Appendix A1: biostratigraphy

Report on fossil fauna collected by Esther Bordet (Yukon Geological Survey) during 2016 summer field season

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Report Date: April 18, 2017

**16EB-082-1**

Light gray lime grainstone, contains:

* crinoid ossicles, several of which articulated into columnar stems
* calcareous algal "bits"

**Age**: Indeterminate, but conformable with a presumed Late Triassic age.

**Environment:** very shallow-water (suggested by abundant algae), open-marine setting (evidenced by crinoids)

**16EB-101-1**

Polymictic limestone conglomerate, with varying types of carbonate clasts and lesser interstitial lime mud infilling. Only identifiable fossils are rare to abundant small crinoid ossicles, (all more or less of the same morphotype). The ossicles are confined to lime mud which fills voids between larger carbonate clasts, where abundant can even form an encrinite, though more typically the ossicles occur infrequently.

**Age:** uncertain, post-Cambrian

**Environment:** abundance of crinoids indicate a normal marine environment.

**16EB-116-1**

Medium gray, recrystallized lime mudstone, contains:

* crinoid ossicles
* indeterminate sponge-like object
* indeterminate biotic debris

**Age:** probably Late Triassic

**Environment:** Crinoid ossicles imply normal marine salinities

**16EB-128-2**

Light gray lime mudstone, contains:

* disarticulated shells (bivalves or brachiopods) in cross-section on cut slab surfaces
* recrystallized scleractinian corals (probably Retiophyllia)
* recrystallized calcareous sponge (indeterminate)
* crinoid ossicles (not common)
* undetermined medium-sized, high-spired gastropod

**Age:** Late Triassic

**Environment:** shallow-water, open-marine conditions

**16EB-142-1**

Calcareous boulder conglomerate contains:

* crinoid ossicles
* undetermined solitary scleractinian corals, poorly preserved, common
* possible hydrozoan

**Age:** Late Triassic undifferentiated

**Environment:** Shallow-water, carbonate platform

**16EB-173-1**

Light gray and medium gray lime mudstone (both color variants present), contains:

* poorly preserved scleractinian corals (recrystallized), probably Retiophyllia
* indeterminate small smooth brachiopods (probably terebratulids)
* Stromatactis-like structures

**Age:** Late Triassic, undifferentiated

**Environment:** shallow-water (photic zone, shelfal depths), open-marine

**16EB-284-1**

Light brownish-gray limestone mudstone to wackestone, contains:

* crinoid ossicles
* several bivalve shells in cross-section (indeterminate)
* calcareous algal fragments

**Age:** Indeterminate, but conformable with a presumed Late Triassic age.

**Environment:** very shallow-water (suggested by abundant algae), open-marine setting (evidenced by crinoids)

**16EB-287-1**

Light gray lime mud- to wackestone, contains:

* recrystallized sponge?
* crinoid ossicles
* fine-ribbed bivalve
* "Lepismatina" sp. (a spiriferid brachiopod)
* disarticulated bivalves in cross-section on slabbed rock sections

**Age:** Middle to Late Triassic, as indicated by the spiriferid brachiopod "Lepismatina" sp.

**Environment:** shallow-water, open marine (shelfal) conditions

**16EB-388-1**

Medium-gray (fresh) lime mudstone, contains:

* several small indeterminate solitary scleractinian corals (poorly preserved)
* several small indeterminate ribbed bivalve fragments
* small smooth ostracodes
* crinoid ossicles

**Age:** probably Late Triassic

**Environment:** probably normal marine to slightly restricted marine.

**16EB-433-2**

Reddish-orange weathering lime mudstone (very distinctive lithology) with molluscan debris, contains:

* Fine-ribbed pectinoid bivalve
* several other small and ribbed bivalves, mostly indeterminate, but one possible Cassianella sp.
* Zygopleura (Anoptychia) sp. (high-spired gastropod)
* undetermined tube-like object
* crinoid ossicles (including Pentacrinus sp. ossicles)

**Age:** Late Triassic (undifferentiated).

**Environment:** Normal marine salinity.

**16EB-457-1**

Limestone packstone, contains:

* Eocomeoseris ramosa (Frech) - scleractinian coral
* Colonial scleractinian coral (probably Gablonzeria profunda (Reuss of Yarnell, 2000)

**Age:** Late Triassic (undifferentiated)

**Comment:** Eocomoseris ramosa is known from the Alps (Austria), Slovenia, Poland, Iran, Southwest Alaska (Penisular terrane), Southeast Alaska (Alexander terrane), and also India, Mexico (Sonora), Nepal, Peru, Slovenia according Fossilworks website. Constitutes a very good tropical water Tethyan indicator. Interesting enough, not one single occurrence is known from Wrangellia, despite the now good sampling from that terrane throughout its length. An exception may be an occurrence in Oregon in the Wallowa Mountains (Wallowa terrane), which was formerly considered part of Wrangellia, but later segregated out.

**16EB-460-1**

Bioclastic wackstone, contains:

* rare crinoid ossicles
* indeterminate small bivalves in cross-section
* indeterminate biotic debris
* indeterminate scleractinian coral with small corallites (possibly Distichomeandra?)
* recrystallized coralline or sponge-like object
* several high-spired gastropods in cross-section
* Stromatactis structures

**Age:** Late Triassic (can not be resolved further as to stage)

**Environment:** moderately open-marine at least (indicated by presence of crinoid ossicles)

**Comments:** The diversity of the collection is relatively high, but unfortunately the large degree of recrystallization makes detailed identification not possible.

**16EB-477-1**

Dark gray (fresh and weathered), silty, limy argillite, weakly laminated. Estimated age: Early Jurassic. Contains:

* infrequent, very small bivalve shells exposed only in cross-section. Morphologies include both flattish and moderately convex forms.
* crinoid ossicle

**Age:** rare fauna cannot support age identification. Age remains uncertain

**Environment:** appears to a quiet-water, more offshore bio- and lithofacies.

**16EB-539-1**

Macrofossil bearing sandstone. Estimated age: Early Jurassic.

**Flora:** common broken plant debris (some are carbonized)

**Comments:** None of the plant fragments are complete enough to be generically determined. However, the material reminds me in aspect with the Upper Triassic and Lower Jurassic non-marine plant fragments seen out of the Sag River Sandstone and overlying Lower Jurassic on the North Slope of Alaska.

**Age:** None inferred

**Paleoenvironment:** Probably non-marine based on the abundance of plant remains, and absence of marine fauna

**16EB-547-1**
Dark gray lime mudstone, contains:

* numerous brachiopod and bivalves in cross-section on slabbed pieces, lesser gastropods
* crinoid ossicles (not common)
* one small indeterminate coral fragment
* fine-ribbed bivalves (on several broken rock surfaces)
* several smooth brachiopod valves (terebratulids on a broken rock surface)
* Otapira sp. (bivalve, one specimen, on a broken rock surface)

**Age:** Based on the whole fauna, probably Late Triassic (though the genus Otapiria is common in both Late Triassic and Early Jurassic rocks of the Arctic (NE Russia and Alaska)

**Environment:** open-marine (normal salinity), in shelfal depths

**Comments:** The bivalve genus Otapiria is a common element in Upper Triassic and Lower Jurassic faunas of the Arctic. The species here appears to be a new form.

This sample has high abundance of megafossils compared to many of the other Lewes Group samples. Unfortunately the shells appear to be well annealed to the surrounding matrix (probably due to low grade metamorphism?), resulting in difficulty in extracting good specimens from their matrix. Some of the pieces have suggestions of weak silicification of shells.

**16EB-600-1**

Medium-gray (fresh), weathering reddish-brown-orange, lime mudstone. Contains:

* indeterminate ribbed spiriferid brachiopod fragment
* smooth terebratulid brachiopod (fragmentary articulate specimen, probably belonging to the genus Coenothyris sp.)
* one plicate terebratulid brachiopod, resembles Cf. Dielasma julicum (Bittner) of Lees, 1934, p. 33, Pl. 1, figs. 2-5 (refigured in Sandy, 2001, Fig. 40.2 on p. 396)
* several indeterminate brachiopod scraps
* crinoid columnals

**Age:** Late Triassic

**Environment:** Shallow-water, open marine conditions

**Comments:**  This is a very promising small collection, additional material (much larger size) could help refine taxic list and age. The two terebratulid forms, or very similar taxa, noted here also appear in our southern Alaska accreted terranes.

References:

Lees, E.J., 1934, Geology of the Labarge area, Yukon. Transactions of the Royal Canadian Institute, No. 43, v. XX, Part I, p. 1-48, 6 pls.

Sandy, M.R., 2001, Mesozoic articulated brachiopods from the Western Cordillera of North America: their significance for paleogeographic and tectonic reconstruction, palaeobiogeography, and palaeoecology, p. 394-410, in Brunton, C.H.C., Cocks, L.R.M., and Long, S.L., eds., Brachiopods – Past and Present. The Systematics Association.