

*ERYMA JUNGOSTRIX* N. SP. (DECAPODA; ERYMIDAE) FROM THE REDWATER SHALE MEMBER OF THE STUMP FORMATION (JURASSIC; OXFORDIAN) OF UTAH

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A B S T R A C T

A single, well-preserved fossil specimen of a large macruran decapod from the Jurassic Redwater Shale Member of the Stump Formation in northeastern Utah forms the basis for description of a new species of *Eryma* von Meyer, 1840. The discovery documents only the third species of the genus, and one of very few decapods, to have been described from Jurassic rocks in North America.

INTRODUCTION

Although the record of decapod crustaceans in Jurassic rocks of Europe is robust, relatively few occurrences are known from North America. This apparent disparity can be explained, in part, by the comparatively limited amount of exposure of marine Jurassic rocks in North America (Herrick and Schram, 1978). However, it is also likely that little attention has been paid to the collection of mid-Mesozoic decapods in North America. Feldmann and McPherson (1980) summarized occurrences of decapods in Canada and noted only two Jurassic species from that vast region. Within the United States, Jurassic decapods are known only from the Stockade Beaver Member of the Sundance Formation in Wyoming. Herrick and Schram (1978) recognized several taxa judged to be too incompletely preserved to warrant identification to the species level. These included penaeid shrimp, *Antrimops* sp. and *Bombur* sp.; a palinurid lobster, *Mecochirus* sp.; a possible glypheid lobster; and indeterminate material that may represent an anomuran. Subsequently, Feldmann (1979) added the astacid lobster, *Eryma foersteri*, to the list of Sundance Formation decapods. To date, it remains the only substantial Jurassic assemblage known from North America. Thus, the discovery of a well-preserved fossil lobster from Jurassic beds in Utah is particularly significant, and its description forms the basis for this work.

The specimen was collected by one of us (ALT) from the Redwater Shale Member of the Upper Jurassic Stump Formation. Exposures of the Redwater Shale Member are extensive around the Split Mountain Anticline structure within and adjacent to Dinosaur National Monument (Gregson and Chure, 2000), and field work conducted in August 2001 along Cub Creek road just outside of the National Monument resulted in the discovery of fossiliferous exposures of the lower portion of the Redwater Shale Member (Fig. 1). Decapods occur rarely in sparsely fossiliferous, gray sandy calcite concretions with a diameter of 7–12 cm, 8.5 meters above the base of the member (Fig. 2). A single individual, the holotype of *Eryma jungostrix* n. sp., was secured from these concretions in a small east-west trending gully.

The fauna of the Redwater Shale includes a diverse bivalve and gastropod assemblage, ammonites, abundant belemnites, and echinoderms. Occasional ichthyosaur and

plesiosaur bones are also known (Chure, 1993; Bilbey et al., 1990). Decapods have not previously been reported from the Stump Formation. All faunal indicators suggest open marine conditions and water of normal salinity and oxygenation (Gregson and Chure, 2000; Bilbey et al., 1999).

The Redwater Shale is entirely Oxfordian in age in the study area and lies completely within the *Cardioceras cordatum* Ammonoid Biozone (Imlay, 1982). During this study, several well-preserved specimens of *Cardioceras* (*Scarburgiceras*) *reesidei* Maire, 1938, were collected from concretions only a few meters below the decapod horizon, indicating the sequence can be unequivocally assigned to the *Cardioceras cordatum* Biozone.

SYSTEMATIC PALEONTOLOGY

Order Decapoda Latreille, 1802  
 Infraorder Astacidea Latreille, 1802  
 Superfamily Erymoidea Van Straelen, 1924  
 Family Erymidae Van Straelen, 1924

Included Genera.—*Clytiella* Glaessner, 1931; *Clytiopsis* Bill, 1914; *Enoploclytia* McCoy, 1849; *Eryma* von Meyer, 1840; *Galicia* Garassino and Krobicki, 2002; *Palaeastacus* Bell, 1850; *Paraclytiopsis* Oravecz, 1962; *Phlyctisoma* Bell, 1863; *Protoclytiopsis* Birstein, 1958.

Genus *Eryma* von Meyer, 1840

Type Species.—*Macrourites modestiformis* von Schlotheim, 1822, by original designation.

Included Species.—*Eryma affinis* de Ferry, 1865; *E. amalthea* (Quenstedt, 1850), as *Glyphea*; *E. babeaui* Etallon, 1861; *E. bedelta* (Quenstedt, 1857), as *Glyphea*; *E. boloniensis* Sauvage, 1891; *E. bordenensis* (Copeland, 1960), as *Erymastacus*; *E. burgandiana* Catherine and Philippe, 2004; *E. caraboeufi* Morière, 1888; *E. compressa* (Eudes-Deslongchamps, 1842, as *Palinurus* (?)); *E. corallina* Van Straelen, 1924; *E. crassimanus* Krause, 1891; *E. cretacea* Roger, 1946; *E. cumonti* Van Straelen, 1921; *E. delphinensis* Moret, 1946; *E. deslongchampsii* Van Straelen, 1924; *E. dutertrei* Sauvage, 1891; *E. foersteri* Feldmann, 1979; *E. fossata* Krause, 1891; *E. glaessneri* (Van Straelen, 1936), as *Enoploclytia*; *E. gracilimana* Lahusen, 1894;

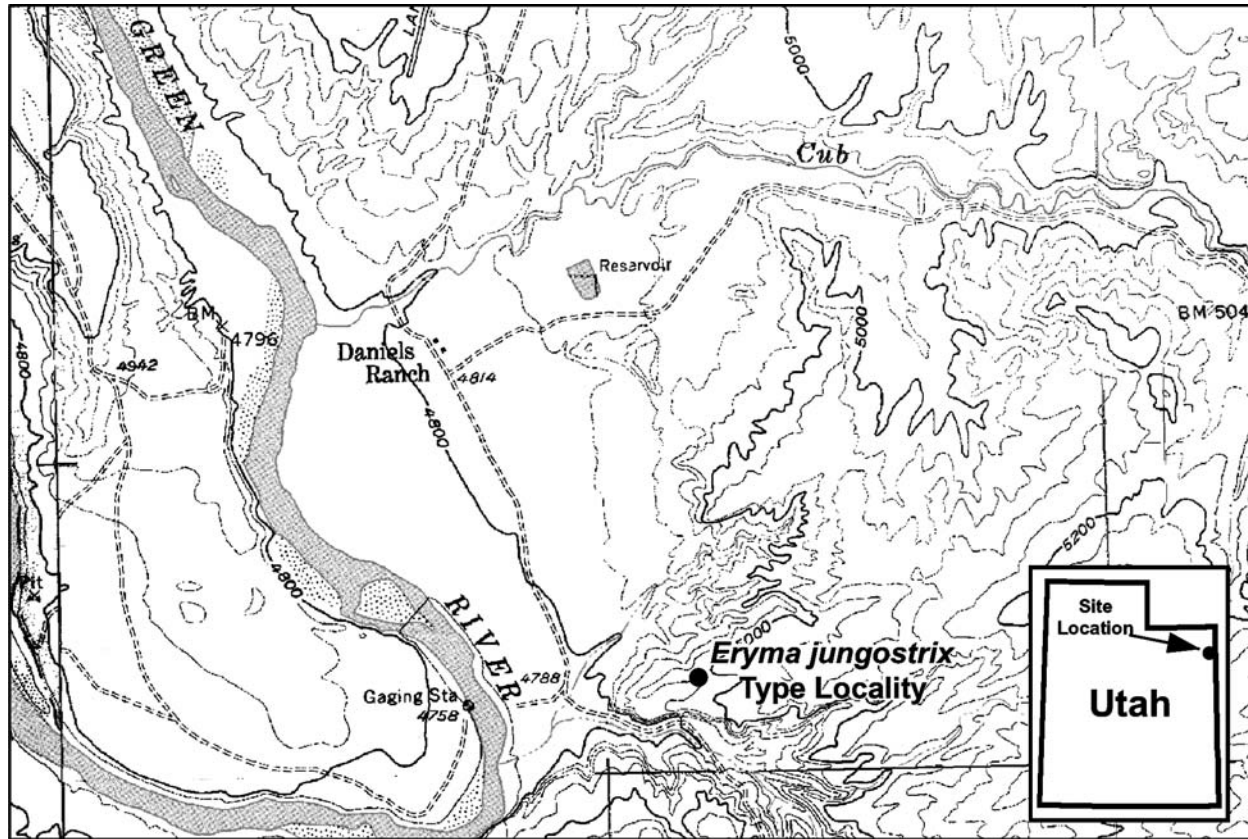


Fig. 1. Map of a portion of northeastern Utah showing the locality from which *Eryma jungostrix* n. sp. was collected.

*E. granulifera* Secretan, 1964; *E. guisei* Wright, 1882; *E. karitzkyi* Lahusen, 1894; *E. lafayi* Lissajous, 1923; *E. loryi* Van Straelen, 1923; *E. madagascariensis* Secretan, 1964; *E. mandelslohi* (von Meyer, 1840), as *Klytia*; *E. meyeri* Garassino, 1996; *E. modestiforme* (Schlotheim, 1822), as *Macrourites*; *E. mosquensis* Lahusen, 1894; *E. nicklesi* Méchin, 1901; *E. ornata* (Quenstedt, 1857), as *Glyphea*; *E. punctatum* Oppel, 1861; *E. quadriverrucata* Trautschold, 1866; *E. radiata* Oppel, 1861; *E.? rinellincola* de Gregorio, 1884; *E. squalida* Etallon, 1861; *E. stricklandi* (Phillips, 1871), as *Glyphea*; *E. sulcata* Harbort, 1905; *E. tiithonia* Van Straelen, 1936; *E. veltheimi* (Münster, 1839), as *Glyphea*; *E. ventrosa* (von Meyer, 1835), as *Glyphea*; *E. verrucosa* (Münster, 1839), as *Glyphea* [= *Pustulina minuta* (Schlotheim, 1822) fide Garassino and Schweigert, in press]; *E. westphali* Schweigert, Dietl, and Röper, 2000.

**Diagnosis.**—Cephalothorax cylindrical, with moderately long, dentate rostrum, strong cervical groove, weak gastro-orbital groove; dorsal [branchiocardiac?] groove variably strongly developed; however, always weaker, more or less parallel preceding one [postcervical groove] or joined to each other; median dorsal suture with strongly defined intercalated plate. Sculpture relatively weak, abdomen smooth, with triangular epimeres [pleura]. Compact to slender claws with strong sculpture, propodus and dactylus longer than the hand [translated from Förster, 1966, p. 89].

**Discussion.**—In addition to the included species listed above, several North American forms that have been

assigned to *Eryma* cannot be confirmed with confidence. *Eryma* (?) *americana* Rathbun, 1923; *E. flecta* Rathbun, 1926; and *E. stantoni* Rathbun, 1935 are all based upon bits of claws and carapace that are far too fragmentary to assign to a genus. Thus, only *Eryma bordenensis* (Copeland, 1960) and *E. foersteri* Feldmann, 1979, represent the genus in North America.

#### *Eryma jungostrix*, new species

Figs. 3, 4

**Diagnosis.**—Erymid with scabrous ornament diminishing in size posteroventrally; well-developed, relatively prominent groove joins branchiocardiac and postcervical grooves which do not merge; mandibular external articulation smooth, prominent.

**Description.**—Carapace large for genus; groove pattern deeply incised; lacking keels; moderately strong scabrous sculpture diminishing in size ventrally and posteriorly.

Rostrum poorly preserved; appearing short, slightly downturned, and bearing at least one dorsal spine. Cephalic regions with moderate-sized post-rostral and supraorbital spines and coarse scabrous ornament dorsally, becoming weaker posteroventrally; bounded ventrally by distinct, smoothly curving antennar groove (b) that extends dorsally, paralleling anterior margin to level of supraorbital spine. Hepatic region with row of nodes arrayed parallel to hepatic groove and weak scabrous ornament. Cervical groove (e-e<sub>1</sub>) deeply impressed, broad; approaches midline at 56 degree

angle; concave forward and directed anteroventrally from midline to level of orbits and becoming straighter and directed more ventrally to intersection with hepatic groove. Mandibular external articulation ( $\omega$ ) triangular, swollen, smooth. Hepatic groove ( $b_1$ ) well defined, shallow, concave dorsally. Postcervical groove ( $c$ ) moderately deeply impressed, weaker at dorsal and ventral ends; approaches midline at 55 degree angle; weakly concave forward, terminating ventrally at position about 1/3 total carapace height. Branchiocardiac groove ( $a$ ) straight, well defined; approaching midline at 44 degree angle, curving more ventrally at level of ventral termination of postcervical groove to join to concave forward inferior groove ( $i$ ) and hepatic groove. Postcervical and branchiocardiac grooves do not join but are united by a short, well-defined groove extending posteroventrally between them. Region between cervical and postcervical grooves coarsely scabrous dorsally, becoming very weakly sculpted posteroventrally. Sculpture on branchial areas uniformly moderately developed. Postmarginal groove and rim ( $p.m.$ ) well developed dorsally and not exposed ventrally. Lateral rim and margin narrow, poorly exposed. Carapace with dorsal suture and subtle indication of narrow, smooth, lanceolate, intercalated plate at anterior end of carapace.

Pleonal somites poorly preserved. Somite 1 shorter than 2–5, which are about equal in length. Surfaces conspicuously pitted on swollen pleura and more weakly pitted on terga. Telson and uropods not preserved.

Exterior, convex surface of left mandible ( $mand$ ) partially exposed ventral to hepatic region; elongate-ovoid, smooth, strongly calcified. Preserved segments of first pereiopod inflated, strong, bearing scabrous sculpture similar to that on cephalic part of cephalothorax. Remainder of thoracic appendages not preserved.

**Etymology.**—The trivial name was derived from the Latin *junco* = joined, and *strix* = groove ( $f$ ), alluding to the narrow, well-defined groove that joins the postcervical and branchiocardiac grooves.

**Types.**—The holotype and sole specimen, USNM 530027, is deposited in the United States National Museum of Natural History, Washington, D.C.

**Occurrence.**—The holotype was collected from the Redwater Shale Member of the Stump Formation, NE 1/4, SW 1/4, SW 1/4, Sec. 4, T5S, R24E (Salt Lake Meridian), north of Dinosaur National Monument, northeast Utah, UTM coordinates 12T 650463E; 4474789N, and was collected August 9, 2001, by Alan L. Titus.

**Discussion.**—Species of *Eryma* are distinguished from one another on the basis of relative degrees of development of the three primary transverse grooves, the extent to which the postcervical and branchiocardiac grooves approach the midline, and the nature of carapace ornamentation. Förster (1966) recognized the significance of the variation in groove patterns and demonstrated that they resulted in three lineages within the genus that diverged in the Late Triassic or Early Jurassic. Feldmann (1979) supported that analysis and allied *E. foersteri* with the lineage characterized by *E. guisei* from the late Dogger (Middle Jurassic) of Great

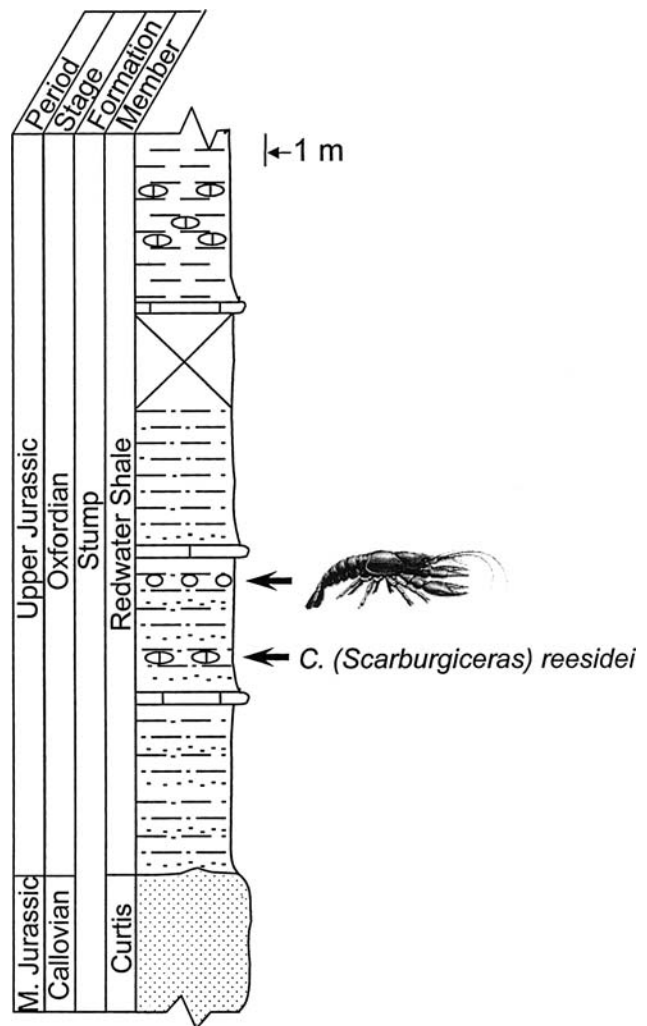


Fig. 2. Stratigraphic section of the Stump Formation, indicating the level from which *Eryma jungostrix* n. sp. was collected.

Britain (Förster, 1966). *Eryma jungostrix* is more closely related to the lineage containing *E. ornata* from the Callovian of Germany based upon the presence of a groove uniting the postcervical and branchiocardiac grooves. However, the two transverse grooves are much more widely separated in *Eryma jungostrix* and the groove between them is much more prominent. It is important to note that the line drawings of Förster depict the postcervical and branchiocardiac grooves as terminating dorsally well before reaching the dorsal midline, whereas examination of his photographs of dorsal views of the corresponding carapaces shows the grooves closely approaching, but not crossing, the midline. Those grooves come very close to the midline in *E. jungostrix* and may cross it. The specimen is ruptured along the dorsal suture, and the left side of the carapace is thrust slightly over the right side, making interpretation of that area difficult.

*Eryma jungostrix* is preserved as an articulated specimen and the carapace and abdomen are inflated, not compressed. Although the distal elements of the first pereiopod and the other thoracic appendages are not preserved and the telson and uropods are likewise not present, the completeness of

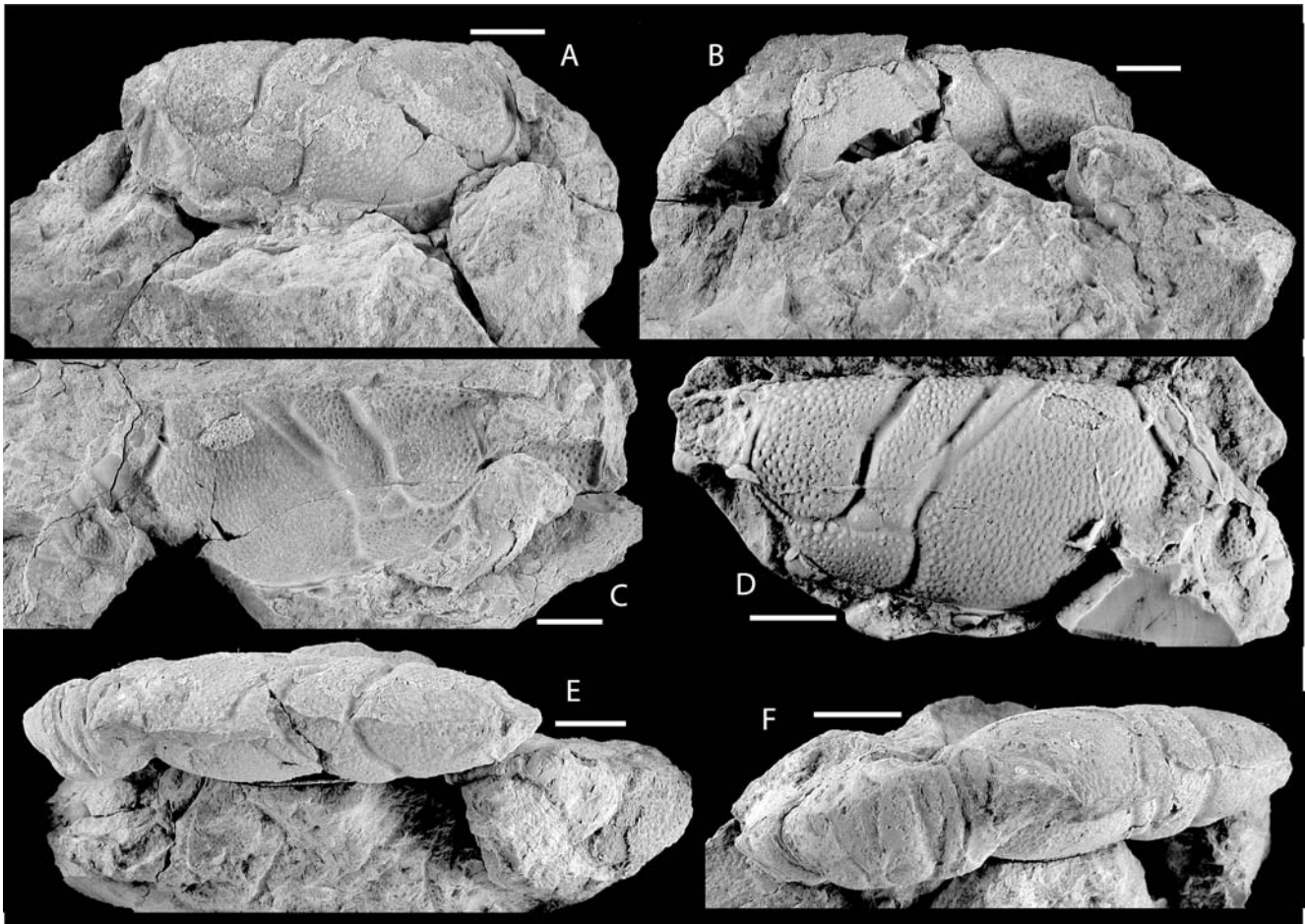


Fig. 3. *Eryma jungostris* n. sp. A, left lateral view of the carapace and abdomen. B, right lateral view of the carapace and abdomen. The proximal elements of the first pereiopod are exposed in front of and below the cephalothorax. C, Mold of the exterior of the left side of the carapace and abdomen. D, latex cast of the left side of the carapace. E, dorsal view of carapace. F, posterodorsal view of carapace and abdomen. Scale bars equal 1 cm.

the specimen suggests that it may be a corpse, rather than a molted specimen. The carapace surfaces are not twisted or distorted as might be anticipated in a molt in which decalcification had occurred. Additionally, the preservation of the cuticle appears to be excellent.

One portion of the cuticle, situated on the medial part of the branchiostegite on the left side of the specimen, exhibits a small area in which the exocuticle has exfoliated. The underlying outer surface of the endocuticle is exposed. The sculpture of the exocuticle is quite different (Fig. 4, arrow).

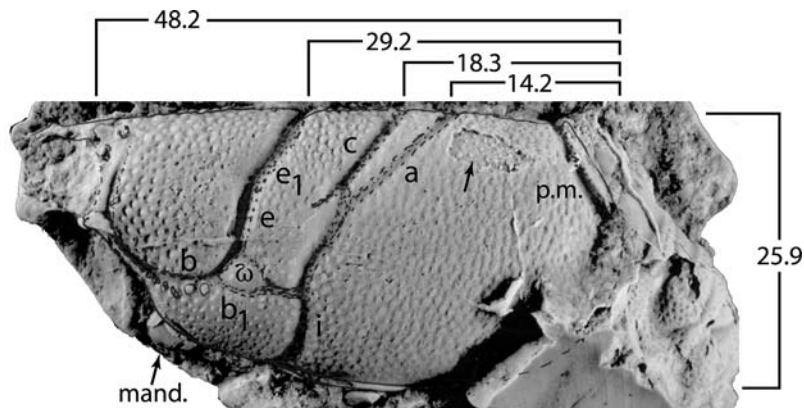


Fig. 4. *Eryma jungostris* n. sp. Latex cast of the left side of the carapace upon which the carapace grooves have been enhanced and labeled and dimensions, in mm, are given. a = branchiocardiac groove, b = antennar groove, b<sub>1</sub> = hepatic groove, c = postcervical groove, e-e<sub>1</sub> = cervical groove, mand. = mandible, p.m. = postmarginal groove and rim, ω = mandibular external articulation. Arrow on the branchiostegite denotes the area of exfoliation of the exocuticle referred to in the text.

This observation is important because it reinforces observations made by Feldmann and Gaździcki (1998) and Waugh et al. (2004) that the cuticular layers are separated by a plane of weakness, that exfoliation of the outer layers commonly occurs, and that the surface morphology of the exocuticle and endocuticle may be quite different. This observation has strong implications for use of surface sculpture as a primary basis for taxonomic decisions.

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