

MACROPALEONTOLOGICAL STUDY
of
PERMIAN AND PENNSYLVANIAN BRACHIOPODS
FINAL REPORT

Foreword

Taxonomic studies and publications on Permian-Pennsylvanian brachiopods from the Arctic Islands are still very incomplete, especially so in the case of the Pennsylvanian.

Although a percentage of the identifications, therefore, may be regarded as firm (being based on local published descriptions), others, qualified by "cf." or "aff.", are more descriptive than taxonomic. When taxonomic studies are completed, many new species and some new genera will result.

Most of the taxa designated "sp. undet" will probably prove to be new species. In order to indicate some continuity between collections from different stations, we have added, in parentheses, the number of the locality where this species is best represented; e.g. Phricodothyris sp. undet. (43).

With respect to age determinations based on brachiopods only, it must be conceded that these are less precise for this purpose than either fusulinids or ammonites. For our part, we prefer to derive the date of brachiopod assemblages on the basis of their fusulinid associations. Age

thus having been determined, the brachiopods furnish a satisfactory secondary criterion, when ammonites or fusulinids are lacking.

To this degree our age determinations herein may be regarded as tentative.

The collections examined proved to be either Middle Pennsylvanian or Early Permian.

Pennsylvanian Faunas

The following collections are Pennsylvanian in age:

C 45232	Sta. 7, 35.5 - 39.0	81°35' N, 77 27'W
C 45260	Sta. 15, 15	81°33' N, 77 50'W
C 45383	Sta. 27, 907 - 911'	81°56' N, 79 25'W
C 45405	Sta. 45, 66.5 - 77.0'	81°53' N, 79 15'W
C 45420	Sta. 45, 193.5 - 194.5'	Same
C 45424	Sta. 45, 216.0 - 225.5'	Same
C 45449	Sta. 64	81°54' N, 78 55'W
C 45452	Sta. 67	81°54' N, 78 55'W
C 45454	Sta. 69	81°54' N, 78 55'W
C 45455	Sta. 69	Same

The Pennsylvanian collections may be grouped into three assemblage units, which are tentatively designated:

Camerisma (?) beds

Cat. no. C 45232

Antiquatonia n.sp. (45) beds

Cat. nos. C 45260, C 45383? C 45424

Antiquatonia aff. morrownsis beds

Cat. nos. C 45405, C 45420, C 45449? C 45453,
C 45454, C 45455

The rich brachiopod assemblage at 66.5' - 77.0', locality 45 (C 45405) is taken as most typical of the zone. It yielded the following:

- | | |
|--|------------------------|
| C 45405 | St. 45 at 66.5 - 77.0' |
| Rhipidomella sp. undet. (45) | |
| Schizophoria sp. undet. A | |
| Schizophoria sp. undet. B. | |
| New leptænid (?) genus | |
| Rugosochonetes ? sp. undet. (45) | |
| Antiquatonic sp. aff. A. morrowensis (Mather) | |
| Echinaria sp. aff. E. Semipunctata (Shepard) | |
| ? Gemmulicosta gemma (Waterhouse) | |
| Linoproductus sp. aff. L. meniscus D.T.C. | |
| Linoproductus sp. aff. L. cora (d'orbigny) | |
| Rudina? sp. undet. | |
| Rhynchopora ? sp. unident. | |
| Stenoscisma sp. unident. | |
| Anthrucospirifer sp. aff. A. occidentalis (Girty) | |
| Neospirifer sp. undet. (45) | |
| Neospirifer sp. cf. "N. sp." of Waterhouse, 1971, pl. 7. | |
| Spiriferellina? sp. undet. | |
| Cleiothyridina sp. undet. (45) | |
| Cleiothyridina sp. aff. C. subcircularis (McChesney) | |
| Composita sp. cf. C. ozarkana Mather | |

The same zonal assemblage still seems to be present 116 feet higher in the section (Cat. no. C 45420). This collection comprises the following brachiopods:

- | | |
|------------------------------|---------------------------|
| C 45420 | Sta. 45 at 192.5 - 194.5' |
| Rhipidomella sp. undet. (45) | |

Schizophoria sp. B.

Derbyia? sp. unident. *

Antiquatonia sp. aff. A. morrowensis (Mather)

Genus undet. aff. Costellaria *

Kozlowskiella sp. cf. K. splendens (Norwood and Pratten) *

Linoproductus sp. aff. L. cora (d'o-bigny)

Rudina? sp. unident.

Composita sp. unident. (45) *

Composita sp. unident. (45) *

(NOTE: * indicates addition to the total assemblage). Other collections from the "morrowensis" beds are the following:

C. 45453 Station 67.

Antiquatonia sp. aff. A. morrowensis (Mather)

Linoproductus sp. unident.

? Cleiothyridina sp. aff. C. subcircularis (McChesney)

Composita sp. unident.

C. 45454 Station 69

Antiquatonia sp. aff. A. morrowensis (Mather)

Echinaria ? sp. unident.

C. 45455 Station 69

Composita sp. cf. C. ozarkana (Mather)

Linoproductus sp. aff. L. meniscus Dunbart Condra.

More doubtfully, because of poor preservation, the following:

C. 45449 Station 64

? Antiquatonia sp. aff. A. morrowensis (Mather)

Stenoscisma sp. unident.

Age Evaluation

Despite the comparison made with such Morrowan (Late Namurian) species as Antiquatonia morrowensis, Cleiothyridina subcircularis, and Composita

ozarkana, the presence of an Anthracospirifer close to A. occidentalis and of a Kozlowskian close to K. splendens seems to indicate the beds could not be older than Des Moinesian.

Hopefully, fusulinid or ammonite evidence will be forthcoming and permit a more definitive age determination.

Antiquotonia n. sp. (45) Beds

At Station 45 (216.0 - 225.5') some 20 feet above beds bearing a "morrowensis" assemblage, a collection (Cat. no. 45424) includes the following brachiopods:

C 45424

Sta. 45 at 216.0 - 225.5

Rhipidomella sp. undet. (45)

Antiquotonia sp. undet. (45)

Echinaria sp. aff. *E. semipunctatus* (Shepard)

Linoproductus sp. aff. *L. cora* (d'orbigny)

Linoproductus sp. aff. *L. meniscus* Dunbar and Condra

Genus aff. *Prohorridonia*

Choristites sp. cf. *C. ussensii* (Stuckenberg)

Genus aff. *Unispirifer*

The same Antiquotonia, very distinct from A. aff. morrowensis of lower beds, occurs also at Station 15, in the following association:

C 45460

Station 15

Antiquotonia sp. undet. (45)

Linoproductus sp. aff. *L. cora* (d'orbigny)

Linoproductus sp. aff. *L. meniscus* D. & C.

More doubtfully, on the basis of abundant but poorly preserved Linoproductus,

C 45383

Sta. 27 at 907-911'

Linoproductus spp.

Age Evaluation:

The Antiquatonia sp. undet (45) beds, while containing significant species not present below, also have a number of species in common with the "morrowensis" beds. Therefore, the two zones appear to be immediately time-successive, and both to be of Des Moinesian age.

Camerisma (?) Beds

The unique brachiopod assemblage from Station 7 (Cct. No. C 45232) would be difficult to place were it not for the associated fusulinids. The brachiopod assemblage is as follows:

C 45232

Station 7

Chaoella sp. undet. (7)

Camerisma ? sp. undet. (7)

Choristites sp. unident.

Neospirifer sp. unident.

The fusulinellids, on casual examination, are probably undescribed species of Wedekindellina, Fusulinella, and possibly, Pseudostaffella,

The combination of Wedekindellina and Fusulinella is indicative of early Des Moinesian. Whether the Camerisma (?) assemblage is older or younger than the previous two zones discussed is not determinable on brachiopod evidence alone. All three zones probably fall within the Middle Pennsylvanian, Des Moinesian.

C 45232

Sta. 7 at 35.5 - 39.0'

Chaoella sp. undet. (7)

Camerisma (?) sp. undet. (7)

Choristites sp. undet. (7)

Neospirifer sp. undet. (7)

The "Camerisma" may in fact prove to be a new genus of
Stenoscismatacea.

Permian Fauna

The following collections are of Permian age:

C 45213	Sta. 6, 250.5 - 256.5'	81°35'N., 77°56'W
C 45387	Sta. 40	81°52'N., 79°35'W
C 45389	Sta. 41	81°54'N., 79°35'W
C 45390	Sta. 42	81°50'N., 79°35'W
C 45391	Sta. 43	81°50'N., 79°35'W
C 45394	Sta. 43	Same
C 45430	Sta. 56	81°52'N., 79°10'W
C 45431	Sta. 56	Same
C 45432	Sta. 56	Same
C 45434	Sta. 57	81°52'N., 79°08'W
C 45466	Sta. 82	81°52'N., 79°10'W
C 45469	Sta. 82	81°55'N., 78°40'W

Permian collections may be grouped into two separate assemblage-zones, which we have designated as follows:

Muirwoodia wyprehti beds - Artinskian

Bathymyonia inexpectata beds - Late Sakmatian

Bathymyonia inexpectata Beds

As typical for the zone, we take the large collection from Station 40, which yielded the following brachiopods:

C 45387 Station 40

Derbyia sp. unident.

? Anidanthus minor Cooper

Anemonaria pseudohorrida (Wiman)

Antiquotonia sp. unident.

Bathymyonia inexpectata Cooper

Concrinello sp. undet. (40)

Genus aff. Derbyella

Marginifera? cf. *M. ? costellata* Cooper
Muirwoodia sp. unident.
Woggenoconcha sp. unident.
Wellerella? sp. undet.
Rhynchopora sp. unident.
Stenosisma sp. cf. *S. mutabile* Chernyshev
Neospirifer sp. undet. (40)
Odontospirifer n. sp. B.
Punctospirifer sp. undet. (40)
Spiriferid genus undet. (6)
Spiriferella parryana (Toula)
Phricodothyris sp. undet. (43)
Dielasma sp. unident.

Other collections belonging to the Bathymyonia inexpectata as -

semblage are:

C 45213

Locality 6

Antiquatonia reticulata Cooper *

Neospirifer sp. undet. (40)

Spiriferid genus undet. (6)

Martinia sp. unident. *

(Note: * indicates additional to the total assemblage.)

C 45389

Locality 41

Anemonaria pseudohorrlda (Wiman)

? Anidanthus minor Cooper

Spiriferella parryana (Toula)

Martinlopsis sp. cf. *M. orientalis* Chernyshev *

Phricodothyris sp. undet. (43)

C 45394

Station 43

Derbyia sp. unident.

Anemonaria pseudohorrlda (Wiman)

Antiquotonia reticulata Cooper
Genus off. *Derbyella*
Jakutoproductus ? sp. unident. *
Lino-productus sp. unident. *
Muirwoodia sp. unident.
Waagenoconcha sp. unident.
Stenosisma sp. cf. *S. mutabile* Cherny shev
Choristites ? sp. unident. *
Odontospirifer n. sp. A. *
Spiriferella parryana (Toula)
Spiriferid genus undet. (6)
Crurithyris ? sp. unident. *
Phricodothyris sp. undet. (43)
Composita sp. aff. *C. trilobata* Dunbar & Condra *

C 45469

Station 82

? *Anidonthus minor* Cooper
Sowerbina sp. unident.
Choristites ? sp. unident.
Spiriferella parryana Toula

C 45466

Station 82

Anemonaria pseudohorrida (Wiman)
Bathymyonia inexpectata Cooper

Age Evaluation:

The brachiopod fauna is widespread, having a number of species in common with the Coyote Butte Formation of Central Oregon (Cooper, 1957) and with Bamber and Waterhouse's (1971) Zones "Eta" through "Ej" of the Jungle Creek Formation of Yukon Territory.

There as in the Eastern Arctic (Vide examinations by us of other collections from that area), the assemblages are associated with the diagnostic

fusulinid, Alaskanella yukonensis Skinner & Wilde. According to Petocz (1970), the beds in which the fusulinid occurs are Late Sakmarian in age.

This is our conclusion also.

This horizon is close to that of Thorsteinsson and Harker's (1960) Faunule 2, in the Belcher Channel Formation of the Grinnell Peninsula.

Muirwoodia Wyprechtii Beds

As typical for the zone, we take the large assemblage from the top of the Permian succession at Station 43. Here these beds lie stratigraphically higher in the section than the beds of Collection no. C 45394, which carry the Bathymyonia inexpectata assemblage.

The following brachiopods comprise the Muirwoodia wyprechtii

Zone at Station 43.

C 45391

Station 43

Derbyia sp. unident.

Anemonaria pseudohorrada (Wiman)

Antiquatonia "arctica" of Frobald, 1950

Cancrinella "cancriniformis" of Frobald, 1950

Kutorginella ? sp. undet. (43)

Megousia sp. undet. (43)

Sowerbina bullocki (Nelson)

Waagenoconcha sp. unident.

Rhynchopora sp. undet. (43)

Neospirifer grönwalli Dunbar

Neospirifer "fasciger" of Frobald, 1950

Pterospirifer sp. undet. (43)

Spiriferella cf. draschei (Toula)

Spiriferella sarance (de Verneuil)

Spiriferid genus undet. (43)

Phricodothyris sp. undet. (43)

Other collections from the Muirwoodia wyprehti zone are the

following assemblages:

C 45390

Station 42

Muirwoodia wyprehti (Toula)

Sowerbina bullocki (Nelson & Johnson)

Spiriferella "draschel" (of Dunbar, 1962; non Toula) *

C 45430

Station 56

Derbyia sp. undet. (56)

Antiquatonia "arctica" of Frebold, 1950

Muirwoodia wyprehti (Toula)

Linoproductus sp. unident. *

Odontopleura n. sp. A *

Spiriferella "draschel", (Dunbar, 1962; non Toula) *

Phricodothyris sp. undet. (43)

Cleiothyridina (giant species) *

Stenosisma sp. cf. *S. mutabile* Chernyshev *

C 45431

Station 56

This collection lot yielded only an incomplete Derbyia. It is included among the Muirwoodia wyprehti assemblages on the basis of its stratigraphic position between collections C 45430 and C 45432.

C 45432

Station 56

Anemonaria pseudohorrida (Wiman)

Muirwoodia wyprehti (Toula)

Spiriferella "draschel" (of Dunbar, 1962; non Toula)

Spiriferella sarance (de Verneuil)

C 45434

Station 57

Antiquatonia "arctica" of Frebold, 1950

Anemonaria pseudohorrda (Wiman)

Spiriferella parryana (Toula) *

Age Evaluation:

The fauna of the Muirwoodia wyprehti Zone includes many elements that link it with the Upper Marine Group of Northeast Greenland (see Frebold, 1950; Dunbar, 1962). Among these are:

Antiquatonia "arctica" of Frebold, 1950

Cancrinella "cancriniformis" ditto

Neospirifer "fasciger" ditto

Muirwoodia wyprehti (Toula)

Neospirifer gronwalli Dunbar

Spiriferella "draschei" (Dunbar 1962; non Toula)

Spiriferella cf. draschei (Toula)

Spiriferella parryana (Toula)

Dunbar (1962) reillustrates Toula's original figures of "Spirifer" draschei from Svalbard, as well as figures of specimens from Northeast Greenland. It is our impression that the latter comprise a different but closely related species, which in the current collections, we designate as Spiriferella "draschei" of Dunbar, non Toula. Both species are present in the collections from the M. wyprehti beds.

Spiriferella parryana, another Svalbard species, was recognized by Dunbar from Greenland on the basis of a single specimen in an association of Artinskian age equivalent to our Muirwoodia wyprehti Zone.

Our studies of a number of collections from the eastern Arctic Islands indicate that the Athisis andrupi Assemblage (our Muirwoodia wyprechti beds) and the Schwagerina jenkinsi fusulinid assemblage are intermingled and contemporaneous. (Unfortunately, in earlier reports, we applied the name Spiriferella parryana to designate these beds. The present study shows that S. parryana is quite long-ranging; therefore we now substitute the name Muirwoodia wyprechti as the zonal designate.)

On the basis of the fusulinid association and on stratigraphic position, rather than on the joint occurrence of Spiriferella sarance, we also correlate the Muirwoodia wyprechti beds with Faunule 3, at the top of the Belcher Channel Formation of the Grinnell Peninsula (see Harker & Thorsteinson, 1960)

Turning to northwestern Canada, we find among fossils in the lower part of the Takkandit Formation, (Zones Fa and Fs), the following: Sowerbina cf. bullocki, Spiriferella sarance, Anemonaria pseudohorrida, and the S. jenkinsi Zone fusulinid, Schwagerina hyperborea (Salter) (vide Bamber and Waterhouse, 1971, pp. 165, 166).

From the same area and horizon, Nelson and Johnson (1968), record Sowerbina bullocki, Spiriferella sarance, S. rajah (close to the Spiriferella we identify above as S. "draschei"), Muirwoodia greenlandica (presumably our M. wyprechti, which is close to that Ufimian species), as well as the fusulinids Schwagerina jenkinsi and S. hyperborea. On East Porcupine River (op. cit., p. 719, text fig. 2), they show beds with an abundance of Sowerbina bullocki lying about 100 feet above beds with Bathymyonia

Inexpectata, recalling the relationship of the two zones at Station 43 of the present study. Harker and Thorsteinsson, 1960 also give the zone an Early Leonardan equivalency. As to the brachiopod assemblage at the top of the Upper Marine Group in Northeast Greenland, Dunbar et al (1962) concede that the beds might be as young as Leonardan.

This is, under the circumstances, a fairly remarkable concensus, - at least that the beds involving the Schwagerina jenkinsi fusulinid zone and the Muirwoodia wyprehti (equals Athyris andrupi) brachiopod zone are Leonardan (Artinskian) in age.

Our current interpretation is that they are Late Artonskian.

The fauna listed by Dr. A. Logan, from "10 miles northwest of Yelverton Lake" (G.S.C. Loc. C 1886) (G.S.C. Paper 68-31, p. 14) appears to have come from beds we would include in our Muirwoodia wyprehti Zone.