Becs, S.S., 1965 JOURNAL OF PALEONTOLOGY, V. 39, NO. 1, P. 21-30, PLS. 9-10, 4 TEXT-FIGS., JANUARY, 1965

DEVONIAN FAUNULE FROM THE JEFFERSON FORMATION, CENTRAL BLUE SPRING HILLS, UTAH-IDAHO UCLA Type Collection

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ABSTRACT—Five species of brachiopods, two gastropods, one coral and one trilobite are described from the lower Jefferson Formation. New species are *Atrypa oneidensis* and *Ambothyris utahensis*. Spirifer engelmanni Meek is placed in the genus Allanaria. A correlation of the lower Jefferson with the strata containing the Allanaria allani fauna of Alberta and with the subzone in the lower "Spirifer" argentarius zone of Nevada is suggested.

INTRODUCTION

D URING the summers of 1960 and 1961, a faunule consisting of few species but many individuals was collected from the Jefferson Formation in the Samaria Mountain area, about 12 miles south-southwest of Malad, Idaho (textfig. 1). The collections were made as part of a general study of the Paleozoic stratigraphy and paleontology in the central Blue Spring Hills, Utah-Idaho. This paper presents descriptions and illustrations of the significant forms identified from the Jefferson Formation.

The fossils were obtained from the Hyrum Member of the Jefferson and constitute one of the few faunas reported from the Jefferson Formation in southeastern Idaho. The described forms include nine species—five brachiopods, two gastropods, one coral and one trilobite. A few indeterminate bryozoans, rugose corals, and one pelecypod were also collected. More than 75 percent of the specimens collected belong to the brachiopod species *Atrypa oneidensis* n. sp.

All the types from the Jefferson Formation are deposited in the paleontological collections of the Department of Geology, University of California at Los Angeles.

Devonian fossils have been described or reported from the Jefferson in western Montana by Kindle (1908) and Laird (1947) and from the Bear River Range, Utah, by Kindle (1908) and Williams (1948). In southeastern Idaho a few species from the Jefferson are reported in faunal lists from the Aspen Range, near Soda Springs, and from the northern Bear River Range (Mansfield, 1952).

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STRATIGRAPHY

The Jefferson Formation is 2,061 feet thick in the central Blue Spring Hills. It is divisible into two members—the lower Hyrum Member, 1,300 feet thick, and the upper Beirdneau Member, 760 feet thick. The lithology is similar to that in the Bear River Range, about 35 miles to the southeast, where the two members were first described by Williams (1948).

The Beirdneau Member, composed of dolomite, orthoquartzite, and calcareous sandstone, has yielded no fossils in any areas of outcrop. Most of the Hyrum Member in the Blue Spring Hills consists of fine to coarsely crystalline limestone and dolomite units which are also barren of fossils. Within the lower part of the Hyrum is a distinct 300-foot fossiliferous limestone sequence which forms a mappable unit. It consists of medium-gray, aphanitic to coarsely crystalline, silty and organic-detrital limestones which form blocky ledges and slopes (text-fig. 2). This unit is traceable for about nine miles north-south along the east flank of Samaria Mountain. The faunule described here occurs throughout most of the limestone unit; specimens were obtained from several separate stream divides where the limestone is exposed (text-fig. 1).

DISCUSSION OF THE FAUNULE

All of the specimens come from the fossiliferous limestone unit within the Hyrum Member of the



TEXT-FIG. 1—Index map of Devonian localities in the central Blue Spring Hills; Jefferson Formation outcrop shown by diagonal ruled lines.

Jefferson Formation. The following forms have been identified:

Atrypa oneidensis n. sp. Allanaria engelmanni (Meek) Ambothyris utahensis n. sp. Emanuella (?) sp. Cyrtina cf. C. billingsi Meek Straparolus (Straparolus) sp. Loxonema sp. Thamnopora sp. Proetus sp.

This faunule has affinities with Middle or Upper Devonian faunas of Utah, Nevada, and western Canada. Allanaria engelmanni (Meek) and Ambothvris utahensis n. sp. are identical or very similar to forms reported from the lower Jefferson Formation in the Bear River Range east of Logan, Utah (Williams, 1948), and east of Paradise, Utah (Kindle, 1908). Williams reported Allanaria engelmanni (Meek), "Spirifer" utahensis Meek, "Martinia maia" (Billings), and three species of Atrypa from the Hyrum Member in Logan Canyon. The fauna from the Jefferson Formation described by Kindle (1908) includes "Spirifer" argentarius and "Martinia maia." Illustrations of the latter resemble somewhat Ambothyris utahensis, from the Blue Spring Hills. However, it is not clear from which part or parts of the Jefferson Formation Kindle's collections were made.

The fossiliferous interval of the Hyrum Member in the Bear River Range was correlated with the "Spirifer" argentarius zone of the Devils Gate Limestone in Nevada by Merriam (1940) and Cooper et al. (1942). At that time it was thought that the type for Allanaria engelmanni was associated with "S." argentarius. Subsequent study by Nolan, Merriam, and Williams (1956) indicated that A. engelmanni was characteristic of a subzone in the lowest part of the "S." argentarius zone but stratigraphically below the actual occurrence of "S." argentarius. The Hyrum faunas from the Logan quadrangle and the Blue Spring Hills may thus be equated in part to the fauna of the subzone in the lower "S." argentarius zone of Nevada based on the occurrence of A. engelmanni. This form has been reported from Jefferson localities in Utah, Wyoming and Montana. In western Montana it occurs with "S." jasperensis Warren, a form considered by Laird (1947) to be time equivalent and closely related to "S." argentarius.

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The Devils Gate Limestone, except for the uppermost part, was considered by Merriam (1940) to be late Middle Devonian. In the Devonian Correlation Chart, Cooper et al. (1942) placed the Devils Gate Limestone and the Jefferson Formation in the lower Upper Devonian. After further study, Nolan, Merriam, and



TEXT-FIG. 2—Columnar sections of lower Jefferson Formation at the Utah-Idaho boundary and at Gardner Canyon in Idaho, showing the occurrence of the fauna. A, Allanaria engelmanni; Am, Ambothyris utahensis; At, Atrypa oneidensis; T, Thamnopora; Cy, Cyrtina cf. C. billingsi; L, Loxonema; S, Straparolus.

Williams (1956, p. 51) suggested that the Middle-Upper Devonian boundary might best be placed within the Devils Gate at the base of the "Spirifer" argentarius zone and hence below strata containing Allanaria engelmanni. Laird (1947) correlated a Jefferson fauna from northwestern Montana with that of the "Spirifer" argentarius zone of Nevada. Because of the similarity of the Montana fauna with that of the lower Minnewanka Limestone of Alberta, Laird also believed that the Jefferson Formation of Montana and much of the Devils Gate Limestone, including the "Spirifer" argentarius zone, should be placed in the Upper Devonian.

The occurrence of Atrypa oneidensis n. sp., Cyrtina cf. C. billingsi Meek, and Allanaria engelmanni in the lower Jefferson suggests a correlation with the Allanaria allani fauna of the Waterways Formation in northeastern Alberta. These three species are very similar to Atrypa clarkei Warren, Cyrtina billingsi and Allanaria allani (Warren) respectively, of the A. allani fauna. There is some uncertainty regarding the age of the A. allani fauna. It occurs above the highest known Stringocephalus and below the Eleutherokomma leducencis zone of well established Late Devonian age (Warren and Stelck. 1956, p. 6-8). Crickmay (1950, p. 221) favors a Middle Devonian age designation. McLaren (1962, p. 13) considers it to be Late Devonian. Warren and Stelck (1956, p. 6-8) equate the A. allani fauna to the Ladogioides kakwaensis (formerly Pugnoides kakwaensis) zone of the Flume Formation in the Alberta Rockies. The fauna of this zone is considered by McLaren (1961, p. 4) to be of early Late Devonian age but older than the Allanaria allani fauna. Cyrtina billingsi and Allanaria engelmanni are important elements in the L. kakwaensis zone.

Crickmay (1950, p. 221) and McLaren (1954, p. 169) suggested a correlation of the Waterways Formation in Alberta with the Cedar Valley Limestone of Iowa because several species from the Waterways Formation, including Cyrtina *billingsi*, have counterparts in the Cedar Valley beds. McLaren (1962) later concluded that the Waterways was post Cedar Valley. The age of the Cedar Valley is not yet settled (see discussion by Dunn, 1959, p. 1003,1004). Recent investigators (Müller and Müller, 1957; Dunn, 1959) consider it to be late Middle Devonian. However, the Tully Limestone of New York, considered correlative to the Cedar Valley by Cooper, et al. (1942), contains the ammonoid genus Pharciceras, known only from the Upper Devonian of Europe and North Africa (House, 1962, p. 256).

In conclusion it seems reasonable to correlate

the Jefferson faunule of the Blue Spring Hills with the Allanaria allani fauna of the Waterways Formation, with the fauna associated with Allanaria engelmanni in the lower "Spirifer" argentarius zone of the Devils Gate Limestone in Nevada, and perhaps in part with the Ladogioides kakwaensis zone of the Alberta Rockies. Strata containing these faunas have been assigned to both the Middle and Upper Devonian series by different investigators. The presence in the lowermost Jefferson of Ambothvris and Emanuella, genera common though not restricted to the Middle Devonian, together with the absence of typical Upper Devonian forms, suggests that the lower 300 feet of Jefferson may be Middle Devonian in age and that the Middle-Upper Devonian boundary may occur within the fossiliferous limestone unit (text-fig. 2).

At least 1,500 feet of Jefferson strata occur above the fossiliferous beds in the Blue Spring Hills. Whatever age is assigned to the lower Jefferson faunule it is likely that most of the Iefferson Formation is Late Devonian.

SYSTEMATIC DESCRIPTIONS

Phylum COELENTERATA Class ANTHOZOA Subclass TABULATA Genus THAMNOPORA Steininger, 1831 THAMNOPORA SD. Pl. 9, fig. 13

Several fragments of a cylindrical dendroid corallum were collected from locality 4481 in the Jefferson Formation. The long slender corallites which bend abruptly near the outer surface of the corallum and the circular inside cross-section produced by thickening of the wall are typica

EXPLANATION OF PLATE 9

- 12—Loxonema sp. Side view of typical specimen, UCLA 35016, \times 1; from locality 4480. 13—Thamnopora sp. Side view of polished section \times 1; UCLA 35014; from locality 4481.
- 14-Cyrtina cf. C. billingsi (Meek), lateral view of UCLA 35009, X2; from locality 4481.
- 16-Proetus sp. View of pygidium, UCLA 35017, ×2; from locality 4480.
- 17-Straparolus (Straparolus) sp. Apical view of UCLA 35015, X2; from locality 4480.

FIGS. 1-11,15—Atrypa oneidensis Beus, n. sp. 1, dorsal view of paratype, UCLA 35000, $\times 1$; 2, posterior view of paratype, UCLA 35003, $\times 1$; 3,4,11, posterior, anterior and ventral view of holotype, UCLA 35002, $\times 1$; 5,6, ventral and lateral view of paratype, UCLA 35001, $\times 1$; 7,8, ventral and lateral view of paratype, UCLA 35004, ×2; 9,10, dorsal and ventral view of paratype, UCLA 34999, ×2; 15, typical occurrence in limestone, $\times 1$; from locality 4482.

JOURNAL OF PALEONTOLOGY, VOL. 39 PLATE 9



JOURNAL OF PALEONTOLOGY, VOL. 39 PLATE 10

S. S. Beus



for this genus. The largest fragment found had a length of 40 mm. and a diameter of 10 mm. *Figured specimen.*—UCLA 35014.

> Phylum BRACHIOPODA Genus Atrypa Dalman, 1828 Atrypa ONEIDENSIS n. sp. Pl. 9, figs. 1–11,15; text-figs. 4E,F.

Diagnosis.—Fine radiating costae, prominent growth lamellae, nearly equal biconvexity.

Description.—Shell small to medium for genus, subovate, cardinal angles obtuse, width greater than length, greatest width at mid-length, subequally biconvex but occasional large specimens dorsi-convex; hinge line short, slightly curved, anterior commissure straight in small specimens but moderately arched in most adult forms; shallow sulcus developed in anterior portion of pedicle valve in some specimens; dimensions of holotype in mm.: width, 23.0 length, 20.4, thickness, 11.7.

Pedicle valve moderately convex, greatest convexity posterior to mid-length, beak medium size, straight to slightly incurved.

Brachial valve slightly to much more convex than pedicle valve, inequal convexity more pronounced in large specimens, greatest convexity posterior to mid-length, becoming flattened at lateral margins where edge not broken; beak small, incurved.

Ornamentation on both valves consisting of fine radiating costae increasing in number anteriorly by bifurcation or occasionally by intercalation, gradually increasing in size anteriorly. In larger specimens, 7 or 8 costae occupying a width of 2 mm. near beak, 4 or 5 costae occurring within 2 mm. width near anterior margin; faint to very prominent concentric growth lamellae occurring on both valves but usually most prominent on pedicle valve.

Internal structures as illustrated by serial sections in text-figure 4 include large teeth and sockets. In small shells umbonal cavities between small dental lamellae and side of the pedicle valve; in larger shells cavities apparently filled with shell material, dental lamellae cannot be distinguished. Brachidium not preserved.

Material.—Approximately 140 specimens were examined, most of them from localities 4481 and 4482 although specimens were found at all stream divides exposing the lower Jefferson.

This species is the most abundant form collected. It occurs throughout the upper half of the 300-foot thickness of fossiliferous limestone in the lower Jefferson Formation. At some intervals the specimens make up an estimated 60 percent of the rock volume. The shells are generally not silicified and can best be obtained by breaking up the limestone matrix. One block of limestone measuring approximately 3 by 5 by 2inches yielded 98 specimens; dimensional measurements were made on 82 of these. The largest specimen had length-width proportions of 23.4 mm. and 25.4 mm. The smallest specimen was 6.7 mm. long and 7.2 mm. wide. Text-figure 3 is a scatter diagram of the length-width proportions. The mean size is: length 12.9 mm., width 13.5 mm. The wide range in size indicates that this sample includes forms in various growth stages. The size distribution indicates that only a few individuals are adult specimens and that most of the sample is composed of juveniles. The lack of

EXPLANATION OF PLATE 10

All figures are $\times 2$ except fig. 5, which is $\times 3$, and fig. 6, which is $\times 4$.

- FIGS. 1-9—Ambothyris utahensis Beus, n. sp. 1-5, posterior, lateral anterior, dorsal and ventral views of holotype, UCLA 35006; 6-9, dorsal views of paratypes, UCLA 35078, 35079, 35007, 35080; ornamentation displayed on 6; from locality 4480.
 - 21,22—Emanuella (?) sp. Dorsal and ventral view of specimen etched from limestone, UCLA 35008; from locality 4647.
 - 10-20—Allanaria engelmanni (Meek). 10-12, dorsal, lateral and ventral view of specimen with most of outer shell preserved, UCLA 35011; 13-15, dorsal, lateral and posterior view of exfoliated specimen, UCLA 35010; 16-18, dorsal, lateral and posterior view of specimen from cotype lot, USNM 7748; from the White Pine district, Nevada; 19, anterior view showing fine radial striations, UCLA 35012; UCLA 35012; UCLA specimens from locality 4482.



TEXT-FIG. 3—Scatter diagram of length-width dimensions of Atrypa oneidensis Beus, n. sp.

size sorting and the absence of abundant worn or broken shells in the sample suggest that it is a reasonably accurate representation of an untransported assemblage of *Atrypa oneidensis*.

Remarks.—This species most nearly resembles A. clarkei (Warren) from Alberta, but differs in having growth lamellae and a more prominent pedicle beak. Also the larger specimens of A. clarkei examined have length and width dimensions nearly double of those of the largest specimens of A. oneidensis collected.

The specimens at hand are similar in size and general shape to forms of A. "reticularis" (Linnaeus) from the Hamilton Group of New York, and the Silica Shale of Ohio, but can be distinguished from these and other large forms of A. "reticularis" by the less prominent posterolateral corners and the finer and closer spaced coatae. A. "reticularis" from the above localities has 4-6 costae in a width of 5 mm. near the anterior margin whereas A. oneidensis has 10-11 costae in the same width.

The smaller specimens of A. oneidensis resemble A. cf. A. missouriensis (Miller) as illustrated by Merriam (1940, pl. 7, figs. 15,16) but can likewise be distinguished from the latter by finer costae. The small immature specimens of A. oneidensis are nearly identical with the smaller smooth forms of A. "reticularis" and A. gregeri (Rowley) illustrated by Branson (1922, p. 97,98, pl. 18, figs. 7–9; pl. 23, fig. 12) from Missouri. The adult specimens of A. oneidensis are readily distinguished from the above forms by their more unequal biconvexity and growth lamellae.

Holotype.—UCLA 35003. Paratypes.—UCLA 34999, 35000, 35001, 35002, 35004. Unfigured paratypes.—UCLA 39500 to 39581.

Genus Allanaria Crickmay, 1953 Allanaria engelmanni (Meek) Pl. 10, figs. 10–20; text-figs. 4C,D

Spirifera engelmanni MEEK, 1860, v. 12, p. 308.

Spirifer engelmanni MEEK, 1876, in SIMPSON, p. 346, pl. 1, figs. 1a-c; MEEK, 1877, p. 41-42, pl. 3, figs. 3-3c, (?) 3d-f; WALCOTT, 1884, p. 138; MERRIAM, 1940, p. 87-88, pl. 8, figs. 3,4; LAIRD, 1947, p. 457, pl. 64, figs. 13-15.

Diagnosis.—Pedicle valve with high, nearly flat interarea; fine radial striations on plications, shallow smooth sulcus, low median fold.

Description.—Shell small, semi-circular, widest at hinge, cardinal angles acute but near 90 degrees; anterior commissure gently arched. Dimensions of three specimens in mm.: length 11.0, 10.5, 9.5; width 14.8, 15.5, 13.3; thickness 9.7, 10.5, 8.8.

Pedicle valve deeply convex, slightly curved, interarea high and catacline to plane of commissure, arching backward slightly near beak; horizontal striations visible on surface of interarea in some specimens; sulcus smooth, shallow, extending from beak to anterior commissure, bounded by the two most prominent plications; lateral slopes bear nine to 13 plications which are faint near beak increasing in width and height anteriorly.

Brachial valve gently convex with flat-topped or rounded fold which on some specimens bears faint median furrow in anterior half; beak short, extending slightly beyond the hinge line; lateral slopes bearing rounded plications as on pedicle valve.

Very fine thread-like radial striations occurring on outer surface of both valves. Striations spaced about 8 or 10 per mm. seen best under magnification. Concentric growth lines and growth lamellae exposed on specimens with sufficient outer shell material.

Pedicle interior with strong dental lamellae parallel for about half distance above their base, diverging outward in upper part, lamellae extending about one-fourth length of valve; hinge teeth strong. Brachial interior bearing large socket plates, brachidium not observed.

Material.—Eight nearly complete specimens were collected from locality 4482 and some fragments from locality 4481. All specimens come from the middle and upper ledge-forming units of the fossiliferous limestone in the Jefferson Formation and are associated with Atrypa oneidensis.

Remarks.—This species is placed here in the genus Allanaria as defined by Crickmay (1953). A. engelmanni exhibits the noncostate fold and sulcus, high interarea, inequal biconvexity and fine radial striae characteristic of the genus. Allanaria engelmanni appears very similar to A. allani (Warren), the type species of Allanaria, from the Waterways Formation of Alberta, as illustrated by Crickmay (1953, pl. 1, figs. 1-12). The Jefferson specimens differ from A. allani in having a higher and flatter interarea, finer radial striations, and a hinge width equal to the maximum shell width in most specimens. Crickmay (1962, personal communication) first suggested to the author that engelmanni and allani might be congeneric.

The groove in the median fold of Allanaria engelmanni is not mentioned in the original description by Meek (1860); however, Girty (1899, p. 504) observed "... a shallow median sulcus on the fold" of some specimens from Nevada, and Laird (1947, p. 457) described the same feature on specimens from Montana. The Blue Spring Hills specimens are identical with the cotype of A. engelmanni (pl. 10, figs. 16-18, USNM 7748).

Figured specimens.—UCLA 35010, 35011, 35012, 35013; USNM 7748.

Genus Ambothyris George, 1931 Ambothyris utahensis n. sp. Pl. 10, figs. 1–9; text-figs. 4A,B

Diagnosis.—Small size, width greater than length; faint radial and concentric ornamentation.

Description.—Shell small, suboval, inequally biconvex, width greater than length, cardinal angles rounded, hinge straight, greatest width in front of hinge, anterior commissure straight or gently uniplicate.

Pedicle valve strongly arched, greatest convexity posterior to mid-length, strongly inflected; interarea triangular, long, gently curved; beak moderately prominent, extends 2 mm. beyond hinge line in some larger specimens; interior provided with large hinge teeth.

Brachial valve moderately arched, greatest convexity posterior to mid-length, gently arched transversely with minor elevation along mid-line of some specimens; beak short; interior provided with short, stout cardinal process and two strong crural plates diverging downward and extending about one-third length of brachial valve; crura and spiralia not preserved.

Ornamentation rarely preserved; faint, closely spaced concentric growth lines and radial striae observed on shell surface of one specimen; shell of most specimens partially or completely exfoliated. Fine, rounded radial costae occurring on internal molds of some specimens.

Material.—One dozen nearly complete specimens and numerous fragments were obtained from locality 4480 and a few incomplete specimens were collected at locality 4647. All the specimens occur stratigraphically near the middle of the fossiliferous limestone unit of the Jefferson Formation.

Remarks.—A. utahensis closely resembles forms from the Jefferson Formation near Logan, Utah, referred by Kindle (1908, pl. 4) to "Martinia maia" (Billings) (=Ambothyris according to McLaren, 1954, p. 170). The specimens at hand have a less prominent pedicle beak than those illustrated by Kindle.

The Blue Spring Hills specimens differ from the types of *Ambothyris halli* (Branson) in having a less strongly arched pedicle beak and a more transverse outline. The width/length ratio of *A. halli* specimens described from Missouri (Branson, 1922, p. 106) and from Iowa (Stainbrook, 1943, p. 449) is about 1.03. The width /length ratio of *A. utahensis* is 1.17.

Measurements.—

length,	width,	thickness,
mm.	mm.	mm.
12.3	15.8	8.8
11.9	14.7	7.2
10.5	11.3	7.0
10.4	12.5	7.7
10.1	11.4	5.6
9.5	10.2	6.9
9.0	10.0	7.0
8.2	9.4	5.6
7.9	8.1	5.4
7.6	9.2	4.8
7.0	7.7	4.6
6.0	7.5	4.0
5.5	6.4	3.7

Holotype.—UCLA 35006. Paratypes.—ULCA 35007, 35078, 35079, 35080. Unfigured paratypes.—UCLA 39582 to 39589.

> Genus EMANUELLA Grabau, 1925 EMANUELLA (?) sp. Pl. 10, figs. 21,22

Description.—A single silicified brachial valve was found at locality 4647. Dimensions: length 10.0 mm., width 13.2 mm. The outer shell surface bears faint concentric bands and numerous fine pustules suggestive of spine bases. The short, stout, multilobed cardinal process, prominent socket plates and deep sockets are well preserved on the brachial interior. Slender rodlike crura extend forward from their supporting plates more than one half the length of the shell.

Figured specimen.-UCLA 35008.

Genus Cyrtina Davidson, 1859 Cyrtina cf. C. billingsi Meek, 1868 Pl. 9, fig. 14

Cyrtina billingsi MEEK, 1868, p. 97, pl. 14, figs. 6a-d. Description.—No complete specimens of this

form are available. Two nearly complete internal



TEXT-FIG. 4—Serial sections of Devonian brachiopods ×3. A, B, Ambothyris utahensis Beus, n. sp.; C, D, Allanaria engelmanni (Meek); E, F, Atrypa oneidensis Beus, n. sp.; E. illustrates dental lamellae in immature specimen. Numbers indicate distance forward from the beak in mm.

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molds of the pedicle valve have dimensions of: length 10 mm., 9 mm.; width 15.5 mm., 14.5 mm. The high triangular interarea and finely punctate shell are indicative though not diagnostic of Cyrtina. The shape and size of the specimens correspond closely to those of Cyrtina billingsi as originally illustrated by Meek (1868, pl. 14, figs. 6a-d). The pedicle valve bears a definite median sulcus; fine concentric lines show on the exfoliated shell surface. Some specimens of this form from locality 4481 were shown by Walter Sadlick (1960, personal communication) to D. J. McLaren who referred them to Cyrtina billingsi.

Figured specimen.-UCLA 35009.

Phylum MOLLUSCA Class GASTROPODA Genus STRAPAROLUS Montfort, 1810 STRAPAROLUS (STRAPAROLUS) sp. Pl. 9, fig. 17

Description.-Shell small, turbinate, low conospiral; advolute, with broad, shallow umbilicus; whorl profile rounded; suture depressed, aperture rounded. Ornamentation not preserved.

Material.---Three incomplete internal molds were collected from locality 4480. Traces of this form are abundant in the lower part of the limestone unit of the Jefferson Formation but apparently most specimens are destroyed by weathering.

Figured specimen.-UCLA 35015.

Genus LOXONEMA Phillips, 1841 LOXONEMA Sp. Pl. 9, fig. 12

Description.-Shell medium, high-spired turriform, laterally compressed; whorl profile slightly rounded, shelf on early whorls; suture depressed. Dimensions of largest specimen: length 32.5 mm. including last four whorls; maximum width 17.0 mm. Pleural angle based upon last three whorls: 27 degrees; dip of suture 23 degrees. Surface

ornamentation not preserved. Remarks.-Two incomplete internal molds were obtained from locality 4480 and other frag-

ments from locality 4481. The figured specimen resembles Loxonema altivolvis Whiteaves as illustrated by McCammon (1960, pl. 13, figs. 8a, 8b) but is smaller.

Figured specimen.-UCLA 35016.

Phylum ARTHROPODA Class TRILOBITA Genus PROETUS Steiniger, 1831 PROETUS Sp. Pl. 9, fig. 16

Several small pygidia were collected from

locality 4480. Dimensions of illustrated specimen: length 7.8 mm.; width 9.3 mm. Axis elevated and with 13 pleural segments: pleural lobes convex with 9 segments.

Figured specimen.--UCLA 35017.

FOSSIL LOCALITIES

- 4480 BOX ELDER COUNTY, UTAH. Brigham City Quad.; sec. 14, T. 14 N., R. 4 W., unsurveyed; fossiliferous limestone on east side of gully and about 50 yards north of road up Rough Canyon from a point where a brecciated limestone slab is exposed at stream cut on north side of road, $2\frac{1}{4}$ miles west and $1\frac{1}{2}$ miles north of Washakie, Utah.
- 4481 BOX ELDER COUNTY, UTAH. Brigham City Quad.; sec. 34, T. 15 N., R. 4 W., unsur-veyed; gray fossiliferous limestone exposed on crest of divide between Middle Canyon and North Canyon, a few yards south of the Utah-
- Idaho boundary, approximately 3½ miles west and 1½ miles north of Portage, Utah.
 4482 ONEIDA COUNTY, IDAHO. Pocatello Quad.; NW ¼ sec. 19, T. 16 S., R. 36 E., unsurveyed; gray fossiliferous limestone on crest of divide between Brush Canyon and Gardner Canyon, approximately $3\frac{3}{8}$ miles west of Woodruff, Idaho; 200 feet stratigraphically above locality 4647.
- 4647 ONEIDA COUNTY, IDAHO. Pocatello Quad.; NW ¼ sec. 19, T. 16 S., R. 36 E., unsurveyed; first prominent gray limestone ledge about 200 feet stratigraphically above the orthoguartzite bed in lower Jefferson Formation, on crest of divide between Brush Canvon and Gardner Canyon, approximately 33 miles west of Woodruff, Idaho.

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