form of the species occurred (modified from Merewether et al., 2011, fig. 2).

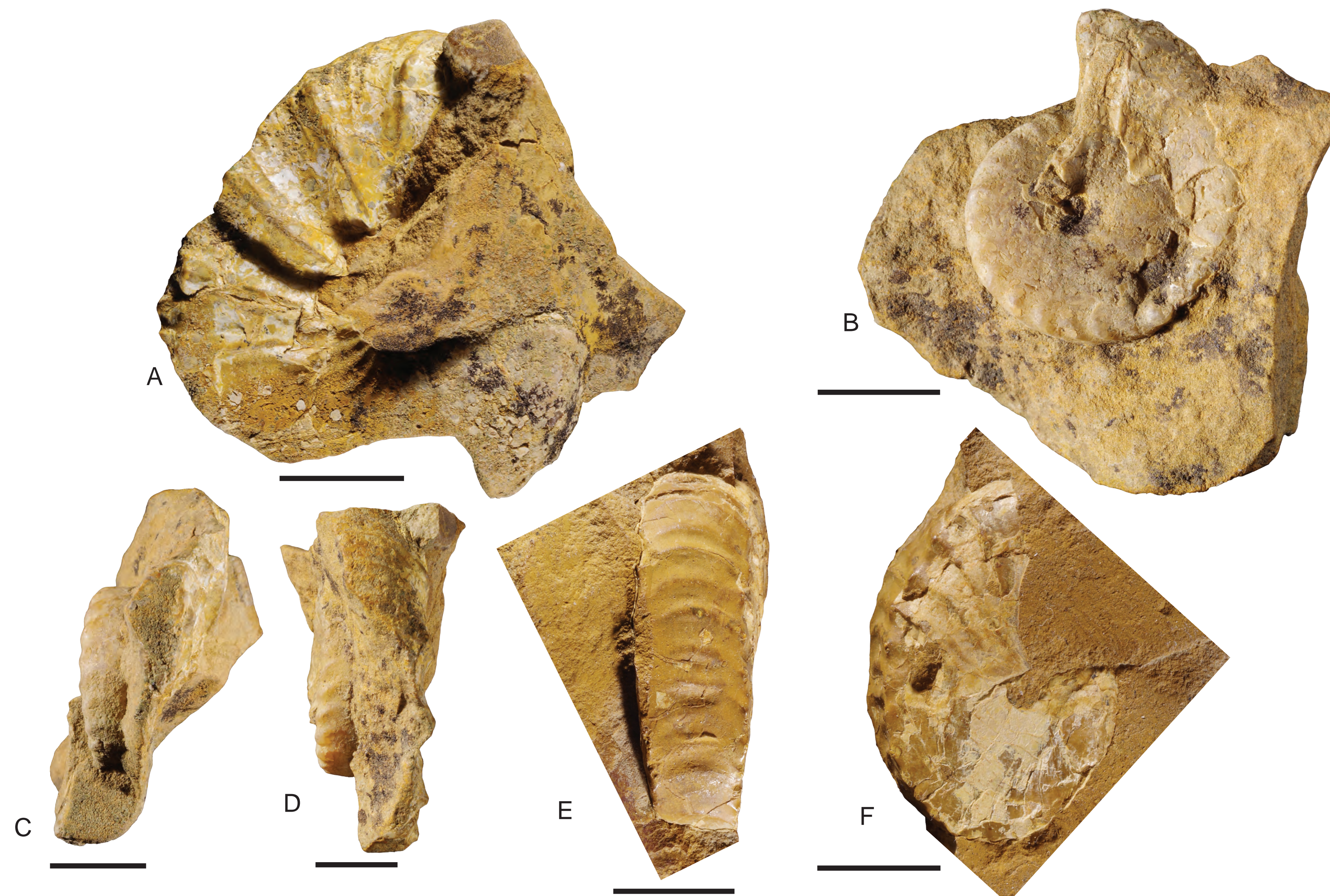


Figure 6. A-D, *Haresiceras (Haresiceras) montanaense* (early form), A, left lateral, B, right lateral view of inner whorl, C, top view of venter and D, ventral views of inner whorl and body chamber; E-F, *Haresiceras (Haresiceras) montanaense* (late form), E, ventral and F, lateral views. Both NMMNH specimens. Scales equal 1 cm.

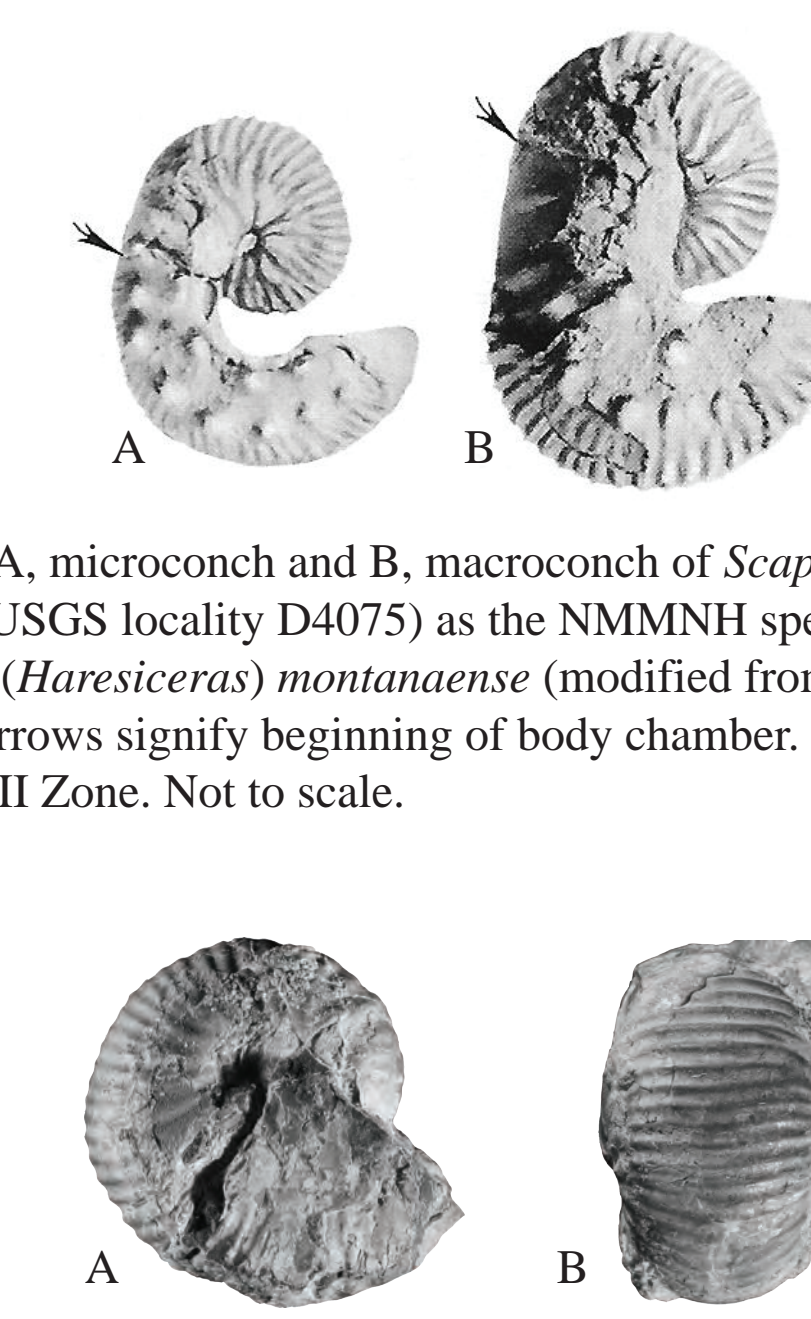


Figure 8. A-B, A, microconch and B, macroconch of *Scaphites leei* III from the same locality (USGS locality D4075) as the NMMNH specimen of the early form of *Haresiceras (Haresiceras) montanaense* (modified from Cobban, 1969, pl. 1, figs. 19, 25). Arrows signify beginning of body chamber. Lowermost Campanian *Scaphites leei* III Zone. Not to scale.

Figure 9. A-B, A, lateral and B, ventral views of *Scaphites (Scaphites) hippocrepis* I from the same area as the NMMNH specimen of the late form of *Haresiceras (Haresiceras) montanaense*, but stratigraphically lower. Lower Campanian *Scaphites hippocrepis* I Zone. Scales equal 1 cm.

ACKNOWLEDGMENTS

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