Theriosynoecum wyomingense (Branson, 1935), a Possible Guide Ostracode to the Salt Wash Member of the Morrison Formation

GEOLOGICAL SURVEY BULLETIN 1161-A

Theriosynoecum wyomingense (Branson, 1935), a Possible Guide Ostracode to the Salt Wash Member of the Morrison Formation

By I. G. SOHN *and* R. E. PECK

CONTRIBUTIONS TO GENERAL GEOLOGY

GEOLOGICAL SURVEY BULLETIN 1161-A

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1963

UNITED STATES DEPARTMENT OF THE INTERIOR

STEWART L. UDALL, *Secretary*

GEOLOGICAL SURVEY

Thomas B. Nolan, *Director*

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington 25, D.C.

CONTENTS

ILLUSTRATION

659503—63

CONTRIBUTIONS TO GENERAL GEOLOGY

THERIOSYNOECUM WYOMINGENSE (BRANSON, 1935), A POSSIBLE GUIDE OSTRACODE TO THE SALT WASH MEMBER OF THE MORRISON FORMATION

By I. G. Sohn and R. E. Peck

ABSTRACT

The ostracode species *Theriosynoecum wyomingense* (Branson, 1935) appears to be restricted to the Salt Wash Member of the Morrison Formation in the Colorado Plateau area and to equivalents of the Salt Wash Member in lithologically undifferentiated sedimentary rocks in Wyoming, South Dakota, and Montana. Associated charophytes tend to support this hypothesis.

INTRODUCTION

The Morrison Formation consists of nonmarine Upper Jurassic sedimentary rocks, probably of Kimmeridgian age, that are present throughout most of the western interior of the United States. Reeside (1952) summarized the available knowledge of the stratigraphy of the Morrison Formation, and more recently Craig and Cadigan (1958) described in greater detail the stratigraphy of the Morrison Formation of the Colorado Plateau and adjacent areas. The measured sections used by Craig and his associates are described by Craig (1959). Briefly, the Morrison Formation in the Colorado Plateau has been divided on the basis of lithologic criteria into two parts that are named in ascending order the Salt Wash Member and the Brushy Basin Member; the formation cannot be so divided to the north and east of the Colorado Plateau. A possible extension of time equivalents of the Salt Wash Member to the north as far as Fergus County, Mont., and to the Black Hills of Wyoming and South Dakota on the basis of the occurrence of the distinctive zonal ostracode species *Theriosynoecum wyomingense* (Branson, 1935) is suggested here.

MEMBERS OF THE MORRISON FORMATION

The Salt Wash Member of the Morrison Formation consists of (Craig and others, 1955) interstratified light-colored sandstone and claystone 200 to 400 feet thick, whose upper part intertongues with and grades into the Recapture Member to the south and southwest in New Mexico and Arizona. The Brushy Basin Member (Craig and others, 1955) consists of varicolored shale or mudstone with some sandstone lenses as much as 500 feet thick. The member intertongues with and grades into the Westwater Canyon Member that overlies the Recapture Member (Craig and others, 1955, fig. 20). The arbitrary boundary between the undifferentiated Morrison Formation and the recognizable Salt Wash and Brushy Basin Members, as shown by Craig and others (1955, figs. 21, 29), is indicated on figure 1. This figure shows also the localities from which the fossils were collected.

MICROFOSSILS

OSTRACODES

The name *Theriosynoecum* Branson, 1936, was proposed as a substitute name for the junior homonym *Morrisonia* Branson, 1935. At the time of its description, *Morrisonia* was based on a single relatively abundant distinctive species, *Theriosynoecum wyomingense* (Branson, 1935), from a green argillaceous sand lens, 3 miles south of Mayoworth, Wyo., in the eastern foothills of the Bighorn Mountains. The type locality is considered to be near the middle of the Morrison Formation. This species was illustrated by Branson (1935, pl. 57, figs. 17–21), Grekoff (1958, p. 1, figs. 15, 16), Howe (1961, text fig. 239), Peck (1956, p. 96, fig. 22), Peck (1959, p. 118, fig. 24), Peck and Reker (1948, pl. 3, fig. 8), Sohn (1958, p. 123, figs. 19, 20). The genus has been monotypic for 20 years, presumably because the generic characters as originally defined were found only in the type species. Mandelstam (1956, p. 138) and Grekoff (1958) suggested, however, that many of the bisulcate Mesozoic nonmarine species previously assigned to the *Metacypris-Gomphocythere* group actually belong to *Theriosynoecum*. Branson (1961) concurred with such an expanded definition of *Theriosynoecum*, and he accepted *Gomphocythere berwickensis* Martin, 1940, as clearly belonging to this genus. This extends the stratigraphic range of the genus into the Cretaceous.

Theriosynoecum wyomingense (Branson, 1935) should be useful to field geologists because fragments of less than half a valve can be distinguished easily from those of associated ostracodes, and most specimens are large enough to be seen readily with an ordinary hand lens (× 10 magnification).

Sohn (1962) noted that the number and position of the nodes in

T. berwickense (Martin, 1940) are constant during the ontogeny of that species. By applying this principle of constancy of surface ornament to the species *T. wyomingense* (Branson, 1935), identification of this species in areas removed from the type locality is possible, and the zone in which this species is present can be extended geographically. We do not as yet have definitive data on the vertical range of this species, but all available data indicate that it is restricted to the Salt Wash Member and to the lower part of the undifferentiated Morrison Formation. The species is present in the following localities: The Salt Wash Member in Colorado (fig. 1,

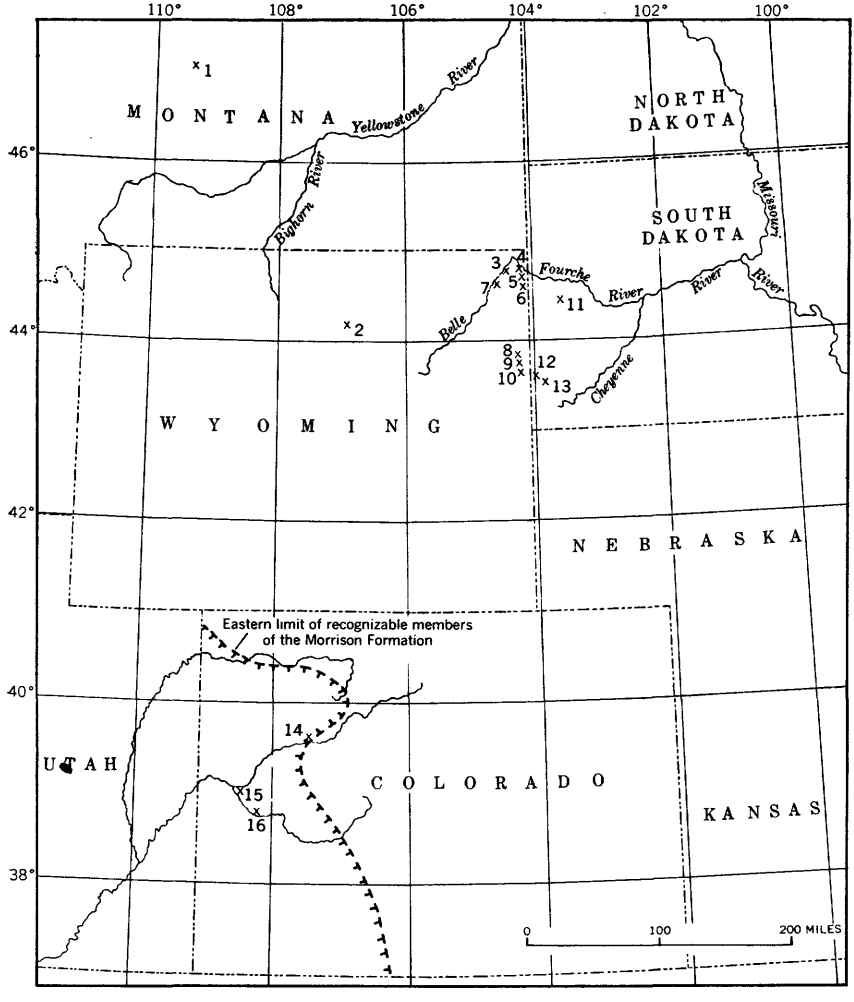

FIGURE 1. Index map of part of the Western United States showing localities where fossils were collected, and the approximate eastern boundary of the Morrison Formation as differentiated into the Salt Wash and Brushy Basin Members.

locs. 14–16), 45 feet above the base of the Morrison Formation in the Black Hills of Wyoming and South Dakota (fig. 1, locs. 3–13), supposedly near the middle of the Morrison Formation at the type locality near Mayoworth, Wyo. (fig. 1, loc. 2), and in the lower part of the Morrison Formation in Fergus County, Mont. (fig. 1, loc. 1).

CHAROPHYTES

In all these localities, *Theriosynoecum wyomingense* is associated with other ostracodes and with charophytes. The associated ostracodes are not as distinctive as *T. wyomingense*, and their range is not known. The associated charophyte species, listed below, were described by Peck (1937, 1957), although the fossils from most of the samples used herein were not used in Peck's study.

Ott[1] attempted to zone the undifferentiated Morrison by means of charophytes, and he concluded (p. 123) that correlation of the Brushy Basin and Salt Wash Member equivalents could not be precisely determined, but that correlations within prescribed limits could be made by statistical methods. He found that *Aclistochara bransoni* Peck, 1937, and *Echinochara spinosa* Peck, 1957, are more common in the Salt Wash Member than in the Brushy Basin Member, whereas *Stellatochara obovata* (Peck), 1937, appears to be restricted to the Brushy Basin Member and its equivalents.

Stellatochara obovata (Peck) is associated with *Theriosynoecum wyomingense* (Branson) in four localities. It is the only species recorded at locality 3, although at localities 1, 6, and 13 it is associated with typically Salt Wash charophyte species. In general, the charophytes support the suggestion that upon further study *Theriosynoecum wyomingense* (Branson) may prove to be a guide fossil to the Salt Wash Member of the Morrison Formation.

DESCRIPTION OF LOCALITIES AND LISTS OF FOSSILS

MONTANA

The following associations are noted:

Locality 1.—Lower part of Morrison Formation, along East Fork of Big Springs Creek, 8½ miles east of Lewiston, Fergus County. Thin-bedded limestone below thick-bedded limestone. Collector R. E. Peck, Aug. 18, 1938.

Ostracoda:
Theriosynoecum wyomingense (Branson, 1935)
Other ostracodes abundant
Charophyta:
Sphaerochara verticillata (Peck) Peck, 1957
Aclistochara bransoni, Peck, 1937
Stellatochara obovata (Peck) Peck, 1957

[1] Ott, H. L., 1957, Stratigraphic distribution of Charophyta in the Morrison of Colorado and Utah: Unpublished M. A. thesis, University of Missouri.

WYOMING

Locality 2.—Morrison Formation, green argillaceous sand lens considered to be near the middle of the formation, 3 miles south of Mayoworth, Johnson County. This is the type locality of the invertebrates described by Branson (1935).

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Latochara concinna Peck, 1957

Sphaerochara verticillata (Peck) Peck, 1957

Locality 3.—Morrison Formation, SW¼ sec. 14, T. 56 N., R. 63 W., Crook County. USGS 26457. Collector, W. J. Mapel.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Stellatochara obovata (Peck) Peck, 1957

Locality 4.—Morrison Formation, 13 ft above Sundance Formation, near Mona Butte, sec. 23, T. 56 N., R. 65 W., Crook County. Unit 10 of section measured by W. J. Mapel: 30½ ft thick, claystone, greenish-gray with a grayish-red band at the top, calcareous lenses, and thin beds of grayish-white clayey limestone. Sample from lower 10 ft, USGS 26922, collected by C. S. Robinson, Henry Bell, L. R. Page, and I. G. Sohn, Aug. 11, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Latochara latitruncata (Peck) Peck, 1957

Praechara voluta (Peck) Peck, 1957

Locality 5.—Morrison Formation, 24 ft above Sundance Formation, south side of an outlying butte at Nichelson's Ranch, NW¼NW¼ sec. 34, T. 54 N., R. 61 W., Crook County. Unit 4 of section measured by W. J. Mapel, 13 ft thick, marl, greenish-gray, some thin beds and nodules of light-gray limestone. Sample 4 ft below top of unit, USGS 26926, collected by W. J. Mapel, C. L. Pillmore, and I. G. Sohn, Aug. 20, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Aclistochara jonesi Peck, 1937

Sphaerochara verticillata (Peck) Peck, 1957

Locality 6.—Morrison Formation, 30 ft above Sundance Formation, about 3 miles north of Beulah, SW¼ sec. 7, T. 53 N., R. 60 W., Crook County. Unit 5 of section measured by W. J. Mapel, 24 ft thick, claystone, mostly greenish-gray becoming dusky red in the top 3 or 4 ft, silty becoming more silty at the top, calcareous, a few light-gray limestone nodules weathering out on the slope. Sample 14 ft above base of unit, USGS 26929, collected by W. J. Mapel, C. L. Pillmore, and I. G. Sohn, Aug. 20, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Stellatochara obovata (Peck) Peck, 1957

Sphaerochara verticillata (Peck) Peck, 1957

Praechara voluta (Peck) Peck, 1957

Locality 7.—Morrison Formation, 6 ft to 45 ft above the Sundance Formation, and 186 ft to 225 ft below the top of the Morrison Formation, 1 mile west of Devils Tower National Monument, NW¼ sec. 11, T. 53 N., R. 66 W., Crook County. Unit 2 of section measured by W. J. Mapel: 72 ft thick, claystone, greenish-gray with a few grayish-red bands, beds of grayish-white very fine grained calcareous sandstone or sandy limestone about ½ ft thick, 6 and 19 ft above base of unit; several thin lenticular beds of light-gray clayey limestone mostly less than ½ ft thick. Collected by C. S. Robinson and I. G. Sohn, Aug. 21, 1957.

USGS 26915, sample just below limy sandstone, 6 ft above base of unit.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935) Other ostracodes rare

Charophyta:

Aclistochara sp.

USGS 26916, same unit as above, between 2 limestone lenses, 30 ft above base.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935) Other ostracodes common

Charophyta:

Sphaerochara verticillata (Peck) Peck, 1957

USGS 26917, same unit as above, between 2 limestone lenses, 40 to 45 ft above base.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935) Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Aclistochara sp.

Latochara latitruncata (Peck) Peck, 1957

Locality 8.—Morrison Formation, about 47 ft above Sundance Formation, tributary of Salt Creek, E½SE¼ sec. 23, T. 45 N., R. 61 W., Weston County. Unit 7 of section measured by W. J. Mapel, 65 ft thick, claystone, greenish-gray with grayish-red bands, calcareous in the lower and middle parts, alternately calcareous and noncalcareous in the top 5 to 6 ft, a few thin lenticular beds of light-gray limestone in the lower half, a bed 1 ft thick of grayish-white, very fine grained sandstone 8 ft above base. Collected by W. J. Mapel, C. L. Pillmore, and I. G. Sohn, Aug. 19, 1957.

USGS 26899, claystone, about 35 ft below top of unit, and 30 ft above the base of the Morrison Formation.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes common

Charophyta:

Aclistochara bransoni Peck, 1937

USGS 26900, claystone, 27 ft below the previous collection, and 3 ft above the base of the Morrison Formation.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Echinochara spinosa Peck, 1957

Sphaerochara verticillata (Peck) Peck, 1957

Aclistochara bransoni Peck, 1937

Aclistochara sp.

Latochara latitruncata (Peck) Peck, 1957

Locality 9.—Morrison Formation, 22 ft above base, north end of Whoopup Canyon, NW¼NE¼ sec. 29, T. 44 N., R. 60 W., Fanny Peak quadrangle, Weston County. Shale, USGS 26897, collected by G. Gott, N. Cuppels, D. Brobst, and I. G. Sohn, Aug. 18, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Praechara voluta (Peck) Peck, 1957

Locality 10.—Morrison Formation, 9 ft above the base, road to Elk Mountain Lookout, SE¼ sec. 22, T. 43 N., R. 60 W., Weston County. Shale, USGS 26896, collected by G. Gott, N. Cuppels, D. Brobst. and I. G. Sohn, Aug. 18, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935).

Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Sphaerochara verticillata (Peck) Peck, 1957

SOUTH DAKOTA

Locality 11.—Morrison Formation, about 45 ft below the Lakota Formation, west bank of Spring Creek behind old Morrison farm in NW. cor. SE¼SE¼NW¼ sec. 30, T. 6 N., R. 5 E., Sturgis 7½ min quadrangle, Meade County. Lower part of first limy unit, USGS 26934, collected by K. M. Waage and I. G. Sohn, Aug. 11, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935).

Other ostracodes abundant

Charophyta:

Latochara latitruncata (Peck) Peck, 1957

Locality 12.—Morrison Formation, about 80 ft below massive sandstone of Lakota Formation, east face of Elk Mountain, NW¼ sec. 21, T. 5 S., R. 1 E., south of north border of Dewey quadrangle, Custer County. Shale, USGS 26893, collected by G. Gott, N. Cuppels, D. Brobst, and I. G. Sohn, Aug. 18, 1957.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Aclistochara bransoni Peck, 1937

Locality 13.—Morrison Formation, drill hole, N½NW¼SE¼ sec. 28, T. 6 S., R. 2 E., Custer County. Calcareous shale from near top of hole to 100 ft below collar. USGS 26406, 26407, 26465, 26466, collected by W. A. Braddock, 1955, Report MD–55–40.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Aclistochara latisulcata Peck, 1957

A. complanata Peck, 1957

Latochara latitruncata (Peck) Peck, 1957

L. cf. *L. concinna* Peck, 1957

Praechara voluta (Peck) Peck, 1957

Stellatochara obovata (Peck) Peck, 1957

COLORADO

Locality 14.—Salt Wash Member of the Morrison Formation, shale parting near middle of thick-bedded white nodular limestone between second and third massive sands in Salt Wash Member. Elk Creek, midway between Rifle and Glenwood Springs and north of New Castle, in sec. 15, T. 5 S., R. 91 W., Garfield County. Peck collection USGS 56–13.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes rare

Charophyta:

Aclistochara bransoni Peck, 1937

A. jonesi Peck, 1937

Obtusochara madleri Peck, 1957

Latochara concinna Peck, 1957

L. latitruncata (Peck) Peck, 1957

Echinochara spinosa Peck, 1957

Locality 15.—Salt Wash Member of Morrison Formation, 20 ft above base of member, Ladder Canyon section, sec. 19, T. 12 S., R. 100 W., Mesa County. Peck collection. Unit 45 of measured section by Craig (1959, sec. 102). Shale, sandy, grayish-green in upper half, grayish-green to maroon in lower half, rubbly; contains gray carbonaceous clay band near top and thin irregular brownish weathering limestone near bottom, 12 ft thick.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes abundant

Charophyta:

Stellatochara arguta Peck, 1957

Latochara concinna Peck, 1957

L. latitruncata (Peck) Peck, 1957

Echinochara spinosa Peck, 1957

Locality 16.—Salt Wash Member of Morrison Formation, 10 ft above base of member, Broughton Fruit Farm road, between Delta and Grand Junction, just east of Gunnison River, Delta County. Peck collection. USGS–56, collected Aug. 15, 1956.

Ostracoda:

Theriosynoecum wyomingense (Branson, 1935)

Other ostracodes common

Charophyta:

Aclistochara bransoni Peck, 1937

A. jonesi Peck, 1937

Latochara concinna Peck, 1957

L. latitruncata (Peck) Peck, 1957

Praechara ? voluta (Peck) Peck, 1957

Obtusochara madleri Peck, 1957

Echinochara spinosa Peck, 1957

REFERENCES

Branson, C. C., 1935, Fresh-water invertebrates from the Morrison (Jurassic?) of Wyoming: Jour. Paleontology, v. 9, p. 514–522, pls. 56, 57.

——— 1936, New name for a Morrison ostracode genus: Jour. Paleontology, v. 10, p. 323.

——— 1961, Note on the fresh-water ostracod genus *Theriosynoecum:* Oklahoma Geology Notes, v. 21, no. 9, p. 246–247.

Craig, L. C., 1959, Measured sections of the Morrison and adjacent formations: U.S. Geol. Survey open-file report, 173 measured sections, 1 map.

Craig, L. C., and Cadigan, R. A., 1958, The Morrison and adjacent formations in the Four Corners area, in Intermountain Assoc. Petroleum Geologists Guidebook 9th Ann. Field Conf., 1958: p. 182–192, 4 text figs.

Craig, L. C., and others, 1955, Stratigraphy of the Morrison and related formations, Colorado Plateau region, a preliminary report: U.S. Geol. Survey Bull. 1009–E, p. 125–168, figs. 19–31.

Grekoff, Nicolas, 1958, Sur la taxionomie des genera *Gomphocythere* (Sars) et *Metacypris* (Brady et Robertson): Rev. Micropaléontologie, v. 1, p. 22–30, 2 pls.

Howe, H. V., 1961, Family Limnocytheridae, *in* Moore, R. C., ed., Treatise on invertebrate paleontology, pt. Q, Arthropoda 3: Lawrence, Kans., Kansas Univ. Press, p. 309–312, figs. 235–239.

Mandelstam, M. I., 1956, *Theriosynoecum, in* Kiparisovoi, L. D., Markovskogo, B. P., and Radchenko, G. P., eds. New families and genera. Data on Paleontology (in Russian): Vsesoyuz. Nauch.-Issled, Geol. Inst. (VSEGEI), new ser., Paleont. no. 12, p. 138–139.

Martin, G. P. R., 1940, Ostracodeen des norddeutschen Purbeck und Wealden: Senckenbergiana, v. 22, p. 275–361, 12 pls.

Peck, R. E., 1937, Morrison Charophyta from Wyoming: Jour. Paleontology, v. 11, p. 83–94, pl. 14.

——— 1956, Rocky Mountain Mesozoic and Cenozoic nonmarine microfossils, *in* Wyoming Geol. Assoc. Guidebook 11th Ann. Field Conf., 1956: p. 95–98, 1 pl.

——— 1957, North American Mesozoic Charophyta: U.S. Geol. Survey Prof. Paper 294–A, 44 p., 8 pls., 7 figs.

——— 1959, Stratigraphic distribution of Charophyta and nonmarine ostracods, *in* Intermountain Assoc. Petroleum Geologists Guidebook, 10th Ann. Field Conf. 1959: p. 115–121, 1 pl. (Explanation to plate inadvertently omitted.)

Peck, R. E., and Reker, C. C., 1948, The Morrison and Cloverly Formations, *in* Wyoming Geol. Assoc. Guidebook 3d Ann. Field Conf. 1948: p. 125–139, 3 pls.

Reeside, J. B., Jr., 1952, Summary of the stratigraphy of the Morrison Formation: U.S. Geol. Survey Prof. Paper 233–B, p. 22–26.

Sohn, I. G., 1958, Middle Mesozoic non-marine ostracodes in the Black Hills, *in* Wyoming Geol. Assoc. Guidebook 13th Ann. Field Conf. 1958: p. 120–126, 1 pl., 2 figs.

——— 1962, Genetic control of surface ornament in an ostracode species [abs.]: Geol. Soc. America Spec. Paper 68, p. 276; 1961, Geol. Soc. America, Program 1961 Annual Meetings, p. 152.

○