

*The* CANADIAN  
FIELD-NATURALIST

VOLUME LI

1937

THE OTTAWA FIELD-NATURALISTS' CLUB  
OTTAWA, CANADA

# The Canadian Field-Naturalist

VOL. LI

OTTAWA, CANADA, DECEMBER, 1937

No. 9

## CONTRIBUTIONS TO THE TRIASSIC OF PEACE RIVER, B.C.\*

By F. H. McLEARN

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**S**INCE the preparation of a recent publication on new species from the Triassic Schooler Creek formation (*Canadian Field-Naturalist*, October, 1937) the writer has had the opportunity of reinvestigating this formation in the foothills of the Rocky Mountains along Peace River and of making additional collections. Pending the publication of a report on the Triassic faunas it seems advisable to make some additional comments in advance and describe some new species.

### STRATIGRAPHY

The field work of the past summer has confirmed the validity of the *Nathorstites*, *Lima poyana*, *Halobia* and *Monotis subcircularis* zones. The *Lingula schwyni* zone however has not stood up so well. A new pelecypod zone has been found, below that of the *L. poyana*. Its relation to, and degree of distinctness from, the *L. poyana* zone has yet to be determined by exact office study. The 1937 collections also add considerably to our knowledge of the *Halobia* and *Monotis* faunas.

As noted in a previous publication the *Nathorstites* fauna is of Ladinian or very early Karnian age. No exact correlation with Mediterranean faunas has yet been made, although there is a considerable resemblance to them. A number of pelecypods not previously found in this fauna were collected during the past summer field season.

The *Halobia* fauna was found at several new localities during the past season, including ledges at river level on the north side of the Peace between the mouth of Clearwater River and Rocky Island and on the high hill on the south side of the Peace River near the mouth of Nabesche (Ottertail) River. Additions to the fauna include *Discotropites* cf. *sandlingensis* Hauer, *D.* cf. *formosus* Smith, *Trachyceras* and

*Halobia* n. sp. ? (cf. *superba* Mojsisovics, *ornatissima* Smith and *gigantea* Smith). These species, together with the previously listed *Discotropites* cf. *acutus* Mojsisovics, *Gomionites*, *Juvavites* and other genera and species reveal the Mediterranean aspect of the fauna and suggest a correlation with the Upper Karnian or *Tropites* zone of the Mediterranean and with the *Tropites subbullatus* zone of the Hosselkus limestone of California.

The section at Parle Pas rapids is very interesting. If there is no overturning of strata there and no faulting the succession is as follows: At the base is a considerable thickness of strata with *Monotis subcircularis*, *Oxytoma* sp. and *Placites*. Above are beds with *Placites*, "Nautilus" and some pelecypods. Both of these zones are of Norian and upper Triassic age. The highest beds at the rapids contain an "Arnioceras"-like ammonite and *Pecten* n. sp. The possibility of a Jurassic age of these high beds, however, can only be considered after a careful examination of the rather poorly preserved ammonite.

Of particular interest in the study of the structure of the foothills along Peace River is the alternation of areas of gently dipping strata with areas of steeply dipping and folded strata, and the high angle overthrusts from the west. Peculiar asymmetric anticlines (or monoclines), with eastward dipping axes, low dipping or almost flat east limbs and steep west limbs occur at 8-mile Creek, at Aylard Creek and just east of the Nabesche (Ottertail) River.

### SYSTEMATIC PALAEOZOOLOGY

#### Genus *Nathorstites* Boehm

At early stages of growth the whorls are stout and depressed, the umbilicus is fairly small and there are folds on the inner part of the sides. With growth there is compression, sharpening of the venter, closing of the umbilicus and loss or decline of folds on the sides. Some specimens become more compressed than others and

become oxycones. Others at the same stage of growth and of the same size as the oxyconic variety are still fairly stout-whorled, have only angular venters and still retain reduced lateral folds around the umbilicus. Rare constrictions occur, particularly in earlier whorls. The direction of the growth lines on specimens from Peace River is mostly that of a single curve, convex forward on the sides and bent back a little on the venter. There is at least superficial resemblance to shells from the Middle Triassic of California referred by J. Perrin Smith, incorrectly perhaps, to *Dalmatites* Kittl.

*Isculites schooleri* McLearn

1930 *Isculites schooleri* McLearn, Trans. Roy. Soc. Can., 3rd ser., vol. 24, sec. 4, p. 5, pl. 1, fig. 6.

The generic name *Isculites* was first mentioned by Mojsisovics in 1886. It was followed in brackets by "*I. hauerinus*". The genus was not described by him until seven years later, together with several species, the first of which was *Isculites decreescens* (Hauer). In 1915 Diener recorded *I. decreescens* as the genotype. In 1934 Spath also recognized this species as the genotype.

The important features of the Peace River shells are the involute, rounded globose inner or earlier whorls, the contracted anterior part of the living chamber and accompanying umbilical expansion, the long living chamber more than a whorl in length, the subdued, ill defined, irregular ornament or almost smooth surface and the simple, mostly goniatitic, suture line, with broad rounded ES and S1, small, very low or indistinct S2, L1 narrower than the saddles and rounded and entire L2.

The Peace River species lacks the costate *Anatimites*-like sculpture of typical Norian *Isculites*. (See Mojsisovics 1893, pl. 87, figs. 3a to 3d). In form and poorly defined surface ornament it resembles the Norian species *Isculites subdecreescens* Mojsisovics, the Karnian species *Isculites heimi* Mojsisovics and the Karnian *Isculites bittneri* Gemellaro from Sicily, but it lacks the more elaborate ceratitic or almost ammonitic suture line of this group of species. It is closer to a species from Timor, *Isculites ladinus* Welter, which has a similar whorl shape, contracted living chamber, lack of well defined surface ornament, broad rounded ES and S1 and L1 narrower than the saddles. The Timor species also has two notches in L1 which appear to be present in at least one specimen of the Peace River species. *Thana-*

*mites* Diener, particularly *Thanamites bicuspoidatus* Diener has a similar suture line, but lacks the umbilical expansion of the outermost whorl.

It may be necessary to make a new genus for the group of *I. subdecreescens* and another for *I. ladinus* and *I. schooleri*.

*Sirenites (Meginoceras) meginiae* (McLearn)

Plate 1, figures 8 to 11

1930 *Steinmannites (Meginoceras) meginiae* McLearn, Trans. Roy. Soc. Can., Ser. 3, vol. 24, sec. 4, p. 4, pl. 1, figs. 7, 8

The assignment of the Peace River species to *Steinmannites* was of course not justified. Later it was referred to *Paratrachyceras*. As it shows a beginning, but only a beginning, of the *Sirenites* type of ventral ornament, it is retained in subgenus *Meginoceras* and included in the genus *Sirenites*. It differs from typical *Sirenites*, for example the genotype *Sirenites senticosus* Dittmar (Mojsisovics, 1893, p. 727, pl. 161, figs. 8-12, 14 to 15), in the fewer tubercles, clavi or short ribs marginal to the sulcus as compared with the number of costae on the sides of the whorl. There are only about 6 ventral clavi to 5 lateral costae or 8 to 7, instead of about 3 ventral clavi to each 2 costae on the sides, as in typical *Sirenites*. This means that only about every fifth, seventh or eighth costa divides on the ventral shoulder, each branch to end in a tubercle, clavus or short thick rib marginal to the ventral sulcus, instead of every second costa doing so as in the type of *Sirenites*. The Peace River shells also differ from typical *Sirenites* in the lack of tubercles on the sides of the whorl. A specimen figured as a variety of *S. senticosus* by Mojsisovics (1893, pl. 161, figs. 12a,b) however, does not appear to have tubercles on the sides of the ultimate or outermost whorl.

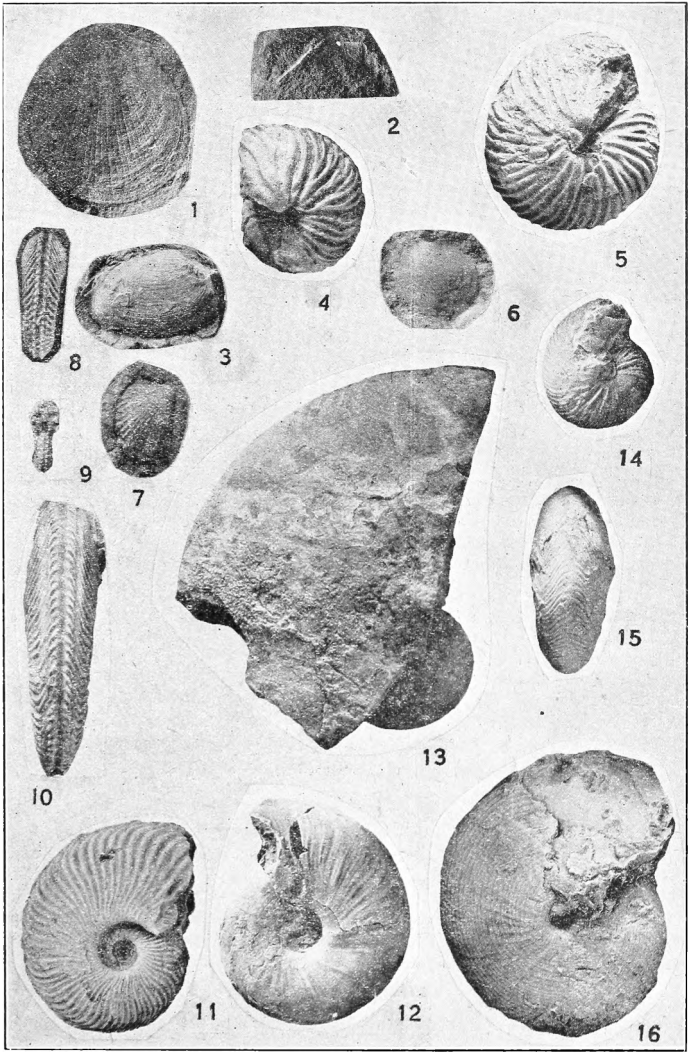
In growth the ventral ornament passes from a tuberculate, through a clavate, to a "short rib" or braided stage.

*Silenticeras hatae* (McLearn)

Plate 1, figure 12

1930 *Daphnites (Silenticeras) hatae* McLearn, Trans. Roy. Soc. Can., 3rd ser., vol. 24, sec. 4, p. 4, pl. 1, fig. 3.

This, the single species included in *Silenticeras*, resembles typical species of the Norian Alpine genus *Daphnites* Mojsisovics in the compressed form, ventral sulcus, strong projection of the falcoid growth lines and simple ceratitic suture line. It differs in the less well defined and less regular costation, even more strongly projected growth lines and greater



involution. The early Karnian Alpine genus *Klipsteinia* Mojsisovics has not the strong projection of the growth lines at the periphery, has tubercles on either side of the ventral sulcus and is more evolute.

*Juvavites (Gonionotites) spickeri* n. sp.

Plate 1, figure 13

This is a large, compressed, almost discoidal, involute species. The whorls are much higher than thick, have converging almost flat sides and narrow abruptly rounded venter. The umbilicus is small and has a rounded but well defined border. The surface of the outermost or ultimate whorl is not well preserved, but it appears to be smooth on the sides and costate on the ventral shoulder, where the costæ are bent forward. The outer and ventral part of the penultimate whorl is covered with arcuate, faint, very fine, approximate, even costæ or coarse striæ of low relief, the inner part with fewer and stronger costæ. The lobes of the suture line are long and narrow. The saddles are long and slender. There are at least an auxiliary saddle and an auxiliary lobe. Saddles and lobes are moderately indented.

The holotype and only specimen does not show, at the anterior end, the broadened venter of typical *Gonionotites*, but it is probable that only the beginning of the ultimate whorl is preserved.

This species has much finer costation on the inner whorls and deeper and more slender saddles than *Gonionotites italicus* Gemmellaro. *Gonionotites discus* Gemmellaro has very fine ornament on the inner whorls, but lacks the costæ on the ventral shoulder of the ultimate whorl.

Geol. Surv. collections; holotype, cat. no. 8807.

*Juvavites mertoni* n. sp.

Plate 1, figures 14, 15

This is a compressed, involute species. The whorls are much higher than thick and have convergent, gently convex sides and narrow, arched venter. The umbilicus is small, and the umbilical border well rounded. The surface of the outer part of the whorl of the holotype is covered with fine even costæ curved forward near the venter and continuous and strongly arcuate across it. The inner part of the side of the whorl of the holotype is poorly preserved, but appears to have only a few distantly spaced fine costæ. The inner part of the side of the whorl of the paratype has fewer and more

elevated costæ than those on the outer part of the same whorl. The costation somewhat resembles that of a figured specimen of *Juvavites (Anatomites) sigismundi* Mojsisovics, but *J. mertoni* shows no constrictions. The ornament is even more like that of *Juvavites (Dimorphites?) weberi* Welter but the costation is finer.

Geol. Surv. colls; holotype, cat. no. 8828, paratype, cat. no. 8796.

*Juvavites mackenzii* n. sp.

Plate 1, figure 5

This is a robust, stout-whorled species with almost flattened venter. There are about 25 stout costæ on the last whorl, which are not continuous across the venter. The whorls are thinner than those of *Juvavites ottartsi* Diener. Geol. Surv. collections; holotype, cat. no. 8829.

*Juvavites (Anatomites) humi* n. sp.

Plate 1, figure 4

In this small, somewhat compressed species, the costæ are more curved near the venter and the almost flattened venter is narrower than in *Juvavites (Anatomites) herbichi* Mojsisovics. The costæ on the anterior part of the ultimate whorl are coarse and of strong relief. In the posterior part of this whorl, the spaces between the constrictions are partly smooth.

Geol. Surv. collections; holotype, cat. no. 8799.

*Malayites dawsoni* n. sp.

Plate 1, figure 16

This is a compressed, involute species. The sides of the whorls are convex and convergent, the venter rounded, the umbilicus small and the umbilical shoulder rounded. There are well defined spiral fine costæ on the venter and outer part of the side of the whorl and spiral flat bands on the inner part of the side. On the inner or earlier whorls are fine radial costæ of low relief which bifurcate on the side of the whorls and are arcuate across the venter. On the outermost whorl all the radial costæ are of low relief, some have disappeared on the sides, but all remain on and near the venter, so that there may be three on the venter to one on the side. The spiral ornament, however, persists unchanged to the anterior end of the holotype specimen. The suture line has somewhat triangular fairly deeply indented, saddles and lobes.

Compared with *Malayites brouweri* Pakuckas, the Peace River species is more compressed and

the costation is not so well defined on the ultimate whorl.

Geol. Surv. collections, holotype, cat. no. 8836.

*Pecten sarsianus* n. sp.

Plate 1, figures 1, 2

The left valve is compressed, a little higher than long, and has a broad depression parallel to and just below the postero-dorsal margin. The greater part of the shell, but not the ears, is ornamented with very fine, widely spaced, finely nodose costæ.

Geol. Surv. collections, holotype, cat. no. 8781, paratype, 8780.

*Pleuromya ? nidovana* n. sp.

Plate 1, figure 3

This is a thin-shelled, quite convex species with the beaks situated about one-fourth to one-third distance from the anterior end, and evenly rounded postumbonal slope, and the surface ornamented with fine, fairly regular costæ or ridges of growth.

In form and sculpture this species closely resembles the American Karnian species described as *Posidonia madisonensis* Smith. It appears, however, to have a thinner shell.

Geol. Surv. collection; holotype, cat. no. 8775.

*Monotis ? irencana* n. sp.

Plate 1, figure 6

Apparently specimens of only one valve are preserved. This is rounded to somewhat obliquely oval in outline and moderately convex. The umbones are low and the hinge line long. The surface is flattened to concave in the dorsal angles, but there is no very pronounced demarcation of wings. The surface slopes more steeply to the left "wing" than to the right. The surface is ornamented with radial, fine, even costæ of low relief with wide spaces between. If a *Monotis*, or nearly related to it, the shape suggests a right valve. The left "wing" however is not so distinct as the posterior wing of *Monotis*.

The species is smaller, less convex and has a relatively longer hinge line and finer, more distant costation than *Monotis montini* McLearn. The radial fine costæ are not so closely arranged as in *Pseudomonotis tenuistriata* Bittner.

Geological Survey collections; holotype, cat. no. 8762.

*Lima nappii* n. sp.

Plate 1, figure 7

This is a small, moderately convex species, higher than long. The anterodorsal umbonal

slope is long, rounded and abruptly descending to the anterodorsal margin. There are about 18 to 20 elevated, rounded, radiating costæ with relatively wide spaces between them.

There are more radial costæ than in *Lima subcumaunica* Krumbek or *Lima cumaunica* Bittner.

Geological Survey collections, holotype, cat. no. 8784.

Submitted for publication

30 October 1937.

DESCRIPTION OF PLATE I

Note: All figures are of natural size unless otherwise stated.

Figure 1. *Pecten sarsianus* n. sp. Paratype. Geol. Surv. collections, cat. no. 8780.

Figure 2. Same species. Holotype. Geol. Surv. collections, cat. no. 8781.

Figure 3. *Pleuromya ? nidovana* n. sp. Holotype. Geol. Surv. collections, cat. no. 8775.

Figure 4. *Juvavites (Anatomites) humi* n. sp. Holotype. Geol. Surv. collections, cat. no. 8799.

Figure 5. *Juvavites (Anatomites) mackenzii* n. sp. Holotype. Geol. Surv. collections, cat. no. 8829.

Figure 6. *Monotis ? irencana* n. sp. Holotype. Geol. Surv. collections, cat. no. 8762.

Figure 7. *Lima nappii* n. sp. Holotype. Geol. Surv. collections, cat. no. 8784.

Figure 8. *Sirenites (Meginoceras) meginac* McLearn X 2, Ventral ornament in clavate stage. Plesiotype. Geol. Surv. collections, cat. no. 8842.

Figure 9. Same species X 2. Ventral ornament in tuberculate stage. Plesiotype. Geol. Surv. collections, cat. no. 8841.

Figure 10. Same species. Ventral ornament in "short rib" stage. Plesiotype. Geol. Surv. collections, cat. no. 8811.

Figure 11. Same species. Holotype. Geol. Surv. collections, cat. no. 9042.

Figure 12. *Silenticeras hatae* n. sp. Holotype. Geol. Surv. collections, type no. 9043.

Figure 13. *Juvavites (Gonionotites) spiekri* n. sp. Holotype. Geol. Surv. collections, cat. no. 8807.

Figure 14. *Juvavites mertoni* n. sp. Paratype. Shows ornament on inner part of side of whorl. Geol. Surv. collections, cat. no. 8796.

Figure 15. Same species. Holotype. Geol. Surv. collections, cat. no. 8828.

Figure 16. *Malayites dawsoni* n. sp. Holotype. Geol. Surv. collections, cat. no. 8836.