

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-12

Sample No.: 07-JB-63-M1
 Site No.: JB-63
 Lab No.: 11-38
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Jeff Bond
 Submitter: Jeff Bond & Brent Ward
 Material: basal peat forest bed
 Sample volume: ~1000 mL (dry), wt. ~200 grams (dry)

PLANT MACROFOSSILS:

Non Vascular Plants:

| | | | |
|---------------------|----------|-----|---------------------------|
| Bryophytes | "mosses" | +++ | 'matted clumps', one type |
| <i>Sphagnum</i> sp. | | + | single leaves |

Vascular Plants:

| | | | |
|--|---------------------------|-----|--|
| Equisetaceae | "horsetail family" | | |
| <i>Equisetum</i> sp. | | + | stem fragments: 15 |
| Pinaceae | "pine family" | | |
| <i>Picea glauca</i> * (Moench) | Voss | +++ | needles (whole), twig terminals with needles attached: ~20, twig terminals, cone: 1, cone scales: 4, seeds: 32, seed wings and fragments: 30 |
| Poaceae (Gramineae) | "grass family" | | |
| <i>Poa</i> type | | + | caryopses: 4 |
| Cyperaceae | "sedge family" | | |
| <i>Carex canescens</i> L. | | ++ | seeds with perigynium: 367, seeds: 3 |
| <i>Carex aquatilis</i> type | | + | seeds with perigynium: 10 |
| <i>Carex</i> trigonous type | | + | seeds with perigynium: 2 |
| <i>Eriophorum</i> sp. | | + | seed: 1 |
| Araceae | "arum family" | | |
| <i>Calla palustris</i> L. | | + | seeds: 2 |
| Betulaceae | "birch family" | | |
| <i>Betula</i> tall shrub/small tree type | | ++ | bracts: 10, pollen catkin frgs.: 6 |
| <i>Betula</i> arboreal type | | + | nutlets: 74 |
| | | + | nutlet: 1 |
| Rosaceae | "rose family" | | |
| <i>Potentilla palustris</i> (L.) Scop. | | + | seeds: 11 |
| Onagraceae | "evening primrose family" | | |
| <i>Epilobium</i> sp. | "willow herb" | + | seed: 1 |
| Ericaceae | "heath family" | | |
| <i>Vaccinium</i> sp. | | + | seeds: 2 |
| Asteraceae (Compositae) .. | "composite family" | | |
| Genus? | | + | seeds: 2 |
| Unknown plant macrofossil taxa | | + | seed: 1 |

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| | | |
|--------------------------|---|---|
| Other: | | |
| wood | + | fragments: 2 (~1 cm in size, abrupt ends) |
| twigs (excluding spruce) | + | fragments: 2 (<i>Betula?</i>) |
| modern fibrous roots | + | thin, fine white root fragments |
| deciduous leaf | + | fragments: 12 |
| bark | + | fragments |

*spruce needles and twig terminals not counted due to abundance

ANIMAL MACROFOSSILS:

| | | |
|--|-----------------------------|---|
| PORIFERA | "sponges" | |
| HAPLOSCLERINA | | |
| Spongillidae | | |
| <i>Spongilla</i> type | + | 3-cell cluster: 2, single cells: 3 |
| BRYOZOA | | |
| <i>Cristatella mucedo</i> L. | + | statoblasts: 7 |
| <i>Plumatella</i> sp. | ++ | statoblasts**: ~100 |
| ARTHROPODA | | |
| INSECTA | | |
| COLEOPTERA | "beetles" | |
| Dytiscidae | "predaceous diving beetles" | |
| <i>Hydroporus</i> sp. | + | head: 1, elytron: 1 |
| Hydrophilidae | "water scavenger beetles" | |
| <i>Helophorus tuberculatus</i> Gyll. | + | head: 1, elytron: 1 |
| | + | elytra: 2 |
| Hydraenidae | "minute moss beetles" | |
| <i>Ochthebius</i> sp. | + | elytron: 1, pronotum: 1 |
| Staphylinidae | "rove beetles" | |
| <i>Olophrum consimile</i> Gyll. | + | prosternum: 1, sternites: 2 |
| <i>Olophrum</i> sp. | + | pronota: 4 |
| <i>Stenus</i> sp. | + | elytra: 8, heads: 2 |
| <i>Tachinus</i> sp. | + | head: 1, elytron: 1 |
| <i>Lathrobium</i> type | + | pronotum: 1 |
| | + | articulated elytra: 1, head: 1 |
| Helodidae | "marsh beetles" | |
| <i>Cyphon</i> sp. | ++ | heads: 3, pronota: 4, elytra: 19, half elytra: 3 |
| Elmidae..... | "riffle beetles" | |
| | + | elytron: 1 |
| Elateridae | "click beetles" | |
| | + | head: 1 |
| Curculionidae | "weevils" | |
| <i>Isochnus?</i> | + | articulated small elytra: 1 (1 mm size) |
| Scolytidae | "bark beetles" | |
| | + | head: 1 |
| <i>Phloeotribus?</i> sp. | + | half elytron: 1 |
| <i>Pityophthorus</i> spp. | + | elytra: 2 |
| <i>Polygraphus rufipennis?</i> (Kirby) | + | elytron: 1 |
| TRICHOPTERA | "caddisflies" | |
| Genus? | + | half head capsules: 2, misc. sclerites: 2 |
| LEPIDOPTERA | "butterflies/moths" | |
| | + | larva heads: 3, larva mandible: 1, larva coprolite frass: 5 |
| DIPTERA | "flies" | |
| | + | fly pupae: 19, pupa fragments: 2 |
| Chironomidae | "midges" | |
| | ++ | larvae head capsules: >100** |
| HYMENOPTERA | "wasps and ants" | |
| Ichneumonoidea | "ichneumons and braconids" | |
| Ichneumonidae | + | thoracic fragments: 3 |

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| | | | |
|----------------------------|------------------|----|------------------------------|
| Formicidae | "ants" | | |
| <i>Myrmica</i> type | | + | head: 4 |
| <i>Formica</i> type | | + | heads: 2 |
| <i>Camponotus</i> type | | + | head: 1 |
| CRUSTACEA | | | |
| Cladocera | "water fleas" | | |
| <i>Simocephalus</i> sp. | | ++ | ephippia: >100** |
| ARACHNIDA | | | |
| Oribatei | "oribatid mites" | ++ | many types** |
| Hydrozetidae | | | |
| <i>Hydrozetes</i> type | | + | ~15 mites |
| Araneae | "spiders" | + | cephalothoraces: 4 |
| Erigonidae | | + | chelicera: 1 |
| <i>Erigone</i> sp. | | + | male cephalothorax: 1 |
| Unknown animal taxa | | + | immature mandibles: 6 (same) |
| Other: | | | |
| small mammal fecal pellets | | + | ~40 half pellets |

**discontinued enumeration due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Two bulk samples collected by Jeff Bond and Brent Ward from site JB-63, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample is from a peat forest bed layer sampled at the base of the section (**Figure 4**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

The most notable features in this sample are the abundance of organic matter (100% by volume) consisting mostly of conifer remains and the excellent preservation of all the macrofossils. Macrofossils were so well preserved it gave the appearance that the sample was as 'fresh' as the day it was deposited. Almost all of the spruce (*Picea*) needles were complete (not fragmented) and many were seen attached to twig terminals and nearly all of the sedges (*Carex* spp.) had the perigynia intact. The majority of birch (*Betula* spp.) nutlets had partial or entire wings intact and some of the insect fossils were articulated (elytra) with some retaining scales/hairs.

The large volume of organic matter recovered in 07-JB-063-M1 consists of mainly spruce remains including thousands of whole needles, many twig terminals with needles attached, twig terminals with lateral buds, one cone, cone scales, seeds and seed wings (Figure 5). Spruce macrofossils were so abundant that they obscured isolation of other macrofossils. One excellently preserved spruce twig terminal with approximately 20 needles attached has been submitted to Beta Analytic Inc. for AMS radiocarbon dating (Figure 6). Identification of spruce species can be done based on needle morphology and anatomy (Dunwiddie, 1985; Weng and Jackson, 2000). *Picea* needles are usually four angled in cross section with stomatal rows usually occurring on all surfaces. By examining the anatomical cross-sections of spruce needles, species can be differentiated by the number, position and diameter of resin ducts. Two well preserved spruce needles were cross sectioned consecutively (~20 cross sections/needle) mounting each section in a series from base to tip. The cross sections revealed resin ducts that were discontinuous indicating they belonged to either white spruce (*Picea glauca*) or Engelmann spruce (*Picea engelmannii*) since black spruce (*Picea mariana*) have continuous resin ducts. Based on the smaller resin duct size and position (closer to the needle angles) as well as higher concentration of the ducts near the needle tip and base, the needles were identified as white spruce. Engelmann spruce has larger diameter resin ducts, are positioned slightly away from the needle angles and concentrated more within the center of the needle (Weng and Jackson, 2000). White spruce is common in northern boreal forests forming the northern tree line in the Yukon Territory. It is a medium-sized conifer growing 25 m high and 60 cm in diameter occurring on a variety of soils and under a wide range of climatic conditions (Farrar, 1995).

Other components of the coarse organic fraction include abundant moss and some fragments of horsetail (*Equisetum*) stems, deciduous leaves, bark, wood (2 fragments, ~1 cm in size) and two unidentifiable twigs (excluding spruce twig terminals). Mosses (Bryophytes) of predominantly one type were so plentiful that they formed 'clumps/mats' around the larger spruce macrofossils. Sphagnum (*Sphagnum*) moss was rare with only single leaves being observed.

Macrofossil remains of other trees and shrubs in this sample include many birch (*Betula* spp.) bracts (10), pollen catkin fragments (6) and nutlets (75). From the many nutlets recovered almost all of them had complete or near complete seed wings. Based on the nutlet size and shape, the majority are tall shrub/small tree birch (Figure 7). Examination of the bracts with pointed lobes and shorter lateral lobes that are angled upwards suggest the birch may be water birch (Figure 8). One larger bract with missing lateral lobes appears to be an arboreal birch such as white birch, *Betula papyrifera*. One nutlet with complete seed wings (Figure 7) that are much larger than the seed also suggests the presence of arboreal birch. Water birch (*Betula occidentalis*) is generally a tall shrub (3-6 m) but may become a small tree up to 10 m high (Figure 8). It grows on moist soils along streams, forest and marshes, mixed with poplars, willows and alders (Farrar, 1995) and in Yukon Territory also on dry ridges and slopes (Cody, 2000). White birch (*Betula papyrifera*) in Yukon Territory is a small tree 5 to 20 m high found in open woodland (Cody, 2000) (Figure 7). Another shrub in this sample is the ericaceous shrub *Vaccinium*. Although a species could not be assigned, the seeds are more than likely mountain cranberry (*Vaccinium vitis-idaea*) or bog bilberry (*Vaccinium uliginosum*). These species are common in acidic soil being found on alpine slopes, muskegs, swamps, woodland, boggy situations and heath.

The remaining plant macrofossil seeds recovered from 07-JB-63-M1 are either annual or perennial herbs with the majority being plants of poorly drained sites. The most abundant seeds recovered were sedges dominated by silvery/gray sedge, *Carex canescens*. The preservation of the sedges is excellent with the majority still retaining the outer perigynia enabling identification to the species level. *Carex canescens* were common (Figure 9) with 367 seeds with intact perigynia being recovered. This perennial herb inhabits bogs, swamps, fens, wet meadows and stream banks. Less common was water sedge, *Carex aquatilis* type (Figure 10), a common wetland plant of marshes, bogs, wet meadows and shallow water along shores. Other plants of poorly drained sites include

marsh cinquefoil (*Potentilla palustris*) and wild calla (*Calla palustris*). Marsh cinquefoil (Figure 11) is an emergent bog plant found in marshes and bogs similar to wild calla that grows in wet boggy areas (Figure 12).

Similar to the plant macrofossils, invertebrate and animal fossil remains are rich and diverse in 07-JB-63-M1. Many of the fossils recovered are aquatic or hygrophilous being found near water. Aquatic invertebrates and crustaceans include abundant bryozoans (*Plumatella*, >100 statoblasts; *Cristatella mucedo*, 7 statoblasts), water fleas (*Simocephalus* sp., >100 ephippia) and some freshwater sponges (*Spongilla* type, 5 cells). Species of the freshwater *Plumatella* occur primarily in still or slow-flowing waters feeding on protozoans, bacteria and suspended organic matter. Water fleas inhabit all types of quiet freshwater bodies being abundant wherever there is plenty of planktonic algae and diatoms to feed upon. Aquatic arachnids in this sample include the oribatid mites *Hydrozetes* and spiders *Erigone*. Species of *Hydrozetes* and *Erigone* can be found on vegetation that borders lakes, bog pools and wet fens where they are often found in great densities. *Hydrozetes* were fairly abundant in this sample (~15 mites).

Many aquatic insects also occur in 07-JB-63-M1. Aquatic insects that live in freshwater pools, bogs, ponds and lakes include the predaceous diving beetle *Hydroporus*, water scavenger beetles Hydrophilidae including *Helophorus tuberculatus* (Figure 18), larvae midges (Chironomidae), and immature caddisflies (Trichoptera). Species of *Hydroporus* are often found in shallow aquatic habitats, especially near the water margin amongst emergent vegetation (Larson *et al.*, 2000). Hydrophilidae are most common in small pools and ponds with emergent vegetation. Very little is known about the habitat requirements of the water scavenger beetle *Helophorus tuberculatus* however specimens collected from Dawson City, Y.T. were taken by sifting wet *Sphagnum* moss and debris along a muddy creek and at other sites among moss and litter bordering small water bodies (Smetana, 1985). Head capsules of larvae midges were very abundant in this sample and enumeration of the head capsules was discontinued in the fine fraction (>100 head capsules). Chironomidae larvae midges are common in freshwater lentic and lotic environments. Another aquatic insect, the riffle beetle Elmidae can be found in sand, gravel or submerged wood in flowing water such as streams.

Other insects that live near water (hygrophilous) but are not aquatic include mostly beetles of the rove beetle family Staphylinidae, minute moss beetles *Ochthebius* and marsh beetles *Cyphon*. The rove beetle *Olophrum consimile* can be found along streams or at the edges of ponds and lakes in deciduous leaf litter or among moss or sedges growing in shallow water (Campbell, 1983). At least four beetles of *Olophrum consimile* were recovered in this sample. Similarly, the rove beetle *Stenus* have many species that are semi-aquatic, often occurring abundantly in marshes, wet meadows, wet moss, and along the margins of ponds, lakes and streams. Another beetle that was abundant in 07-JB-63-M1 is the marsh beetle, *Cyphon* with approximately 10 individuals being isolated (Figure 13). Marsh beetles (*Cyphon*) are not confined to marsh environments and are found in damp sites on vegetation bordering all types of water bodies. The adults are terrestrial whereas the larvae are aquatic. The minute moss beetle (*Ochthebius* sp.) inhabits margins or shallow bottoms of damp sites.

Although the majority of fossil remains in 07-JB-63-M1 are aquatic or semi-aquatic, the presence of bark beetles (Scolytidae) fossil insects indicates the site is forested. Bark beetles are boreal forest insects that feed and reproduce in the cambium region of dying, injured, or fallen trees and shrubs. They are host specific feeding on select trees. The tentatively identified species of bark beetle *Polygraphus rufipennis?* is a generalist feeding on all conifers in its range (Bright, 1976) (Figure 14). Species of the bark beetle *Pityophthorus* are found in dead or dying twigs or small branches or boles of coniferous and deciduous trees and in the stems of woody shrubs and vines. (Bright, 1981) (Figure 15). Another bark beetle in this sample, *Phloeotribus?* could not be positively identified (missing the diagnostic declivity of the elytra). Of the one species of *Phloeotribus* found in the Yukon Territory today, *Phloeotribus piceae* feeds on all species of spruce (*Picea* spp.) (Bright,

1976). Other insects associated with forest include ants. Three different genera of ants were observed in this sample including *Myrmica*, *Formica* and the carpenter ant *Camponotus* (Figure 16).

An interesting find in this sample were coprolites of Lepidoptera larvae (Figure 17 & 18) and associated fossil larvae head capsules. Approximately 5 fossil frass/fecal material were isolated in 07-JB-63-M1. Their matrix consisting of small needle quadrate-shaped fragments of more than likely white spruce and deeply digested groundmass are very similar to larvae coprolites obtained from old growth stands of eastern hemlock in Nova Scotia (Ponomarenko and Telka, 2003). It appears that the white spruce forest in sample 07-JB-63-M1 had some insect infestation (Lepidoptera). Other fossil fecal remains in this sample include pellets of a small mammal (Figure 18). These pellets are not the usual type seen and a longitudinal cross section through the pellet reveals mostly plant material (vegetative). Other fossils in this sample include many pupae of flies, Diptera (Figure 19). In general, Diptera larvae consume decaying organic matter, or are predacious, and a large portion is parasitic on other insects and other organisms.

Summarizing the fossil data, plant macrofossil evidence suggests a forested environment dominated by white spruce (*Picea glauca*) but also contains birch (*Betula* spp.-medium shrub/small tree type and arboreal birch). Shrubs growing in the forest under story or in openings include berry (*Vaccinium* sp.). Insect fossil evidence supports the plant macrofossil data of a forested environment. Bark beetles (Scolytidae: *Polygraphus rufipennis?* *Pityophthorus* spp. *Phloeotribus?*) that live in boreal forest are well represented in this sample. Plant macrofossil evidence in this sample also suggests the presence of poorly drained site dominated by mostly silvery sedge (*Carex canescens*) and some water sedge (*Carex aquatilis* type). Mosses (Bryophytes) as well as emergent plants of marsh cinquefoil (*Potentilla palustris*) and wild calla (*Calla palustris*) are also growing on poorly drained soils. Noteworthy is the absence of submergent plants typical of pond environments including pondweeds (*Potamogeton* spp.), water lily (*Nymphaea*), white water buttercup (*Ranunculus aquatilis*) and water milfoil (*Myriophyllum*). Thus the absence of certain aquatic taxa and abundance of plants that live on poorly drained sites suggests a shallow aquatic environment.

Fossil insect and invertebrate evidence supports the plant macrofossil data of an aquatic environment. Fossil remains of bryozoans (*Plumatella* sp., *Cristatella mucedo*), and water fleas (*Simocephalus* sp.) are abundant in this sample including many aquatic arthropods of midge larva (Chironomidae), predaceous diving beetle (Dytiscidae, *Hydroporus* sp.), water scavenger beetle (Hydrophilidae including *Helophorus tuberculatus*), and oribatid mites (*Hydrozetes*). The aquatic environment is a shallow, calm, still water body containing plenty of microscopic organisms. Absent from the faunal fossil assemblage are riparian insects such as ground beetles (Carabidae, e.g. *Elaphrus*, *Nebria*, *Bembidion*) that can be found on the terrain that occurs along the banks of streams and rivers. Hygrophilous insects of mostly marsh beetles (*Cyphon* sp.) and rove beetles (*Olophrum consimile*, *Stenus* sp.) can be found on the vegetation among mosses and sedges that are growing in shallow water.

Thus the combined plant and insect fossil evidence portrays a shallow, poorly drained site typical of bogs. Unlike 'true' bogs in which *Sphagnum* is the dominant moss, other aquatic mosses including some *Sphagnum* form the surface carpet of mosses along with silvery sedges. Wild calla is growing in shallow water with emergent bog plants of marsh cinquefoil growing in the deeper reaches of the open shallow water. Tall shrubs of birches can be found growing around the perimeter of the bog giving way to a white spruce coniferous forest surrounding the bog site.

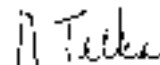
All fossils listed in this report are assignable to taxa/genera that are currently found in the White River area, Yukon Territory suggesting that climate, at the time of deposition was similar to today.

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References:

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March 11, 2008



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-11

Sample No.: 07-JB-63-M2
 Site No.: JB-63
 Lab No.: 11-37
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Jeff Bond
 Submitter: Jeff Bond & Brent Ward
 Material: top of peat layer, sampled next to discontinuous tephra
 Sample volume: ~250 mL (dry), wt. ~100 grams (dry)

PLANT MACROFOSSILS:

| | | |
|------------------------------|----|---|
| Fungal Remains: | | |
| fungal sclerotia | + | ~50* |
| Non Vascular Plants: | | |
| Bryophytes "mosses" | | |
| <i>Sphagnum</i> sp. | + | 'mat clumps', leaves |
| Vascular Plants: | | |
| Pinaceae "pine family" | | |
| <i>Picea</i> sp. | + | charred needle fragments: 5 (mm in size) |
| Other: | | |
| wood/root | ++ | 'blocky' 1 cm size fragments, some 'wavy' fragments |
| fungal hyphae | ++ | fragments |
| modern fibrous roots | + | thin, fine white root fragments |
| peat 'peds' | + | small fragments |

ANIMAL MACROFOSSILS:

ARTHROPODA
 INSECTA
 DIPTERA "flies" + fly pupa: 1

* discontinued enumeration in fine fraction due to abundance
 Key: +=taxon present, +++=taxon is abundant
 Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.
 Report based upon examination of organics greater than 425 microns (0.425 mm)
 If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

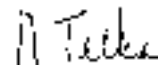
Comments:

Two bulk samples collected by Jeff Bond and Brent Ward from site JB-63, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample is from the top of the peat layer sampled next to the discontinuous tephra (**Figure 3**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 20, 40 and 60 mesh Tyler sieves (mesh openings 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

The most notable feature in this peat sample is abundance of wood fragments and absence or rarity of plant macrofossils and insect fossils. Macrofossils isolated in this sample include one fly (Diptera) pupa, some *Sphagnum* moss and fungal sclerotia. The coarse organic fraction mainly consists of 'blocky' wood fragments that are approximately 1 cm or smaller. Some of the fragments were 'wave-shaped' suggesting the wood may belong to a root (**Figure 20**). Modern white fibrous rootlets were apparent throughout the sample. Also abundant were fungi hyphae that are associated with the fungus *Cenococcum geophilum* (**Figure 21**). The fungus forms an ectomycorrhizal system around roots of trees creating a symbiotic relationship with the root and fungus. The hyphae and fungal sclerotia are not modern contaminants but more than likely are the same age as the root. Macrofossil evidence of trees in this sample is rare with only five mm-sized fragments of charred spruce (*Picea*) needle fragments being isolated. Thus the absence/rarity of trees growing at the site supports the observation that the wood may be a younger root. The wood fragments were originally isolated for AMS radiocarbon dating. Upon closer examination of the fragments, fine black 'fungal stringers' were noted on the surfaces as well as permeating through the wood tissues (**Figure 22**). This fungus is a modern contaminant introduced into the sample by penetrating modern fibrous rootlets. Collection of the sample under wet conditions and storage of the damp sample more than likely allowed for the fungi to grow. Based on the fact that the wood in this sample may be a root and with so much modern fungi contamination, this sample was not AMS radiocarbon dated.

Alice Telka



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March 11, 2008



Figure 1. Site JB-63, White R., Y.T. Photo of peat layer overlying forest bed. Trowel is beside potential ash. Sample 07-JB-63-M2 is from the top of the peat layer sampled next to the discontinuous tephra. Sample 07-JB-63-M1 is from the basal peat, forest bed. Photo courtesy of Jeff Bond.



Figure 2. Site JB-63, White R., Y.T. Photo of cleaned up peat showing ash, log at the base and overlying debris flow/colluvium deposit. Photo courtesy of Jeff Bond.



Figure 3. Site JB-63, White R., Y.T. Close up photo of volcanic ash in peat. Sample 07-JB-63-M2 was sampled next to the discontinuous tephra. Photo courtesy of Jeff Bond.



Figure 4. Site JB-63, White R., Y.T. Close up photo of forest bed where sample 07-JB-36-M1 was taken. Photo courtesy of Jeff Bond.



Figure 5. Left: White spruce (*Picea glauca*) macrofossil cone from 07-JB-063-M1. Right: *Picea glauca* seed and wing from cone.



Figure 6. White spruce (*Picea glauca*) macrofossil twig terminal with needles attached from 07-JB-063-M1. This twig has been submitted to Beta Analytic Inc. for AMS radiocarbon dating. Conifer remains of white spruce were abundant in this sample.

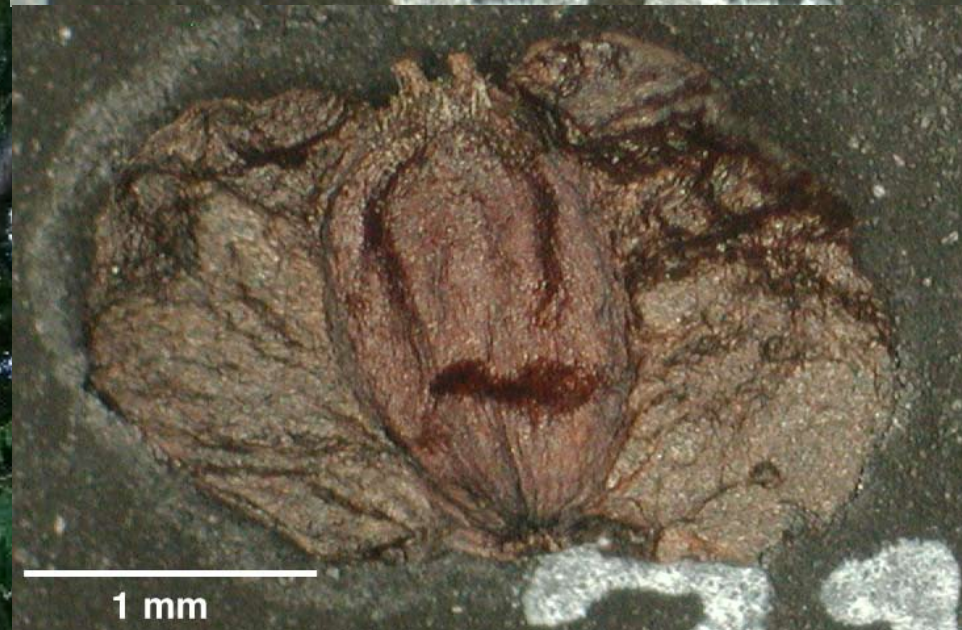


Figure 7. Left: Photo of white birch *Betula papyrifera*, a deciduous tree 5-20 m or more tall found in moist to mesic woodlands, forests, clearcuts, burns and open areas. Right top: macrofossil nutlet of *Betula* from 07-JB-063-M1. Right bottom: another macrofossil nutlet of *Betula* 07-JB-063-M1 that was common in sample 07-JB-063-M1. *Betula* nutlets were abundant in this sample with 74 nutlets recovered.



Figure 8. Left: Photo of water birch, *Betula occidentalis*, generally a tall shrub but may become a small tree up to 12 m high. It grows on moist soils along streams, forests and marshes. Right top: macrofossil *Betula* bract from 07-JB-063-M1. Right bottom: opposite view of birch bract.



Figure 9. Above: Photo of silvery/grey sedge, *Carex canescens* a perennial herb found in bogs, swamps, fens, wet meadows, and lakeshores. Left top: macrofossil achene and perigynium of *Carex canescens* from 07-JB-063-M1. Left bottom: macrofossil *Carex canescens* achene dissected from achene and perigynium shown above. This sedge was abundant in 07-JB-063-M1 (367 achenes with perigynia intact).

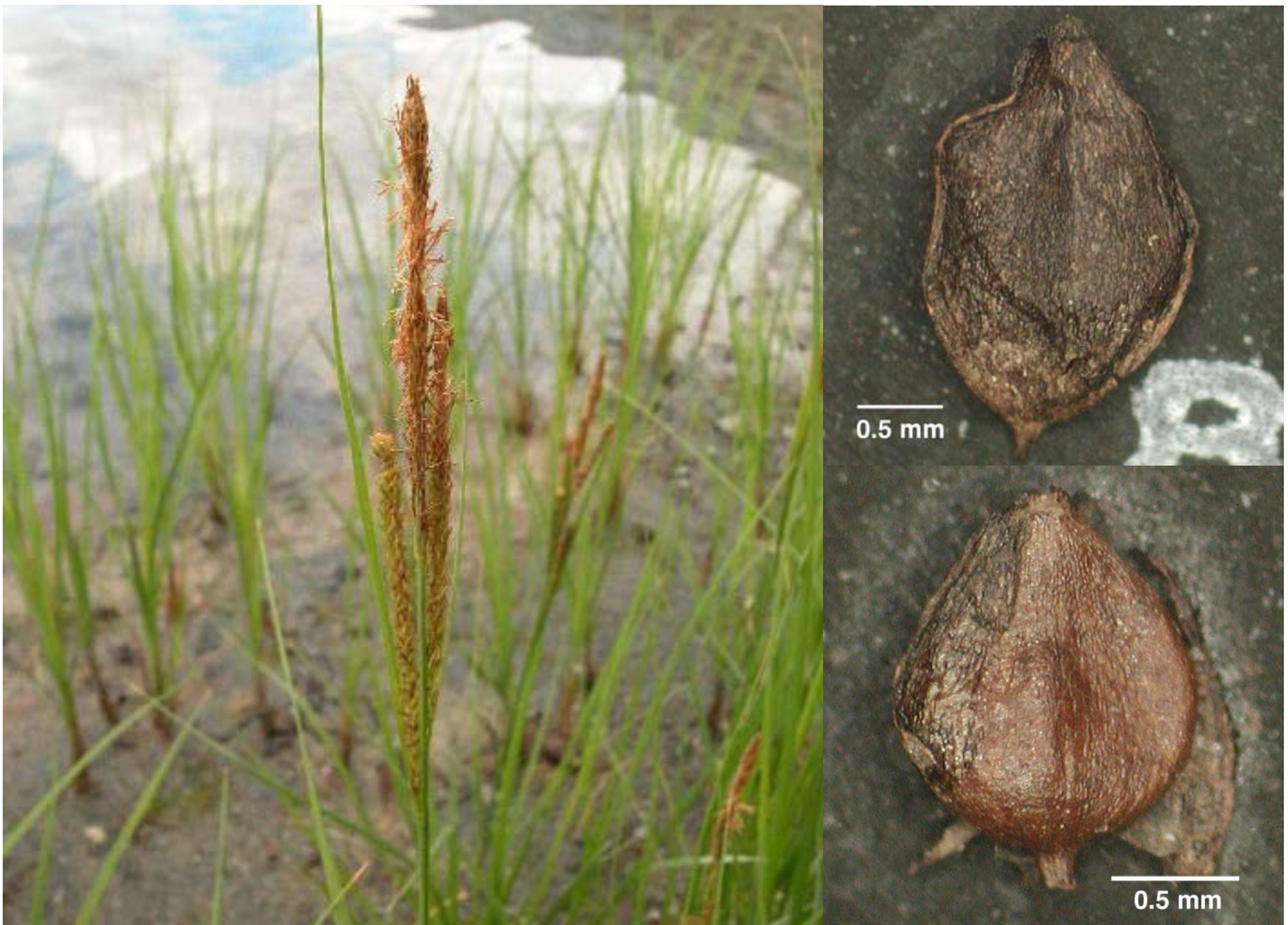


Figure 10. Left: Photo of water sedge, *Carex aquatilis* a common wetland plant of marshes, bogs, wet meadows, and shallow water along shores. Right top: macrofossil achene with perigynium of *Carex aquatilis* type from 07-JB-63-M1. This sedge was less common in this sample (~10) compared to *Carex canescens* (367). Right bottom: *Carex aquatilis* type achene dissected from perigynium.



Figure 11. Image of marsh cinquefoil, *Potentilla palustris*, an emergent bog plant found in marshes and bogs. Inset: macrofossil achene of *Potentilla palustris* from 07-JB-063-M1. Marsh cinquefoil was fairly abundant in this sample with eleven achenes recovered.



Figure 12. Photo of wild calla, *Calla palustris* a low glabrous herb found in wet boggy areas. Inset: macrofossil seed of *Calla palustris* from 07-JB-063-M1.



Figure 13. Photo of marsh beetle, *Cyphon*. Species of *Cyphon* are always found near water, generally occurring on vegetation in damp sites. Inset: fossil elytron of *Cyphon* sp. from 07-JB-63-063-M1. Marsh beetles were abundant in this sample with approximately 10 individuals (~20 elytra) recovered.



Figure 14. Left: photo of bark beetle *Polygraphus rufipennis*. Bark beetles (Scolytidae) feed and reproduce in the cambium layer of dying, injured or fallen trees, shrubs and vines. They are selective in their hosts with *Polygraphus rufipennis* feeding on all conifers in its range. Length of this beetle ranges between 2.1 mm to 3.1 mm. Right: fossil elytron of *Polygraphus rufipennis*? from 07-JB-063-M1.



Figure 15. Left: Characteristic star-shaped egg gallery of *Pityophthorus* from beneath the bark of a coniferous tree branch. *Pityophthorus* occur under the bark or in the pith of recently dead or dying small twigs, branches or boles of coniferous and deciduous trees and in the stems of wood shrubs and vines. This small beetle ranges in size from ~1.6 mm to 3.2 mm. Right: fossil elytron of bark beetle *Pityophthorus* from 07-JB-063-M1.

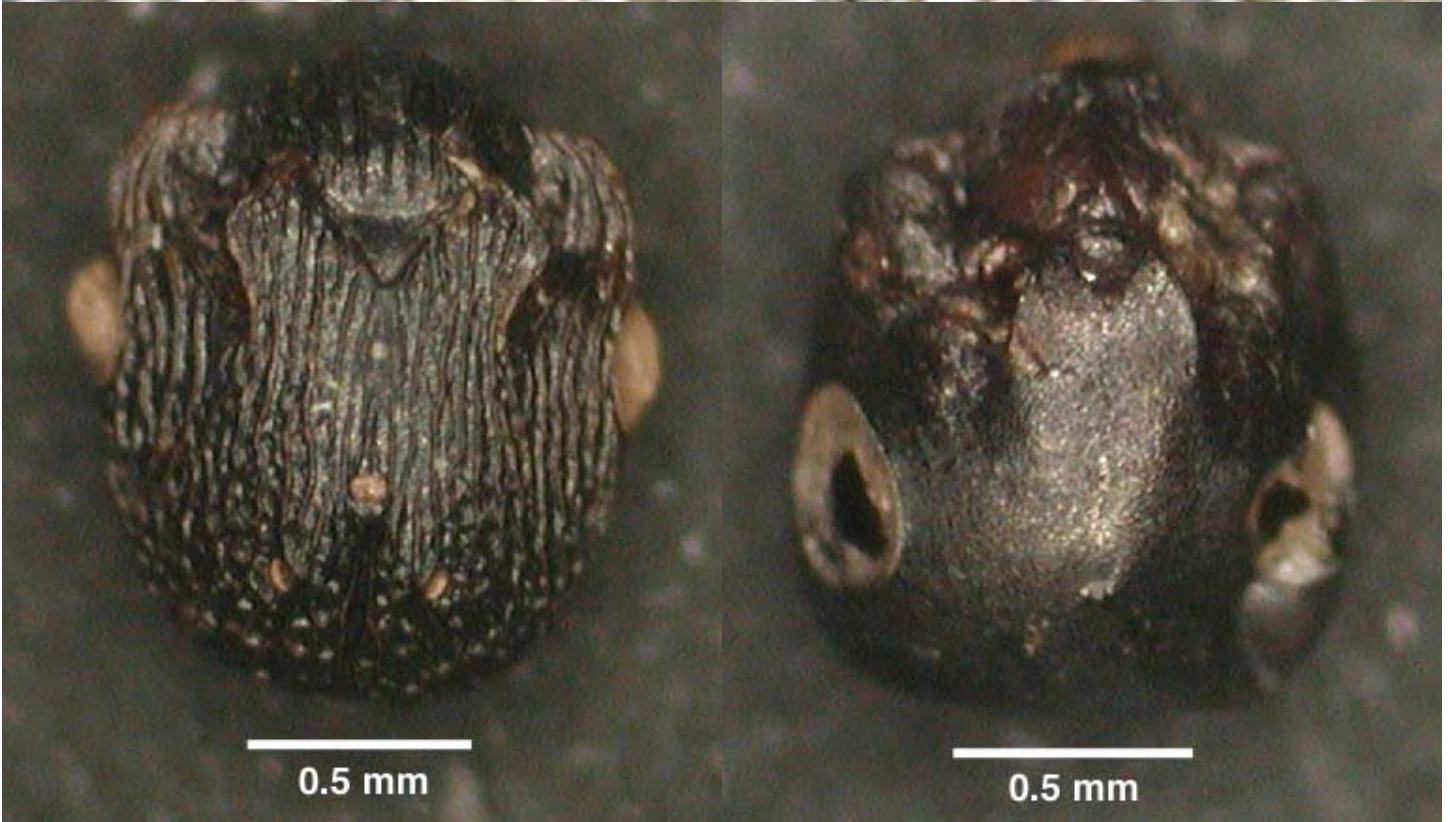


Figure 16. Top: Image of an ant, *Myrmica americana*. Bottom left: fossil head of *Myrmica* type from 07-JB-063-M1. Bottom right: fossil head of *Formica* type from 07-JB-063-M1. Seven ants were isolated in this sample including a carpenter ant, *Camponotus* type.



Figure 17. Left: Photo of spruce budworm, *Choristoneura fumiferana* feeding on fir. The main host(s) for this budworm include balsam fir, black spruce, eastern hemlock, jack pine, Norway spruce, red spruce, tamarack, and white spruce. Right: fossil coprolite of Lepidoptera larva. Approximately 5 fossil frass/fecal material were isolated in 07-JB-63-M1. Their matrix consists of small needle quadrate-shaped fragments of more than likely white spruce and deeply digested groundmass. Photo source (*Choristoneura fumiferana*): Thérèse Arcand, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre.

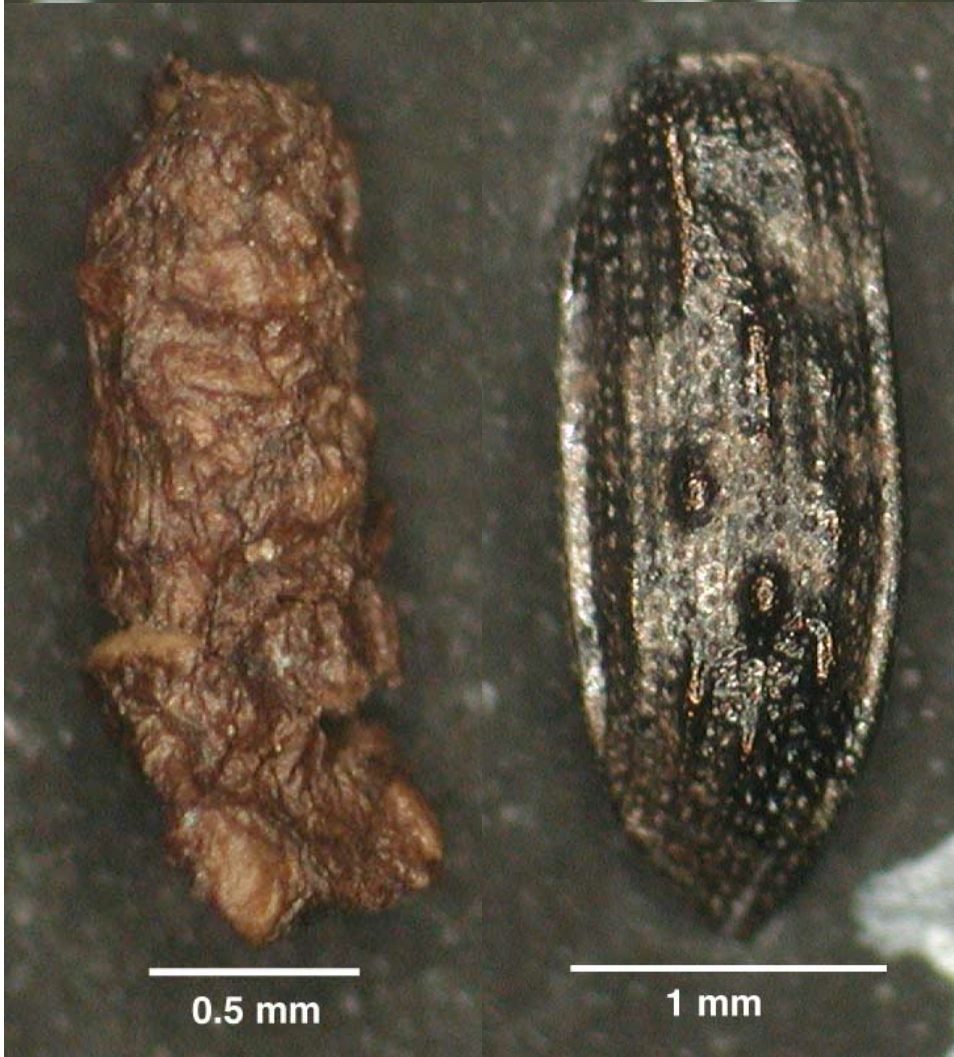
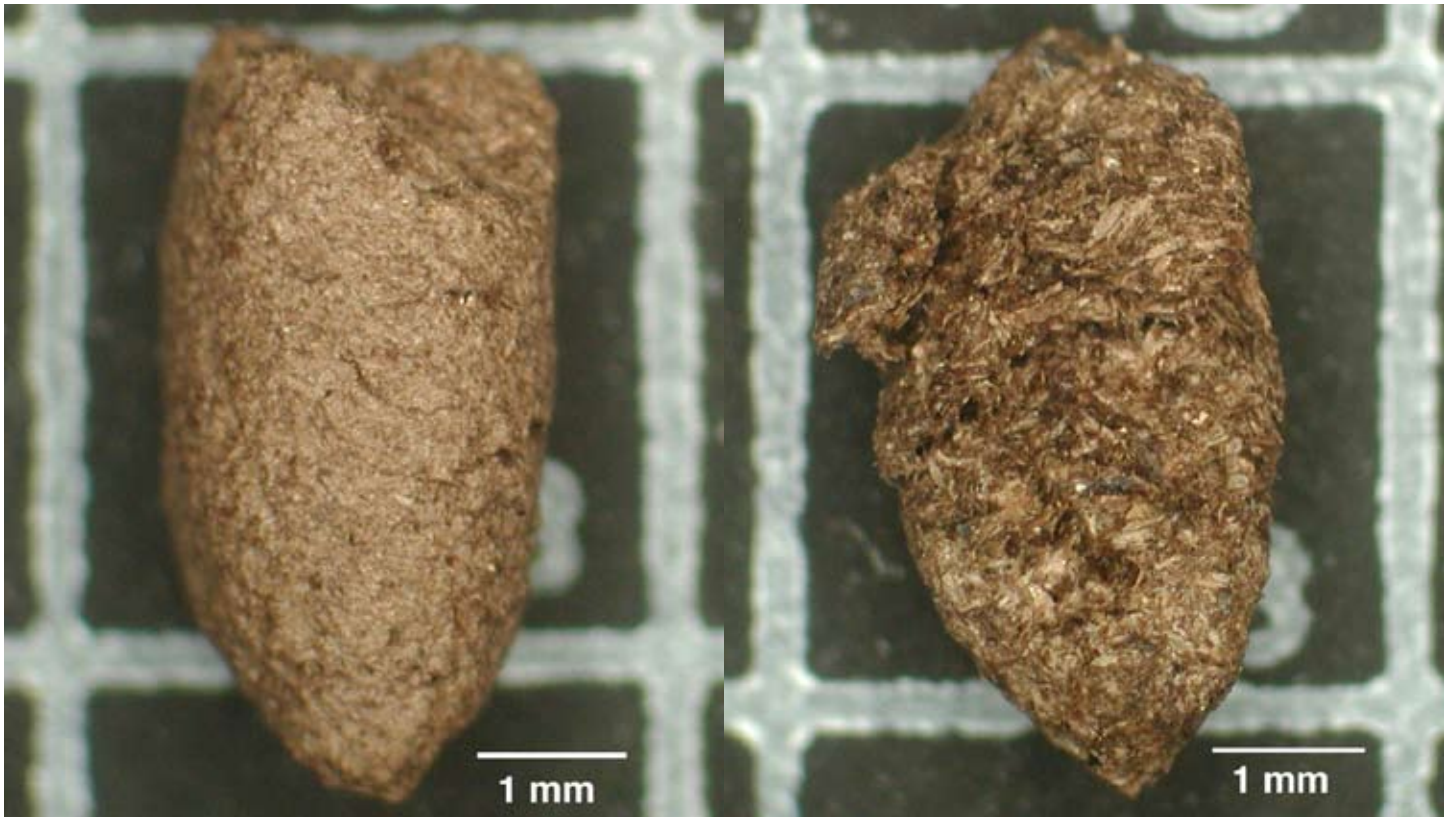


Figure 18. 07-JB-63-M1 macrofossils: Top left: small mammal fossil fecal pellet. Top right: longitudinal cross-section through fossil fecal pellet revealing vegetative mass. Bottom left: coprolites (fossil frass/ fecal material) of Lepidoptera larvae feeding on spruce. Bottom right: fossil elytron of water scavenger beetle *Helophorus tuberculatus*. Very little is known about the habitat requirements of this beetle however specimens collected from Dawson City, Y.T. were taken by sifting wet *Sphagnum* moss and debris along a muddy creek and at other sites among moss and litter bordering small water bodies.



Figure 19. Left: Photo of a tachinid fly (Diptera, *Archytas* sp.). A typical characteristic of this family is the fact that most of them are parasitoids (the larvae develop inside a living host, ultimately killing it), and a few are parasitic (do not kill the host). Larvae are endoparasites (internal parasites) of caterpillars of butterflies and moths, adult and larval beetles, sawfly larvae, various types of true bugs and grasshoppers. Adult flies feed on flowers and nectar from aphids and scales. Right: two fossil Diptera pupae from 07-JB-63-M1. Fly pupa of various types were abundant in this sample (~20).



Figure 20. Root that was AMS ^{14}C radiocarbon dated providing a young age of ~ 630 yrs. BP. Note the 'wavy' shape of the root.

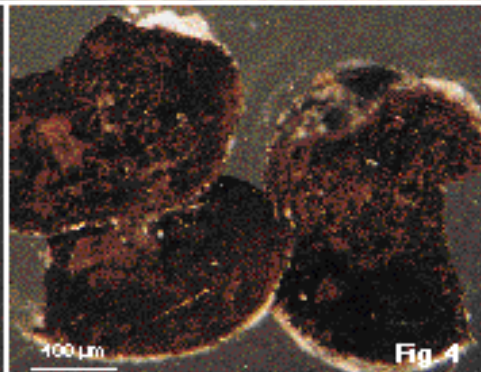
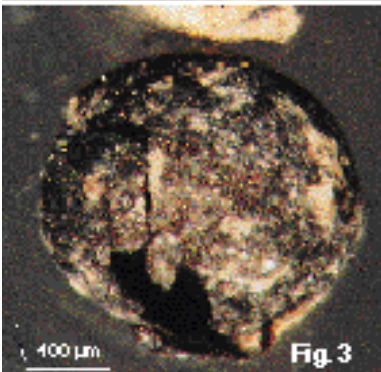
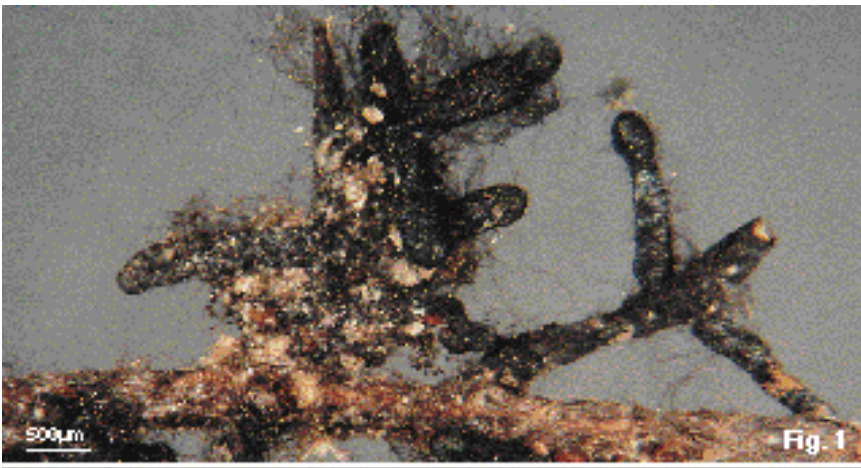


Figure 21. Photos of ectomycorrhizal system on a root caused by the fungus *Cenococcum geophilum*. Top left: Inset Fig. 1: ectomycorrhizal system with abundant emanating hyphae; Fig. 2: ectomycorrhizal root tip with shiny mantle; Fig. 3: fungal sclerotium; Fig. 4: inside of fungal sclerotia sclerotium. These ectomycorrhizal system and hyphae 'wrap' themselves around roots and have a symbiotic relationship with the growing root. Top right: fossil fungal sclerotium from 07-JB-063-M2. Both hyphae and sclerotia were abundant in this sample.

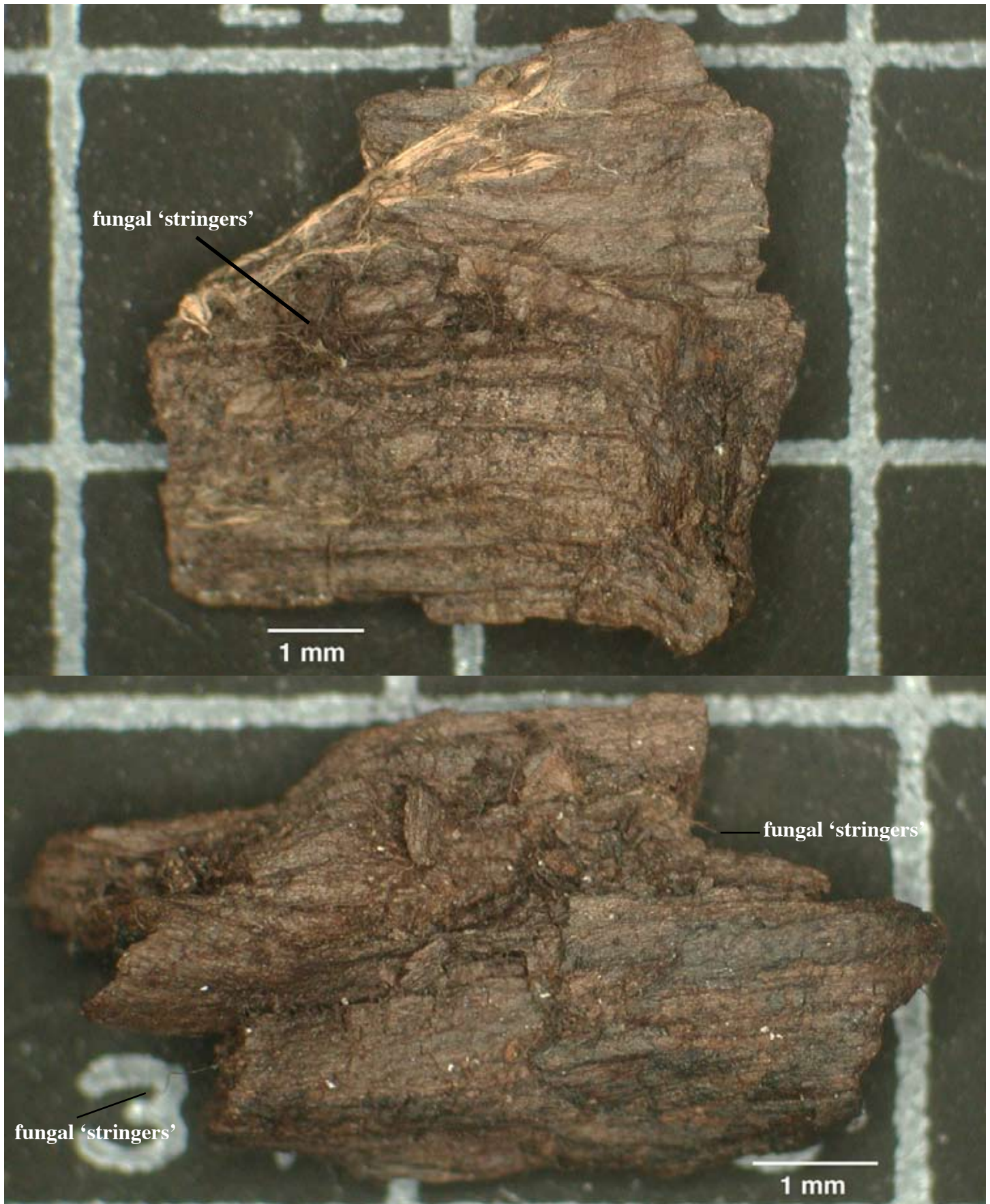


Figure 22. Two wood/root fragments from 07-JB-063-M2 showing modern fungus growth permeating through the wood tissue. Fragments of wood were abundant in this sample, the majority having 'fungal stringers' on the surfaces or within the tissues.



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-01

Sample No.: 10WR94-M1
 Site No.:
 Lab No.: 14-34
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Derek Turner
 Submitter: Derek Turner & Jeff Bond
 Material: ice wedge sediments
 Sample volume: ~985 mL (dry), wt. ~1867 grams (dry)

PLANT MACROFOSSILS:

| | | |
|-------------------------------|-----|---|
| Fungal remains: | | |
| fungal 'spheres' | +++ | soft, sphere-shaped |
| mycorrhizae | +++ | |
| Non Vascular Plants: | | |
| Bryophytes "mosses" | | |
| <i>Sphagnum</i> sp. | + | leaf: 1 |
| Vascular Plants: | | |
| Pinaceae "pine family" | | |
| <i>Picea</i> sp. | + | charred needle frgs. (mm-size): 5 |
| Juncaceae "rush family" | | |
| <i>Juncus/Luzula</i> type | + | seed capsule lobe: 1 |
| Other: | | |
| charcoal | ++ | many various sized fragments, some with adhering silt on surfaces |
| wood | + | mm-sized punky fragment: 1 |
| semi-coke | + | fragments: 2 |

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

| | | |
|---|---|---|
| COLEOPTERA "beetles" | | |
| Curculionidae "weevils" | | |
| <i>Lepidophorus lineaticollis</i> Kirby | + | heads: 3, pronota frgs.: 3, elytra frgs.: 3, sternite: 1 |
| MOLLUSCA | + | shell fragment: 1 |
| Other: | | |
| small mammal bone | + | small fragments: largest fragment is 5 mm long by 1.5 mm wide |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

One bulk sample collected by Derek Turner from White R., Y.T. was submitted for plant macrofossil and insect fossil analyses and isolation of suitable material for AMS radiocarbon dating. This sample represents sediments from an ice wedge.

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was swirl sieved concentrating the organic material on nested 20 and 40 mesh Tyler sieves (mesh openings 0.85 mm and 0.425 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Infinity digital camera mounted on a binocular microscope.

In preparation for AMS radiocarbon dating, suitable organic material from this sample was isolated, weighed and photographed. Prior submission to a dating facility, the isolated material deemed suitable for dating was inspected and in some cases cleaned using an ultra sonic bath. The dried material was packaged using freshly cut, small square pieces of aluminum tin foil, folded into small packets and placed in labeled sterilized covered 3.5 cm diameter petri dishes for shipment to Keck Carbon Cycle AMS Laboratory.

The coarse organic residue (>0.85 mm) after sieving the sample is composed of abundant aged mycorrhizae roots along with many fungal spheres. The fungal spheres are not the normal fungal sclerotia that are often observed with mycorrhizae roots but lighter coloured and 'spongy' in texture. In terms of organic content, this sample contains ~4% organic material with most of it being mainly charcoal pieces. Some of the charcoal has fine silt adhering to the surfaces. A suitable piece has been isolated for submission to Keck Carbon Cycle AMS Laboratory for AMS ¹⁴C dating. Re-burnt charcoal, or semi-coke (2 fragments) also occur in this sample suggesting multiple fires have occurred. The only identifiable charred organics in this sample are small (mm-size) fragments of spruce (*Picea* sp.). Wood or twig fragments are rare with only one small, very punky, easily disintegrative fragment being observed.

Plant macrofossils are rare in this sample with one moss leaf of sphagnum moss and a seed capsule lobe of rush, *Juncus/Luzula* type. Species of bog rush (*Juncus*) are grass-like herbs common in wet sands and sandy gravelly shorelines whereas members of wood rush, *Luzula* live in more dry areas on tundra and turfy places or open woods and herbmat slopes (Cody, 2000).

Fossil remains of animals were equally low in number and diversity in this sample. Preservation of the insect parts is poor and excluding the beetle heads, all were mm-size chitin fragments of pronota and elytra. Fossils of one beetle type, the weevil *Lepidophorus lineaticolis* are the only insects occurring in this sample. This weevil is common in Pleistocene sites in Alaska and the Yukon. Individuals of this phytophagous weevil occur at dry sites within forest and tundra regions including river shorelines. They are commonly collected in alder leaf litter and various other treeless habitats in Yukon Territory (Anderson, 1997).

Other animal remains include small bone fragments and nail/claw fragment of a small mammal more than likely belonging to a small rodent (e.g. vole, mole etc.). One small snail fragment and some smaller shell fragments were also recovered.

This sample yielded very few plant macrofossils and animal fossils with the majority being highly fragmented into small, mm-sized fragments. The mineral fraction (100 mL) is large compared to the amount of organic material recovered in this sample and the preservation of the fossils suggests deposition in a 'harsh' environment of moving water e.g. a stream or river. The abundance of charcoal indicates a fire(s) occurred in the area or region. Charcoal floats well in flowing waters so the fire(s) may have occurred some distance from the final deposition of the sediment at this site.

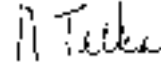
PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-01

References:

Anderson, R.S., 1997. Weevils (Coleoptera: Curculionoidea, excluding Scolytinae and Platypodinae) of the Yukon. In: Insects of the Yukon, eds. H.V. Danks and J.A. Downes, p. 523-556.

Cody, J.W., 2000. Flora of the Yukon Territory, Second edition. NRC Research Press, Ottawa, Ontario, Canada. 669 pp.

Alice Telka



PALEOTEC SERVICES

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March 27, 2012



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-21

Sample No.: 07-JB-53-M1
 Site No.: JB-53
 Lab No.: 11-51
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: organic silt 30 cm below tephra, Unit 3
 Sample volume: ~250 mL (dry), wt. ~425 grams (dry)

PLANT MACROFOSSILS:

| | | | |
|---|-----|--|---|
| Fungal remains: | | | |
| fungal sclerotia | +++ | | 469 |
| Vascular Plants: | | | |
| Pinaceae "pine family" | | | |
| <i>Picea</i> sp. | + | | needles: tips & bases-7, half needle-1, frgs.-3 |
| Poaceae (Gramineae) "grass family" | +++ | | florets (grain & seed coat): 238, caryopses (grains): 117, palea & rachilla (seed coat): 24 |
| Cyperaceae "sedge family" | + | | seed: 1 (poorly preserved) |
| <i>Carex</i> lenticular type | + | | seeds: 2 |
| Chenopodiaceae "goosefoot family" | + | | seeds: 6 |
| Caryophyllaceae ... "pink family" | | | |
| <i>Cerastium</i> sp. | + | | seeds: 8 |
| Ranunculaceae "crowfoot family" | | | |
| <i>Anemone narcissiflora</i> ? | + | | seed: 1 |
| <i>Ranunculus</i> sp.1 | + | | seeds: 3 |
| <i>Ranunculus</i> sp. 2 | + | | seeds: 4 |
| Papaveraceae "poppy family" | | | |
| <i>Papaver</i> sp. | + | | seed: 1 |
| Brassicaceae (Cruciferae)... "mustard family" | ++ | | seeds: 136 (few types) |
| Rosaceae "rose family" | | | |
| <i>Potentilla</i> smooth type | + | | seeds: 26 |
| Primulaceae "primrose family" | | | |
| <i>Androsace septentrionalis</i> type | + | | seed: 1 |
| Polemoniaceae "phlox family" | | | |
| <i>Phlox hoodii</i> ? Richards. | ++ | | capsule & seed: 2, capsule valves: 55, half valves: 37 |
| Boraginaceae "borag family" | | | |
| <i>Lappula</i> sp. | + | | seeds: 10 |
| Ericaceae "heath family" | | | |
| Genus1 | + | | leaves: half leaf-1, leaf tips-2 |
| Genus 2 | + | | leaves: 2 |
| Asteraceae (Compositae).. "composite family" | | | |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-21

| | | |
|--------------------------------|-----|--|
| <i>Artemisia</i> sp. 1 | +++ | florets: 223, leaves & leaf clusters: 100-200, seeds: 27 |
| <i>Artemisia</i> sp. 2 | + | seeds: 13 |
| <i>Taraxicum</i> sp. | + | seeds: 2, half seeds: 2 |
| Genus 1 | + | seeds: 33 |
| Genus 2 | + | seeds: 15 |
| Unknown plant macrofossil taxa | + | seeds: 4 (two types) |
| Other: wood/twigs | + | small mm-sized fragments |

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

HOMOPTERA

Cicadellidae "leafhoppers"

+ heads: 2

COLEOPTERA "beetles"

+ small head: 1, larva mandibles: 2

Carabidae "ground beetles"

+ mandibles: 3, elytra: 2, half elytron: 1, heads: 2, elytra fragment: 1

Bembidion sp.

+ half pronotum: 1 (poorly preserved)

Staphylinidae "rove beetles"

Stenus sp.

+ articulated sternites: 1

Ptiliidae "feather-winged beetles"

+ articulated elytra: 1, pronotum: 1

Scarabaeidae "scarab beetles"

Aphodius sp.

+ head: 1

Byrrhidae "pill beetles"

Morychus sp.

+ head: 1, elytron: 1

Curculionidae "weevils"

Connatichela artemisiae Anderson

+ heads: 3, prothoraces: 2, elytra: 5, half elytra: 3

Lepidophorus lineaticollis Kirby

++ heads: 15, prothoraces: 20, half prothoraces: 9, articulated head & prothorax: 3, articulated abdomen & elytra: 6, articulated elytra: 3, elytra: 22, half elytra: 27

Genus 1

+ articulated head & prothorax: 1, head: 1

Genus 2

+ prothorax: 1, elytron: 1

Genus 3

+ heads: 3, prothorax: 1

LEPIDOPTERA "butterflies/moths"

+ larvae mandibles: 6

DIPTERA "flies"

+ pupae: 2, half pupae: 4, pupa fragments: 3, adult head: 1

Tipulidae "crane flies"

Tipula sp.

+ larva head capsule: 1, half head capsule: 1

HYMENOPTERA "wasps and ants"

+ heads: 7

Ichneumonoidea "ichneumons and braconids"

Ichneumonidae

++ thoracic fragments: 20 (few types)

Braconidae

Cheloninae

+ abdomen: 1

CRUSTACEA

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-21

| | | | |
|----------------------------|-------------------|---|---|
| Cladocera | "water fleas" | | |
| <i>Daphnia</i> sp. | | + | ephippium: 1 |
| ARACHNIDA | | | |
| Oribatei | "oribatid mites" | | |
| Araneae | "spiders" | + | cephalothorax: 1 |
| Erigonidae | | | |
| <i>Erigone</i> sp. | | + | male cephalothorax: 1 |
| MOLLUSCA | | | |
| Gastropoda | "snails, limpets" | + | conical snail: 1 |
| Other: | | | |
| bone | | + | small fragments: 3 (mm-sized) |
| small mammal fecal pellets | | + | pellets: 4 (vegetative type), half pellets: 2 |
| unknown mandible | | + | 1 |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)


If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Two bulk samples collected by Brent Ward and Jeff Bond from site JB-53, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample from Unit 3 is an organic silt 30 cm below tephra (strat diagram **Figure 4**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka



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 March 21, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-22

Sample No.: 07-JB-53-M3

Site No.: JB-53

Lab No.: 11-53

Locality: White R., Y.T.

Latitude: Longitude:

Collector: Brent Ward

Submitter: Brent Ward & Jeff Bond

Material: Unit 3, organic silt 20 cm above tephra and 10 cm below contact with Unit 4

Sample volume: ~500 mL (dry), wt. ~700 grams (dry)

PLANT MACROFOSSILS:

Fungal remains:

 fungal sclerotia + 43

Vascular Plants:

 Poaceae (Gramineae) "grass family" +++ florets (grain & seed coat): 467, caryopses (grains): 282, palea & rachilla (seed coat): 127

Bromus/Elymus sp. + large rachilla: 1

 Cyperaceae "sedge family"

Carex lenticular type + seed: 1

 Chenopodiaceae "goosefoot family" + seed: 1

 Caryophyllaceae ... "pink family" + seeds: 2 (poorly preserved)

Cerastium sp. + seeds: 3

 Ranunculaceae "crowfoot family"

Anemone narcissiflora? + half seed: 1

 Papaveraceae "poppy family"

Papaver sp. + seeds: 5

 Brassicaceae (Cruciferae)... "mustard family" + seeds: 75 (few types)

 Rosaceae "rose family"

Potentilla smooth type + seeds: 25

Amelanchier sp. + seeds: 8, half seed: 1

 Polemoniaceae "phlox family"

Phlox hoodii? Richards. ++ capsule valves: 236

 Boraginaceae "borag family"

Lappula sp. + seeds: 13, half seed: 1

 Asteraceae (Compositae).. "composite family"

Achillea sp. + half seed: 1

Artemisia sp. (check *A. campestris*) +++ florets: 1094, leaf clusters: 173, seeds: 227

Taraxicum sp. + seeds: 7, half seeds: 22

 Genus 2 + seeds: 21

 Unknown plant macrofossil taxa + seeds: 7 (six types), embryos: 7 (few types), half capsules: 3

Other:

 wood/twigs + small mm-sized fragments

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-22

ANIMAL MACROFOSSILS:

ARTHROPODA

| | | |
|---|-----|--|
| INSECTA | + | articulated sternites and ovipositors: 3 |
| HEMIPTERA | | "bugs" |
| Cicadellidae | ++ | heads: 26 |
| Genus 1 | + | heads: 6, pronotum: 1 |
| Genus 2 | + | head: 1 |
| COLEOPTERA | + | "beetles" |
| Carabidae | + | larva head capsule: 1, half head capsules: 13 |
| | + | heads: 3 (poorly preserved), elytra fragments: 4, adult mandibles: 4 |
| <i>Bembidion</i> sp. | + | head: 1 |
| Staphylinidae | | "rove beetles" |
| <i>Stenus</i> sp. | | |
| Ptiliidae | | "feather-winged beetles" |
| Scarabaeidae | | "scarab beetles" |
| <i>Aphodius</i> sp. | + | elytra: 3 |
| Byrrhidae | + | "pill beetles" |
| <i>Morychus</i> sp. | + | small heads: 2, half pronotum: 1 (Check Cytillus) |
| Curimopsis sp. | + | head: 1, pronotum: 1, elytron: 1, half elytra: 12 |
| Cytillus alternatus (Say) | | |
| Elateridae | + | "click beetles" |
| Curculionidae | | "weevils" |
| <i>Connatichela artemisiae</i> Anderson | +++ | heads: @, prothoraces: 25, articulated head & prothorax: @, articulated abdomen & elytra: 6, articulated elytra: 16, elytra: 64, half elytra: 44 |
| <i>Lepidophorus lineaticollis</i> Kirby | +++ | heads: 23, prothoraces: 148, articulated head & prothorax: @, articulated abdomen & elytra: 1, articulated elytra: 41, elytra: 185, half elytra: 129 |
| LEPIDOPTERA | + | "butterflies/moths" |
| DIPTERA | ++ | "flies" |
| HYMENOPTERA | | "wasps and ants" |
| Ichneumonoidea | + | "ichneumons and braconids" |
| Ichneumonidae | +++ | heads: 48, thoracic fragments: 45 (few types) |
| Braconidae | | |
| Cheloninae | + | abdomens: 3 |
| CRUSTACEA | | |
| Cladocera | | "water fleas" |
| <i>Daphnia</i> sp. | + | ephippium: 1 |
| ARACHNIDA | | |
| Oribatei | | "oribatid mites" |
| Araneae | | "spiders" |
| Erigonidae | | |
| <i>Erigone</i> sp. | | |
| Other: | | |
| bone | + | small fragment: 1 |
| small mammal fecal pellets | + | pellets: 2 |
| larva head capsules | + | 10 (same type) |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-22

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Two bulk samples collected by Brent Ward and Jeff Bond from site JB-53, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample from Unit 3 is an organic silt 30 cm below tephra (strat diagram **Figure 4**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

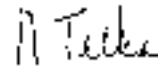
April 16/08:

Notes

-no spruce as seen in M1

-no mosses

Alice Telka



PALEOTEC SERVICES

atelka@sympatico.ca

March 31, 2008



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-13

Sample No.: 07-JB-52B-M1
 Site No.: JB-52B
 Lab No.: 11-9
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: reddish brown tan silt with gastropods, Bed 12 & 13
 Sample volume: ~500 mL (dry), wt. ~800 grams (dry)

PLANT MACROFOSSILS:

| | | |
|--|-----|---|
| Fungal remains: | | |
| fungal sclerotia | + | 2 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | ++ | oogonia: 103* (all with calcium coat) |
| Non Vascular Plants: | | |
| Bryophytes ....."mosses" | + | fragments (one type) |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> spp. | + | seeds: 97 (few with partial perigynium), half seeds: 2 |
| <i>Potamogeton pectinatus</i> L. | | |
| <i>Potamogeton vaginatus</i> Turcz. | | |
| Cyperaceae ....."sedge family" | | |
| <i>Carex</i> lenticular type | + | seeds: 4 |
| <i>Carex</i> trigonous type | + | seeds: 15 |
| <i>Scirpus validus</i> Vahl. | ++ | seeds: 130 (no bristles attached), half seeds: 5 |
| Betulaceae ....."birch family" | + | bracts: 2, nutlets: 8 (poorly preserved) |
| <i>Alnus crispa</i> Ait(Pursh.) | | |
| <i>Alnus incana</i> (L.)Moench. | | |
| <i>Betula nana/glandulosa</i> type | + | nutlets: 10 (poorly preserved) |
| Polygonaceae ....."buckwheat family" | | |
| <i>Polygonum</i> sp. | + | seeds: 2 |
| <i>Rumex maritimus</i> L. | + | calyx and seed: 10, seeds: 12, calyx frgs.: 2 |
| Chenopodiaceae ...."goosefoot family" | | |
| <i>Chenopodium</i> spp. | ++ | seeds: 120* |
| Ranunculaceae ...."crowfoot family" | | |
| <i>Ranunculus sceleratus</i> type | ++ | seeds: 142* |
| <i>Ranunculus</i> sp. | + | seeds: 5 |
| Rosaceae ....."rose family" | | |
| <i>Potentilla anserina</i> L. | +++ | seeds: 401, half seeds: 14 |
| <i>Potentilla</i> smooth type | + | seeds: 20 |
| Haloragaceae ....."water milfoil family" | | |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-13

| | | |
|---|---|---|
| <i>Myriophyllum sibiricum</i> Kom. | + | seeds: 3 |
| <i>Hippuris vulgaris</i> L. | + | seed: 10 |
| Ericaceae | | "heath family" |
| <i>Arctostaphylos uva-ursi</i> (L.) Spreng. | + | seeds: 9 (three seeds attached in a cluster), half seeds: 9 |
| Primulaceae | | "primrose family" |
| <i>Androsace septentrionalis</i> type | + | seeds: 3 |
| Unknown plant macrofossil taxa | + | seed: 1, seed embryo: 1 |
| Other: | | |
| wood/twig | + | small fragments: ~20 (most without bark, abrupt ends) |

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

HEMIPTERA

"bugs"

Corixidae

"water boatmen"

COLEOPTERA

"beetles"

Carabidae

"ground beetles"

Dyschiriodes sp.

Bembidion sp.

Dytiscidae

"predaceous diving beetles"

Hydroporus sp.

Rhantus sp.

Colymbetes sp.

Hydrophilidae

"water scavenger beetles"

Hydraenidae

"minute moss beetles"

Ochthebius sp.

Staphylinidae

"rove beetles"

Bledius sp.

Stenus sp.

Scarabaeidae

"scarab beetles"

Aphodius sp.

Curculionidae

"weevils"

Lepidophorus lineaticollis Kirby

TRICHOPTERA

"caddisflies"

DIPTERA

"flies"

Chironomidae

"midges"

HYMENOPTERA

"wasps and ants"

Ichneumonoidea

"ichneumons and braconids"

Ichneumonidae

Formicidae

"ants"

Formica type

CRUSTACEA

Cladocera

"water fleas"

Daphnia sp.

Ostracoda

"ostracodes"

ARACHNIDA

Oribatei

"oribatid mites"

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-13

| | | |
|-----------------------------|-----|-----------------------------|
| Hydrozetidae | | |
| <i>Hydrozetes</i> type | + | 6 mites |
| Gastropoda | | "snails, limpets" |
| horizontal type (discoidal) | +++ | small snails: 276 |
| vertical type (conical) | +++ | small snails: 352 |
| Unknown animal taxa | | |
| Other: | | |
| small mammal fecal pellets | + | pellets: 3, half pellets: 2 |
| bone fragments | + | small fragments: 2 |
| carbonate 'cylinders' | + | 2 (mm in size) |

**discontinued enumeration in fine fraction due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

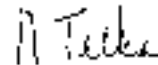
If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. ([Figure 1](#) and [Figure 2](#)) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample, a reddish brown tan silt unit with gastropods is from bed 12 and 13 (strat diagram [Figure 3](#)).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka



PALEOTEC SERVICES
atelka@sympatico.ca
March 11, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-14

Sample No.: 07-JB-52B-M2
 Site No.: JB-52B
 Lab No.: 11-40
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: organic rich paleosol, Bed 14
 Sample volume: ~200 mL (dry), wt. ~325 grams (dry)

PLANT MACROFOSSILS:

| | | |
|--|-----|--|
| Fungal remains: | | |
| fungal sclerotia | + | 15 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | + | oogonia: 43 (all with calcium coat) |
| Non Vascular Plants: | | |
| Bryophytes ....."mosses" | +++ | 'matted clumps', one type |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> sp. | + | seeds: 6 (same species) |
| <i>Ruppia spiralis</i> L. | + | seeds: 2 |
| Cyperaceae ....."sedge family" | + | stem and rhizome fragments: ~5 |
| <i>Carex</i> lenticular type | + | seeds: 29 |
| <i>Carex</i> trigonous type | + | seeds with perigynium: 5 |
| <i>Scirpus validus</i> Vahl. | ++ | seeds: 122 (well preserved, many with bristles attached) |
| Salicaceae ....."willow family" | | |
| <i>Salix</i> sp. | + | seed capsule half fragment: 2, twig with bark and persistent bud attached: 1 |
| Betulaceae ....."birch family" | | |
| <i>Betula nana/glandulosa</i> type | + | nutlets: 15 |
| Polygonaceae ....."buckwheat family" | | |
| <i>Rumex</i> sp. | | |
| Chenopodiaceae ...."goosefoot family" | | |
| <i>Chenopodium</i> sp. | ++ | seeds: 114 |
| Ranunculaceae ...."crowfoot family" | | |
| <i>Ranunculus sceleratus</i> type | + | seeds: 25 |
| Rosaceae ....."rose family" | | |
| <i>Potentilla anserina</i> L. | + | seeds: 45, half seeds: 22 |
| <i>Potentilla</i> smooth type | + | seeds: 11 |
| Haloragaceae ....."water milfoil family" | | |
| <i>Hippuris vulgaris</i> L. | + | seed: 1 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-14

| | | | |
|----------------------------------|-------------------|---|--|
| Primulaceae | "primrose family" | | |
| <i>Androsace septentrionalis</i> | type | + | seeds: 10 |
| Unknown plant macrofossil taxa | | | |
| Other: | | | |
| wood/twig | | + | small fragments: ~15 (most without bark, abrupt ends, herbaceous woody stem fragments) |

ANIMAL MACROFOSSILS:

| | | | |
|-----------------------------------|-------|-----|--|
| PORIFERA | | | |
| "sponges" | | | |
| HAPLOSCLERINA | | | |
| Spongillidae | | | |
| <i>Spongilla</i> | type | +++ | all single cell (~500) |
| BRYOZOA | | | |
| <i>Plumatella</i> | sp. | + | statoblasts: ~60 |
| <i>Fredericella</i> | type | + | statoblasts: ~50 |
| ARTHROPODA | | | |
| INSECTA | | | |
| HEMIPTERA | | | |
| "bugs" | | | |
| Corixidae | ..... | + | hemelytron fragment: 1 |
| | | + | hemelytron fragments: 2 |
| COLEOPTERA | | | |
| "beetles" | | | |
| Carabidae | ..... | + | half pronota: 2, misc. frgs.,: sternites, articulated legs, femurs, tibiae |
| | | + | head fragment: 1 |
| <i>Dyschiriodes</i> | sp. | + | elytra: 2 |
| <i>Bembidion</i> | sp. | + | half pronota: 2, elytra: 2 |
| Dytiscidae | ..... | + | apical elytron fragment: 1 |
| <i>Colymbetes</i> | sp. | + | head fragment: 1 |
| Hydrophilidae | ..... | + | head fragment: 1 |
| Hydraenidae | ..... | + | elytron: 1 |
| <i>Ochthebius</i> | sp. | + | prothorax: , sternites: |
| Staphylinidae | ..... | + | head: 1 |
| <i>Lathrobium</i> | type | + | head: 1, pronota: 3, articulated elytra: 1 |
| <i>Quedius</i> | sp. | + | elytra: 2 |
| <i>Tachyporus</i> | sp. | + | |
| Scarabaeidae | ..... | + | head: 1, elytra: 2, half elytron: 1 |
| <i>Aphodius</i> | sp. | + | |
| Helodidae | ..... | + | half elytra: 2 |
| <i>Cyphon</i> | sp. | + | |
| Byrrhidae | ..... | + | half elytra: 2, basal elytron fragment: 1 |
| <i>Morychus</i> | sp. | + | head fragment: 1, elytron: 1 |
| Chrysomelidae | ..... | + |  |
| Curculionidae | ..... | + | heads: 5, pronota: 4, articulated elytra: 1, basal elytra fragments: 2 |
| <i>Lepidophorus lineaticollis</i> | Kirby | + | |
| TRICHOPTERA | | | |
| "caddisflies" | | | |
| Genus? | | + | misc. sclerites: 2 |
| DIPTERA | | | |
| "flies" | | | |
| Tipulidae | ..... | + | fly pupae: 2, pupa fragments: 3 |
| <i>Tipula</i> | sp. | + | larvae half head capsules: 2 |
| Chironomidae | ..... | + | larvae head capsules: 78 |
| HYMENOPTERA | | | |
| "wasps and ants" | | | |
| Ichneumonoidea | ..... | + | thoracic fragments: 2 |
| Ichneumonidae | | + | |
| Formicidae | ..... | + | "ants" |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-14

| | | |
|--|-----|---|
| <i>Myrmica</i> type | + | heads: 3 |
| CRUSTACEA | | |
| Cladocera "water fleas" | | |
| <i>Daphnia</i> & <i>Simocephalus</i> sp. | ++ | ephippia: 170 |
| Ostracoda "ostracodes" | +++ | articulated valves: 384, valves: 18* (few types) |
| ARACHNIDA | | |
| Oribatei "oribatid mites" | | |
| Hydrozetidae | | |
| <i>Hydrozetes</i> type | + | ~17 mites |
| Araneae "spiders" | | |
| Gastropoda "snails, limpets" | | |
| horizontal type (discoidal) | + | small snails: 95 |
| vertical type (conical) | + | small snails: 33 (one larger snail 12 mm long by 5 mm wide) |
| Unknown animal taxa | + | immature mandibles: 2 (different types) |
| Other: | | |
| small mammal fecal pellets | + | half pellet: 1 |

**discontinued enumeration in fine fraction due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

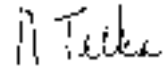
Comments:

Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. ([Figure 1](#) and [Figure 2](#)) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample, an organic rich paleosol is from bed 14 (strat diagram [Figure 4](#)).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Although this sample was relatively small, it contained a large volume of organic matter amounting to ~55% of the original volume examined. The coarse organic fraction in 07-JB-52B-M2 consists of mainly of abundant mosses of one type (~80% by volume), small fragments of wood/twigs including herbaceous woody stems, peat peds and some sedge (*Carex*) stem/rhizome fragments. Sphagnum (*Sphagnum*) moss was not observed in this sample.

Alice Telka

A handwritten signature in black ink, appearing to read "A. Telka".

PALEOTEC SERVICES
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March 15, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-15

Sample No.: 07-JB-52B-M3
 Site No.: JB-52B
 Lab No.: 11-43
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: diffuse organics, Bed 15
 Sample volume: ~250 mL (dry), wt. ~350 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---|----|---|
| Fungal remains: | | |
| fungal sclerotia | ++ | 183 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | + | oogonia: 112 (many with calcium coat) |
| Non Vascular Plants: | | |
| Bryophytes ....."mosses" | + | fragments (one type, ~25% by volume) |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> sp. | + | seeds: 35 |
| <i>Potamogeton vaginatus/pectinatus</i> | + | seeds: 2 |
| Poaceae (Gramineae) ....."grass family" | + | caryopses: 55 (some are Poa) |
| Cyperaceae ....."sedge family" | + | stem and rhizome fragments: ~5 |
| <i>Carex</i> lenticular type | + | seeds: 11 |
| <i>Carex</i> trigonous type | + | seeds: 3 |
| <i>Scirpus validus</i> Vahl. | ++ | seeds: 204 (59 are well preserved with bristles attached), half seeds: 15 |
| Juncaceae ....."rush family" | | |
| <i>Juncus</i> sp. | + | seeds: 29 |
| Betulaceae ....."birch family" | + | bract fragments: 2 |
| <i>Betula nana/glandulosa</i> type | + | nutlets: 10 |
| Chenopodiaceae ...."goosefoot family" | | |
| <i>Chenopodium</i> sp. | + | seeds: 4 |
| Ranunculaceae ....."crowfoot family" | | |
| <i>Ranunculus sceleratus</i> type | + | seeds: 2 |
| Rosaceae ....."rose family" | | |
| <i>Potentilla anserina</i> L. | + | seeds: 16, half seeds: 24 |
| <i>Potentilla</i> smooth type | + | seeds: 19 |
| Haloragaceae ....."water milfoil family" | | |
| <i>Myriophyllum sibiricum</i> Kom. | + | seed: 1 |
| <i>Hippuris vulgaris</i> L. | + | seeds: 2 |
| Ericaceae ....."heath family" | | |
| <i>Arctostaphylos uva-ursi</i> (L.) Spreng. | + | seed: 1 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-15

| | | |
|--|---|--|
| Primulaceae ....."primrose family" | | |
| <i>Androsace septentrionalis</i> type | + | seeds: 13 |
| Verbenaceae ....."vervain family" | | |
| <i>Verbena bracteata?</i> Lag. & Rodr. | + | half seed: 1 |
| Asteraceae (Compositae) .."composite family" | | |
| Genus? | + | seeds: 6 |
| Unknown plant macrofossil taxa | + | seeds?: 5 (all the same) |
| Other: | | |
| wood/twig | + | small fragments: ~15 (most without bark, abrupt ends, herbaceous woody stem fragments) |

ANIMAL MACROFOSSILS:

| | | |
|--|----|--|
| PORIFERA ....."sponges" | | |
| HAPLOSCLERINA | | |
| Spongillidae | | |
| <i>Spongilla</i> type | ++ | single cells: 375 |
| BRYOZOA | | |
| <i>Plumatella</i> sp. | + | statoblasts: 46 |
| <i>Fredericella</i> type | + | statoblast: 1 |
| ARTHROPODA | | |
| INSECTA | | |
| ORTHOPTERA...."cockroaches, grasshoppers etc." | | |
| Acrididae....."grasshoppers" | + | nymph case: 1 |
| HEMIPTERA ....."bugs" | + | head fragment: 1, pronotum fragments: 2 |
| HOMOPTERA | | |
| Cicadellidae ....."leafhoppers" | + | hemelytron fragment: 1 |
| COLEOPTERA ....."beetles" | + | misc. frgs.: sternites, articulated legs, femurs, tibiae |
| Carabidae ....."ground beetles" | + | half elytron: 1 (poorly preserved) |
| <i>Bembidion</i> sp. | + | head: 1, pronotum: 1, half elytron: 1 |
| Dytiscidae ....."predaceous diving beetles" | + | metacoxal plate: 1, half elytra: 2 |
| Hydrophilidae ....."water scavenger beetles" | | |
| <i>Cercyon</i> sp. | ++ | heads: 10, pronota: 2, elytra: 5 |
| Hydraenidae ....."minute moss beetles" | | |
| <i>Ochthebius</i> sp. | + | elytron: 1 |
| Staphylinidae ....."rove beetles" | | |
| <i>Bledius</i> sp. | + | pronota: 2, elytra: 5 |
| Byrrhidae ....."pill beetles" | | |
| <i>Simplocaria</i> sp. | + | half pronota: 2 |
| Elateridae ....."click beetles" | + | ¾ elytron: 1 |
| Curculionidae ....."weevils" | | |
| <i>Lepidophorus lineaticollis</i> Kirby | + | heads: 6, pronota: 9, elytra: 3, half elytra: 1, elytra fragments: 1 |
| <i>Hylobius</i> sp. | + | head: 1, half prothorax: 1 |
| TRICHOPTERA ....."caddisflies" | + | larvae half head capsules: 10, misc. fragments: 2 |
| DIPTERA ....."flies" | + | pupa fragments: 5 |
| Tipulidae ....."crane flies" | | |
| <i>Tipula</i> sp. | + | larvae head capsule: 1, half head capsule: 1 |
| Chironomidae ....."midges" | + | larvae head capsules: 34 |
| HYMENOPTERA ....."wasps and ants" | | |
| Ichneumonoidea ...."ichneumons and braconids" | + | heads: 2 |
| Ichneumonidae | + | thoracic fragment: 1 |
| Formicidae ....."ants" | | |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-15

| | | |
|--|---|-------------------------------------|
| <i>Myrmica</i> type | + | head: 1 |
| <i>Formica</i> type | + | heads: 2, mandibles: 2 |
| CRUSTACEA | | |
| Cladocera "water fleas" | | |
| <i>Daphnia</i> & <i>Simocephalus</i> sp. | + | ephippia: 59 |
| Ostracoda "ostracodes" | + | articulated valves and valves: ~100 |
| ARACHNIDA | | |
| Oribatei "oribatid mites" | | |
| Hydrozetidae | | |
| <i>Hydrozetes</i> type | + | mites: 25 |
| Unknown animal taxa | + | immature mandibles: 6 (two types) |
| Other: | | |
| small mammal fecal pellets | + | pellet: 1, half pellet: 1 |
| carbonate precipitate | + | fragments: 8 |

**discontinued enumeration in fine fraction due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

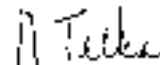
If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. ([Figure 1](#) and [Figure 2](#)) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample, a diffuse organic unit is from bed 15 (strat diagram [Figure 4](#)).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka



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March 11, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-16

Sample No.: 07-JB-52B-M5
 Site No.: JB-52B
 Lab No.: 11-45
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: peat with gastropods, Bed 19
 Sample volume: ~500 mL (dry), wt. ~350 grams (dry)

PLANT MACROFOSSILS:

Algal remains:

| | | |
|---------------------------|-------|---|
| Characeae | | |
| <i>Chara/Nitella</i> type | +++++ | oogonia: 3059* (many with calcium coat); ~10,000 |

Non Vascular Plants:

| | | |
|--------------------------|---|--------------------------|
| Bryophytes ....."mosses" | + | fragments: 15 (one type) |
|--------------------------|---|--------------------------|

Vascular Plants:

| | | |
|--|---|---|
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> sp. | + | seeds: 4 |
| <i>Potamogeton vaginatus/pectinatus</i> | + | seeds: 5 |
| Poaceae (Gramineae) ....."grass family" | + | caryopses: 6 |
| Cyperaceae ....."sedge family" | | |
| <i>Carex lenticularis</i> type | + | seed: 1, half seed: 1 |
| <i>Scirpus validus</i> Vahl. | + | seeds: 42 (16 are well preserved with bristles attached), seed fragments: ~10 |
| Salicaceae ....."willow family" | | |
| <i>Salix</i> sp. | + | seed capsules: 3, half seed capsule: 1 |
| Betulaceae ....."birch family" | | |
| <i>Betula nana/glandulosa</i> type | + | nutlet: 1 |
| Polygonaceae ....."buckwheat family" | | |
| <i>Polygonum amphibium</i> L. | + | half seeds: 2 |
| Chenopodiaceae ...."goosefoot family" | | |
| <i>Chenopodium</i> sp. | + | seeds: 4 |
| Ranunculaceae ...."crowfoot family" | | |
| <i>Ranunculus cymbalaria</i> Pursh. | + | seeds: 2 |
| <i>Ranunculus sceleratus</i> type | + | seeds: 3 |
| Rosaceae ....."rose family" | | |
| <i>Potentilla anserina</i> L. | + | seed: 1, half seed: 1 |
| <i>Potentilla</i> smooth type | + | seed: 1 |
| Haloragaceae ....."water milfoil family" | | |
| <i>Myriophyllum sibiricum</i> Kom. | + | seeds: 2 |
| <i>Hippuris vulgaris</i> L. | + | seeds: 4 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-16

| | | |
|--|-------|---|
| Primulaceae ....."primrose family" | | |
| <i>Androsace septentrionalis</i> type | + | seeds: 8 |
| Asteraceae (Compositae) .."composite family" | | |
| Genus? | + | seeds: 2 |
| Unknown plant macrofossil taxa | | |
| Other: | | |
| calcite structures | +++++ | fragments: mostly tubular rods, 'rosettes' (associated with <i>Chara/Nitella</i>) |
| wood/twig | + | fragments: 4 (mm in size) |
| *discontinued enumeration due to abundance | | |

ANIMAL MACROFOSSILS:

| | | |
|--|---|---|
| PORIFERA ....."sponges" | | |
| HAPLOSCLERINA | | |
| Spongillidae | | |
| <i>Spongilla</i> type | + | single cells: 26 |
| PLATYHELMINTHES | | |
| TUBELLARIA ....."flatworms" | + | cocoon: 1 |
| BRYOZOA | | |
| <i>Plumatella</i> sp. | + | statoblasts: 7 |
| <i>Fredericella</i> type | + | statoblasts: 2 |
| ARTHROPODA | | |
| INSECTA | | |
| ORTHOPTERA...."cockroaches, grasshoppers etc." | | |
| Acrididae....."grasshoppers" | + | nymph case: 1 |
| HEMIPTERA ....."bugs" | | |
| Corixidae ....."water boatmen" | + | pronotum: 1 |
| HOMOPTERA | | |
| Cicadellidae ....."leafhoppers" | + | head fragment: 1 |
| COLEOPTERA ....."beetles" | + | misc. frgs.: sternites, trochanter, prosternum, |
| Haliplidae ....."crawling water-beetles" | | |
| <i>Haliphus</i> sp. | + | elytra fragments: 9 |
| Dytiscidae ....."predaceous diving beetles" | | |
| <i>Graphoderus</i> sp. | + | elytron fragment: 1 |
| Hydrophilidae ....."water scavenger beetles" | | |
| <i>Cercyon</i> sp. | + | head: 1 |
| Staphylinidae ....."rove beetles" | | |
| <i>Bledius</i> sp. | + | pronotum: 1, elytron: 1 |
| Omaliinae | + | elytron: 1 |
| Chrysomelidae ....."leaf beetles" | | |
| <i>Plateumaris/ Donacia</i> sp. | + | apical tip of elytron: 1 |
| Curculionidae ....."weevils" | | |
| <i>Lepidophorus lineaticollis</i> Kirby | + | elytron fragment: 1 |
| TRICHOPTERA ....."caddisflies" | + | larvae half head capsules: 4, head frontoclypeal apotome: 1, misc. fragments: 5; case: 1 (plant material & <i>Chara/Nitella</i> oogonia); pupae abdominal hooks: 9 |
| DIPTERA ....."flies" | + | pupa: 1, pupa fragments: 2 |
| Tipulidae ....."crane flies" | | |
| <i>Tipula</i> sp. | + | half head capsule: 1 |
| Chironomidae ....."midges" | + | larvae head capsules: 133 |
| HYMENOPTERA ....."wasps and ants" | + | head: 1 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-16

| | | | |
|--|-------------------|-----|--|
| Formicidae | "ants" | | |
| <i>Formica</i> type | | + | head: 1 |
| CRUSTACEA | | | |
| Cladocera | "water fleas" | | |
| <i>Daphnia</i> & <i>Simocephalus</i> sp. | | ++ | ephippia: 275* |
| Ostracoda | "ostracodes" | +++ | articulated valves and valves: 857* |
| ARACHNIDA | | | |
| Oribatei | "oribatid mites" | | |
| Hydrozetidae | | | |
| <i>Hydrozetes</i> type | | + | mites: 2 |
| MOLLUSCA | | | |
| Gastropoda | "snails, limpets" | | |
| horizontal type (discoidal) | | +++ | small snails: 357 |
| vertical type (conical) | | +++ | small snails: 677 (few larger ones ~1.5 cm long) |
| Unknown animal taxa | | + | immature mandible: 1 |

*discontinued enumeration in fine fraction due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

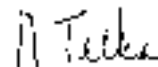
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Comments:

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Alice Telka



PALEOTEC SERVICES

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March 11, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-17

Sample No.: 07-JB-52B-M7
 Site No.: JB-52B
 Lab No.: 11-46
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: light brown organic blebs in reduced gleyed silt, Bed 21
 Sample volume: ~1000 mL (dry), wt. ~1250 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---|---|---|
| Fungal remains: | | |
| fungal sclerotia | + | 3 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | + | oogonium: 1 (with calcium coat) |
| Non Vascular Plants: | | |
| Bryophytes ....."mosses" | + | fragments: 3 |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> sp. | + | seed: 1 |
| <i>Ruppia spiralis</i> L. | + | seed: 1 |
| Poaceae (Gramineae) ....."grass family" | + | caryopsis: 1 |
| Cyperaceae ....."sedge family" | + | stem and rhizome fragments: ~5 |
| <i>Scirpus validus</i> Vahl. | + | seeds: 3 (one with partial bristles) |
| Betulaceae ....."birch family" | + | bract fragments: 3 (poorly preserved) |
| <i>Betula</i> sp. | + | nutlets: 7 |
| Ericaceae ....."heath family" | | |
| <i>Andromeda polifolia</i> L. | + | seeds: 6, leaf fragments (tips): 7 |
| Unknown plant macrofossil taxa | + | seed?: 1 |
| Other: | | |
| wood | + | small fragments: ~7 (one larger fragment 2.5 cm long 1.5 cm wide) (most are worn) |
| twigs | + | few fragments (no bark, abrupt ends) |
| bark | + | few fragments |
| peds | + | cemented mineral grains (Fe stained) |

ANIMAL MACROFOSSILS:

| | | |
|-------------------------|---|-----------------|
| PORIFERA ....."sponges" | | |
| HAPLOSCLERINA | | |
| Spongillidae | | |
| <i>Spongilla</i> type | + | single cells: 7 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-17

PLATYHELMINTHES

| | | | |
|---|---------------------------|---|---|
| TUBELLARIA | "flatworms" | + | cocoon: 1 |
| ARTHROPODA | | | |
| INSECTA | | | |
| COLEOPTERA | "beetles" | + | head fragment: 1 |
| Carabidae | "ground beetles" | | |
| <i>Bembidion</i> sp. | | + | articulated prothorax: 1 |
| Hydrophilidae | "water scavenger beetles" | + | elytra fragments: 2 |
| Staphylinidae | "rove beetles" | + | elytron: 1 |
| <i>Quedius</i> sp. | | + | pronotum: 1 |
| Curculionidae | "weevils" | | |
| <i>Lepidophorus lineaticollis</i> Kirby | | + | heads: 2, pronotum fragment: 1, articulated elytra: 1 (poorly preserved), half elytron: 1, elytra fragments: 2, sternite: 1 |
| TRICHOPTERA | "caddisflies" | + | pupa abdominal hook: 1 |
| DIPTERA | "flies" | | |
| Chironomidae | "midges" | + | adult thoracic fragment: 1 |
| HYMENOPTERA | | | |
| "wasps and ants" | | | |
| Formicidae | "ants" | | |
| <i>Formica</i> type | | + | half head: 1, mandible: 1, propodeum: 1 |
| CRUSTACEA | | | |
| Cladocera | "water fleas" | | |
| <i>Daphnia</i> sp. | | + | ephippium: 1 |
| Ostracoda | "ostracodes" | + | articulated valve: 1 |
| ARACHNIDA | | | |
| Oribatei | "oribatid mites" | + | 1 |
| MOLLUSCA | | | |
| Gastropoda | "snails, limpets" | | |
| horizontal type (discoidal) | | + | small snail: 1 |
| Other: | | | |
| small mammal fecal pellets | | + | type 1 (larger): pellets: 8; type 2 (smaller): 5 |
| bone | | + | small mm-sized fragment: 1 |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

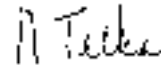
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PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-17

binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka

A handwritten signature in black ink that reads "A. Telka". The signature is written in a cursive style with a large initial "A".

PALEOTEC SERVICES
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March 21, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-18

Sample No.: 07-JB-52B-M8
 Site No.: JB-52B
 Lab No.: 11-47
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: organic blebs in fairly uniform grey silt, Bed 22
 Sample volume: ~1000 mL (dry), wt. ~1600 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---|----|--|
| Fungal remains: | | |
| fungal sclerotia | ++ | 244 |
| Non Vascular Plants: | | |
| Bryophytes "mosses" | + | fragments: 3 |
| Vascular Plants: | | |
| Poaceae (Gramineae) "grass family" | + | caryopses: 15 |
| Betulaceae "birch family" | ++ | nutlets: 58 |
| <i>Betula</i> sp. | + | bract fragments: 16 |
| Brassicaceae (Cruciferae) "mustard family" | + | seeds: 135 |
| Rosaceae "rose family" | | |
| <i>Potentilla anserina</i> L. | + | seeds: 27, half seeds: 22 |
| <i>Potentilla</i> smooth type | + | seeds: 33 |
| Primulaceae "primrose family" | | |
| <i>Androsace septentrionalis</i> type | + | seed: 1 |
| Asteraceae (Compositae) .. "composite family" | + | seed: 1 |
| Unknown plant macrofossil taxa | | |
| Other: | | |
| wood | + | fragments (varied preservation, some worn) |
| twigs | + | few fragments (with bark) |

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

| | | |
|--|---|---|
| ORTHOPTERA... "cockroaches, grasshoppers etc." | | |
| Acrididae..... "grasshoppers" | + | nymph cases: 4, half cases: 5, fragments: 7 |
| HEMIPTERA "bugs" | | |
| Family? | + | pronotum: 1, hemelytron fragments: 3 |
| HOMOPTERA | | |
| Cicadellidae "leafhoppers" | + | heads: 4 |
| COLEOPTERA "beetles" | + | larvae head capsules: 10, many misc. legs, sternites etc., abdomen: 1 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-18

| | | | |
|---|----------------------------|---|--|
| Carabidae | "ground beetles" | + | half elytron: 1 |
| <i>Bembidion</i> sp. | | + | heads: 2, pronotum: 1, elytra: 2 |
| <i>Pterostichus</i> sp. | | + | pronotum: 1 |
| <i>Amara</i> sp. | | + | pronotum: 1, half pronotum: 1 |
| Hydrophilidae | "water scavenger beetles" | | |
| Hydraenidae | "minute moss beetles" | | |
| <i>Ochthebius</i> sp. | | + | elytra: 2 |
| Staphylinidae | "rove beetles" | + | elytron: 1 |
| <i>Bledius</i> sp. | | + | pronota: 4, elytra: 5 |
| <i>Quedius</i> sp. | | + | pronotum: 1 |
| <i>Lathrobium</i> sp. | | + | elytron: 1 |
| <i>Tachyporus</i> sp. | | + | pronotum: 1, elytron: 1 |
| Leiodidae | "round fungus beetles" | | |
| Genus? | | + | articulated prothorax & elytron: 1; articulated pro & mesosternum and elytron: 1; elytra: 3, head: 1 |
| <i>Catops/Colon</i> sp. | | + | elytra: 2 |
| Ptiliidae | "feather-winged beetles" | + | articulated head & pronotum: 1, elytron: 1 |
| Scarabaeidae | "scarab beetles" | | |
| <i>Aphodius</i> sp. | | + | head: 1, half heads: 2, elytron fragment: 1 |
| Byrrhidae | "pill beetles" | | |
| <i>Simplocaria</i> sp. | | + | elytron: 1 |
| Elateridae | "click beetles" | + | larvae caudal plates: 2 |
| <i>Denticollis?</i> sp. | | + | adult prothorax: 1, |
| Anthicidae | "ant-like flower beetles" | + | pronota: 2 |
| Chrysomelidae | "leaf beetles" | + | elytron: 1 |
| <i>Chrysolina?</i> sp. | | + | elytron: 1 |
| <i>Hydrothassa?</i> sp. | | + | elytron: 1 |
| <i>Altica</i> sp. | | + | articulated head and prothorax: 1 |
| Curculionidae | "weevils" | | |
| <i>Lepidophorus lineaticollis</i> Kirby | | + | heads: 9, articulated head & prothorax: 3, pronota: 6, pronotum frgs.: 1, articulated elytra: 4, elytra: 5, half elytra: 5 |
| TRICHOPTERA | "caddisflies" | + | half head capsules: 2, misc. frg.: 1 |
| DIPTERA | "flies" | + | pupae: 22, half pupae: 5, fragments: 15 |
| Chironomidae | "midges" | + | adult thoracic fragment: 1 |
| HYMENOPTERA | "wasps and ants" | + | ovipositor: 1 |
| Ichneumonoidea | "ichneumons and braconids" | | |
| Ichneumonidae | | + | thoracic fragments: 2 |
| Formicidae | "ants" | | |
| <i>Formica</i> type | | + | head: 1, half heads: 2, mandible: 1, misc. frgs. |
| ARACHNIDA | | | |
| Oribatei | "oribatid mites" | + | 16 |
| Araneae | "spiders" | + | cephalothorax fragment: 1, chelicers: 2 |
| MOLLUSCA | | | |
| Gastropoda | "snails, limpets" | | |
| vertical type (conical) | | + | small snails: 5, fragments: 2 |
| Other: | | | |
| small mammal fecal pellets | | + | pellets: 16, half pellets: 6 |
| bone | | + | fragments: 2 |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

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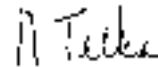
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Comments:

Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample, organic blebs in fairly uniform grey silt unit is from bed 22 at the base of the sequence above the tephra layer (strat diagram **Figure 4**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka



PALEOTEC SERVICES

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March 25, 2008



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-19

Sample No.: 07-JB-52B-M10
 Site No.: JB-52B
 Lab No.: 11-48
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: massive silt, Bed 7
 Sample volume: ~250 mL (dry), wt. ~425 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---|----|-------------------------------------|
| Fungal remains: | | |
| fungal sclerotia | + | 2 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | ++ | oogonia: 345 |
| Non Vascular Plants: | | |
| Bryophytes ....."mosses" | + | fragment: 1 |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton</i> sp. | + | seeds: 17 |
| <i>Ruppia spiralis</i> L. | + | seeds: 17 |
| Poaceae (Gramineae) ....."grass family" | + | caryopses: 9 |
| Cyperaceae ....."sedge family" | | |
| <i>Carex</i> lenticular type | + | seeds: 2 |
| Betulaceae ....."birch family" | | bract fragments: (poorly preserved) |
| <i>Betula</i> sp. | | nutlets: |
| Polygonaceae ....."buckwheat family" | | |
| <i>Rumex maritimus?</i> L. | + | seeds: 3 |
| Chenopodiaceae ...."goosefoot family" | | |
| <i>Chenopodium</i> sp. | + | seeds: 7 |
| Ranunculaceae ....."crowfoot family" | | |
| <i>Ranunculus sceleratus</i> type | + | seeds: 16, half seeds: 4 |
| Rosaceae ....."rose family" | | |
| <i>Potentilla</i> smooth type | + | seeds: 4 |
| Primulaceae ....."primrose family" | | |
| <i>Androsace septentrionalis</i> type | + | seed: 1 |
| Unknown plant macrofossil taxa | | |
| Other: | | |
| wood | + | small mm-sized fragments: 3 |
| transparent plant tissue | + | fragments |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-19

ANIMAL MACROFOSSILS:

| | | | |
|-------------------|---------------------------|-----|-------------------------------------|
| PORIFERA | "sponges" | | |
| HAPLOSCLERINA | | | |
| Spongillidae | | | |
| | <i>Spongilla</i> type | ++ | single cells: ~150* |
| BRYOZOA | | | |
| | <i>Plumatella</i> sp. | + | statoblasts: 14 |
| ARTHROPODA | | | |
| INSECTA | | | |
| COLEOPTERA | | | |
| "beetles" | | | |
| | Elateridae | + | larva caudal plate: 1 |
| | Scarabaeidae | | "scarab beetles" |
| | <i>Aphodius</i> sp. | + | elytron: 1 (bleached) |
| | Curculionidae | + | elytron fragment: 1 (pitted, worn) |
| TRICHOPTERA | | | |
| "caddisflies" | | | |
| DIPTERA | | | |
| "flies" | | | |
| | Chironomidae | + | larvae head capsules: 19 |
| HYMENOPTERA | | | |
| "wasps and ants" | | | |
| CRUSTACEA | | | |
| Cladocera | | | |
| "water fleas" | | | |
| | <i>Daphnia</i> sp. | + | ephippia: 37 |
| | Ostracoda | +++ | articulated valves and valves: 421* |
| ARACHNIDA | | | |
| Oribatei | | | |
| "oribatid mites" | | | |
| Hydrozetidae | | | |
| | <i>Hydrozetes</i> type | +++ | mites: 317* |
| MOLLUSCA | | | |
| Gastropoda | | | |
| "snails, limpets" | | | |
| | horizontal type (conical) | + | small snail: 1 |
| Other: | | | |

*discontinued enumeration due to abundance in fine fraction

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

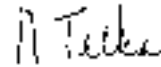
Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. ([Figure 1](#) and [Figure 2](#)) were submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material. This sample from bed 7 is a massive silt unit (strat diagram [Figure 4](#)).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-19

binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Alice Telka

A handwritten signature in black ink that reads "A. Telka". The signature is written in a cursive style with a large initial "A".

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atelka@sympatico.ca
March 21, 2008

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-20

Sample No.: 07-JB-52B-M11
 Site No.: JB-52B
 Lab No.: 11-50
 Locality: White R., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Brent Ward & Jeff Bond
 Material: silt with organics, Bed 4, just below diamicton
 Sample volume: ~300 mL (dry), wt. ~425 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---|----|--|
| Fungal remains: | | |
| fungal sclerotia | + | 94 |
| Algal remains: | | |
| Characeae | | |
| <i>Chara/Nitella</i> type | ++ | oogonia: 306, algae calcite 'tubes': 14 |
| Vascular Plants: | | |
| Potamogetonaceae .."pondweed family" | | |
| <i>Potamogeton pectinatus</i> L. | + | seeds: 6 |
| <i>Ruppia cirrhosa</i> (Petagna) Grande | + | seeds: 13 |
| Scheuchzeriaceae .."arrow grass family" | | |
| <i>Triglochin palustris</i> L. | + | seed: 1 |
| Poaceae "grass family" | + | grains (caryopses): 5 |
| Cyperaceae "sedge family" | | |
| <i>Carex lenticular</i> type | + | seeds: 7 |
| <i>Carex trigonous</i> type | + | seeds: 3 |
| <i>Schoenoplectus tabernaemontani</i> (C.C. Gmel) Palla | + | seeds: 10 |
| Salicaceae "willow family" | | |
| <i>Salix</i> sp. | + | twig with persistent bud: 1 |
| Betulaceae "birch family" | + | nutlets: 3, bract fragment: 1 (poorly preserved) |
| <i>Betula nana/glandulosa</i> type | + | nutlets: 8 |
| <i>Betula</i> medium shrub type | + | nutlets: 2 |
| Polygonaceae "buckwheat family" | | |
| <i>Polygonum lapathifolium</i> type | + | half seeds: 2 |
| Chenopodiaceae "goosefoot family" | | |
| <i>Chenopodium</i> sp. | + | seeds: 3 |
| Ranunculaceae "crowfoot family" | | |
| <i>Ranunculus sceleratus</i> type | + | seeds: 14, half seeds: 4 |
| Rosaceae "rose family" | | |
| <i>Potentilla anserina</i> L. | + | seed: 1 |
| Haloragaceae "water milfoil family" | | |
| <i>Myriophyllum sibiricum</i> Kom. | + | seeds: 3 |
| Ericaceae "heath family" | | |
| <i>Arctostaphylos uva-ursi</i> (L.) Spreng. | + | two articulated seed cluster: 1, seed: 1 |
| Primulaceae "primrose family" | | |
| <i>Androsace septentrionalis?</i> type | + | seed: 1 |

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 08-20

| | | |
|--|-----|--|
| Other: | | |
| wood/twig | + | fragments: ~10 |
| underground rhizomes | + | fragments |
| ANIMAL MACROFOSSILS: | | |
| PORIFERA "sponges" | | |
| HAPLOSCLERINA | | |
| Spongillidae | | |
| <i>Spongilla</i> type | + | all single cell: 50 |
| BRYOZOA | | |
| <i>Plumatella</i> sp. | + | statoblasts: 12 |
| ARTHROPODA | | |
| INSECTA | | |
| COLEOPTERA "beetles" | | |
| Dytiscidae "predaceous diving beetles" | + | femur: 1, sternites: 2 |
| <i>Colymbetes</i> sp. | + | elytron fragment: 1 |
| <i>Graphoderus</i> sp. | + | basal elytron fragment: 1 |
| Curculionidae "weevils" | + | elytra fragments: 3 |
| <i>Apion</i> sp. | | |
| <i>Lepidophorus lineaticollis</i> Kirby | + | head: 1 |
| DIPTERA "flies" | + | adult thoracic fragment: 1, pupa fragment: 1 |
| Chironomidae "midges" | + | larvae head capsules: 9 |
| CRUSTACEA | | |
| Cladocera "water fleas" | | |
| <i>Daphnia</i> & <i>Simocephalus</i> sp. | +++ | ephippia: 989 |
| Ostracoda "ostracodes" | +++ | articulated valves: 433 |
| ARACHNIDA | | |
| Oribatei "oribatid mites" | | |
| Hydrozetidae | | |
| <i>Hydrozetes</i> type | + | mites: 4 |
| Gastropoda "snails, limpets" | | |
| horizontal type (discoidal) | + | small snails: 15 |
| vertical type (conical) | + | small snails: 17 (two types) |
| Pelecypoda "clams, mussels" | + | small valves: 3 |
| Other: | | |
| small bone | + | fragment: 1 |

**discontinued enumeration in fine fraction due to abundance

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

Eight bulk samples collected by Brent Ward and Jeff Bond from site JB-52B, White R., Y.T. (**Figure 1** and **Figure 2**) were submitted for plant macrofossil and insect fossil analyses and potential

recovery of AMS dateable material. This sample, organics in silt is from bed 4 (strat diagram [Figure 4](#)).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive for pollen analysis was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 5, 20, 40 and 60 mesh Tyler sieves (mesh openings 4.0 mm, 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Olympus digital camera mounted on a binocular microscope. Digital photographs of larger objects (twigs etc.) were obtained using a Nikon Coolpix 4500 digital camera outfitted with a macroscopic lens. Images of plants and insects were downloaded from the world wide web and should not be reproduced commercially or published without copyright permission.

Although this sample was relatively small, it contained a large volume of organic matter amounting to ~55% of the original volume examined. The coarse organic fraction in 07-JB-52B-M2 consists of mainly of abundant mosses of one type (~80% by volume), small fragments of wood/twigs including herbaceous woody stems, peat peds and some sedge (*Carex*) stem/rhizome fragments. Sphagnum (*Sphagnum*) moss was not observed in this sample.

TO DO: weevil head, confirm id as Apion

Alice Telka



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March 29, 2008



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PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-04

Sample No.: 09DTSC7-M2 & M2B

Site No.: SC7

Lab No.: 14-13

Locality: Silver Cr., Y.T.

Latitude: Longitude:

Collector: Derek Turner

Submitter: Derek Turner & Brent Ward

Material: M1 lower contact of the loess, interbedded with organic beds; M2 rodent burrow

Sample volume: ~650 mL (dry), wt. ~1468 grams (dry)

PLANT MACROFOSSILS:

No plant macrofossils.

Other:

| | | |
|----------------------------------|----|----------------------|
| fine charcoal/blackened organics | + | small fragments: ~10 |
| mycorrhizal roots | ++ | |

ANIMAL MACROFOSSILS:

No arthropod fossils.

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 250 microns (0.25 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

One bulk sample collected by Derek Turner from site SC7, Silver Cr., Y.T. (**Figure 1**) was submitted for plant macrofossil and insect fossil analyses. This sample is from a potential rodent burrow in mid-MIS 5 loess (**Figure 2 & Figure 3**).

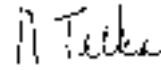
The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was swirl sieved concentrating the organic material on nested 20, 40 and 60 mesh Tyler sieves (mesh openings 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.25 mm (Tyler 60 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Since this sample could potentially contain microtine teeth of a small rodent, the rock/mineral grain sink fraction was also examined. No teeth or bones of a small rodent were observed in the mineral fraction.

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-04

From the large volume of sample examined, very little organic material was observed (<1%). The background organic residue consisted of mostly mycorrhizal roots and associated soil hyphae. For a complete discussion on mycorrhizal roots see macrofossil report, MFRPT 12-05.

This sample contains no plant macrofossils or insect fossils for paleoenvironmental interpretation of the potential rodent burrow deposit.

Alice Telka

A handwritten signature in black ink that reads "A. Telka". The signature is written in a cursive style with a large initial "A" and a stylized "Telka".

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Mar. 26, 2012



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PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-05

Sample No.: BCW-SC-M1 & -M1A
Site No.: SC8
Lab No.: 14-14
Locality: Silver Cr., Y.T.
Latitude: Longitude:
Collector: Derek Turner
Submitter: Derek Turner & Brent Ward
Material: silty sand bed interbedded with some gravel beds
Sample volume: ~1500 mL (dry), wt. ~1988 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---------------------------------|-----|-------------------------------------|
| Fungal remains: | | |
| fungal sclerotia | +++ | some are flattened disk-shaped |
| Vascular Plants: | | |
| Cyperaceae "sedge family" | | |
| <i>Carex</i> lenticular type | + | 'bleached/worn skin' half seed: 1 |
| Other: | | |
| charcoal | + | small fragments: 3 |
| mycorrhizal roots | ++ | |
| roots | + | |
| wood | + | flat, thin fragments, rounded edges |

ANIMAL MACROFOSSILS:

No arthropod fossils.

| | | |
|------------------------------------|---|---|
| MOLLUSCA | + | small mm-sized shell fragments: 9 |
| Gastropoda "snails, limpets" | + | small horizontal type (discoidal) frg.: 1 |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

One bulk sample collected by Derek Turner from site SC8, Silver Cr., Y.T. (**Figure 4**) was submitted for plant macrofossil and insect fossil analyses. This sample was taken from a silty sand bed that is interbedded with some gravel beds just below the contact with glaciolacustrine material (**Figure 5** & **Figure 6**).

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-05

using water displacement technique. The entire sample was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was swirl sieved concentrating the organic material on nested 20 and 40 mesh Tyler sieves (mesh openings 0.85 mm and 0.425 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification.

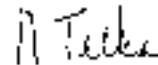
A large volume of sample was processed (1500 ml), but very little organic material was concentrated (~75 ml, 6.6%). The organic residue consists of mostly fragments of roots, root bark, flattened wood and mycorrhizal roots and associated soil hyphae. The roots are not modern however they do appear younger (fresher-looking) than the deposited material. The flattened wood fragments (the largest being 2.5 cm long by 0.5 cm wide) have rounded, worn edges. The wood and associated detritus appears to have been transported in a 'hostile' environment of rapid moving water or may represent shoreline detritus that has been wave washed into thin, flakey, worn pieces.

This sample contained 100's of fungal sclerotia, some being flattened into disk-shaped spheres (they are normally round spherical-shaped 'balls') (Figure 7). Fungal sclerotia are produced by *Cenococcum geophilum*, a fungus that forms a mycorrhizal relationship with roots of trees and plants. This fungus forms an ectomycorrhizal (ECM) mutualistic association with Gymnosperms (mostly conifers) or Angiosperms (flowering plants including herbaceous plants, shrubs, grasses and most trees). Ectomycorrhizas have well developed mantles/sheaths that form thin-to-thick masses of hyphae that cover the outside of fine root tips. They have a symbiotic relationship with the roots of the host plant, growing along side of and surrounding the roots with long lateral mycorrhizal roots and branched short roots (Figure 8). The short roots have emanating hyphae that have fine fungus 'stringers' that extend into the surrounding sediment (Figure 9 and Figure 10). This sample contained an abundance of soil hyphae some having 'fuzzy, spider web-like' material surrounding some of the detritus.

Macrofossils are rare in this sample and no fossils of arthropods/insects were recovered. One very worn half seed of sedge (*Carex* lenticular type) was isolated and one snail fragment (horizontal-discoidal type) and small mm-sized shell fragments were observed.

Based on the rarity of macrofossils, little can be said in terms of the depositional environment of this sample.

Alice Telka



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March 26, 2012

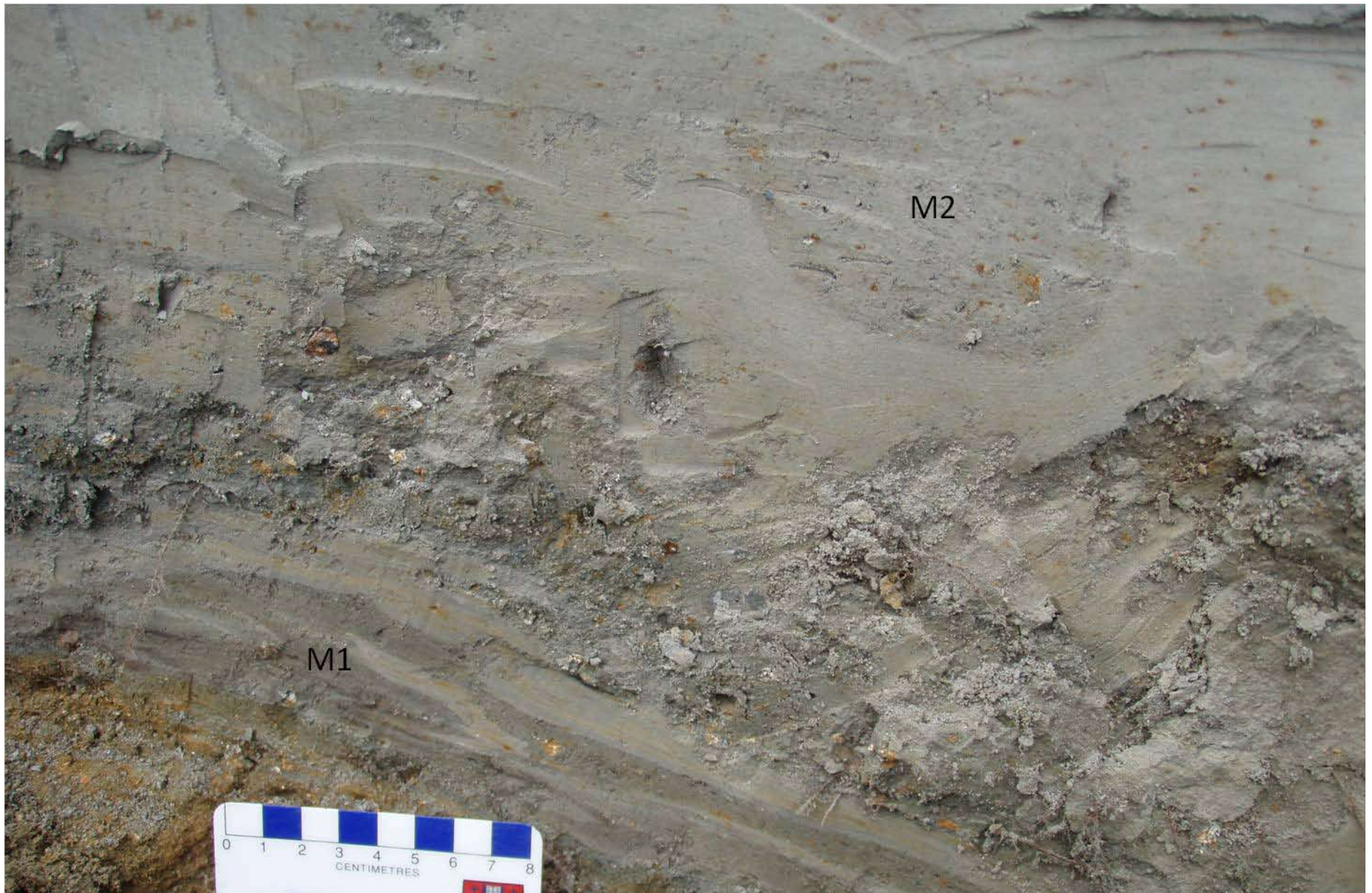


Figure 2. Close up of samples submitted for macrofossil analyses from site SC7. Sample 09DTSC7-M1 (not examined) is at the lower contact of the loess (mid-MIS 5) that appears to be interbedded with organic beds. Sample 09DTSC7-M2 & -M2B (examined) is believed to be from a rodent burrow. Photo courtesy of Derek Turner.



Figure 3. Close up of sample 09DTSC7-M2 & -M2B collected from a rodent burrow. Photo courtesy of Derek Turner.



Figure 5. Photo of silty sand bed interbedded with some gravel beds just below the contact with glaciolacustrine material from Silver Cr. Y.T., site SC8. Samples BCW-SC-M1 (examined) and 09SC8-M1 (not examined) were subsampled from this late MIS 5 (5e?) unit and submitted for macrofossils analyses. Photo courtesy of Derek Turner.



Figure 6. Close up photo of silty sand bed interbedded with some gravel beds just below the contact with glaciolacustrine material from Silver Cr. Y.T., site SC8. Samples BCW-SC-M1 (examined) and 09SC8-M1 (not examined) were subsampled from this late MIS 5 (5e?) unit and submitted for microfossils analyses. Photo courtesy of Derek Turner.

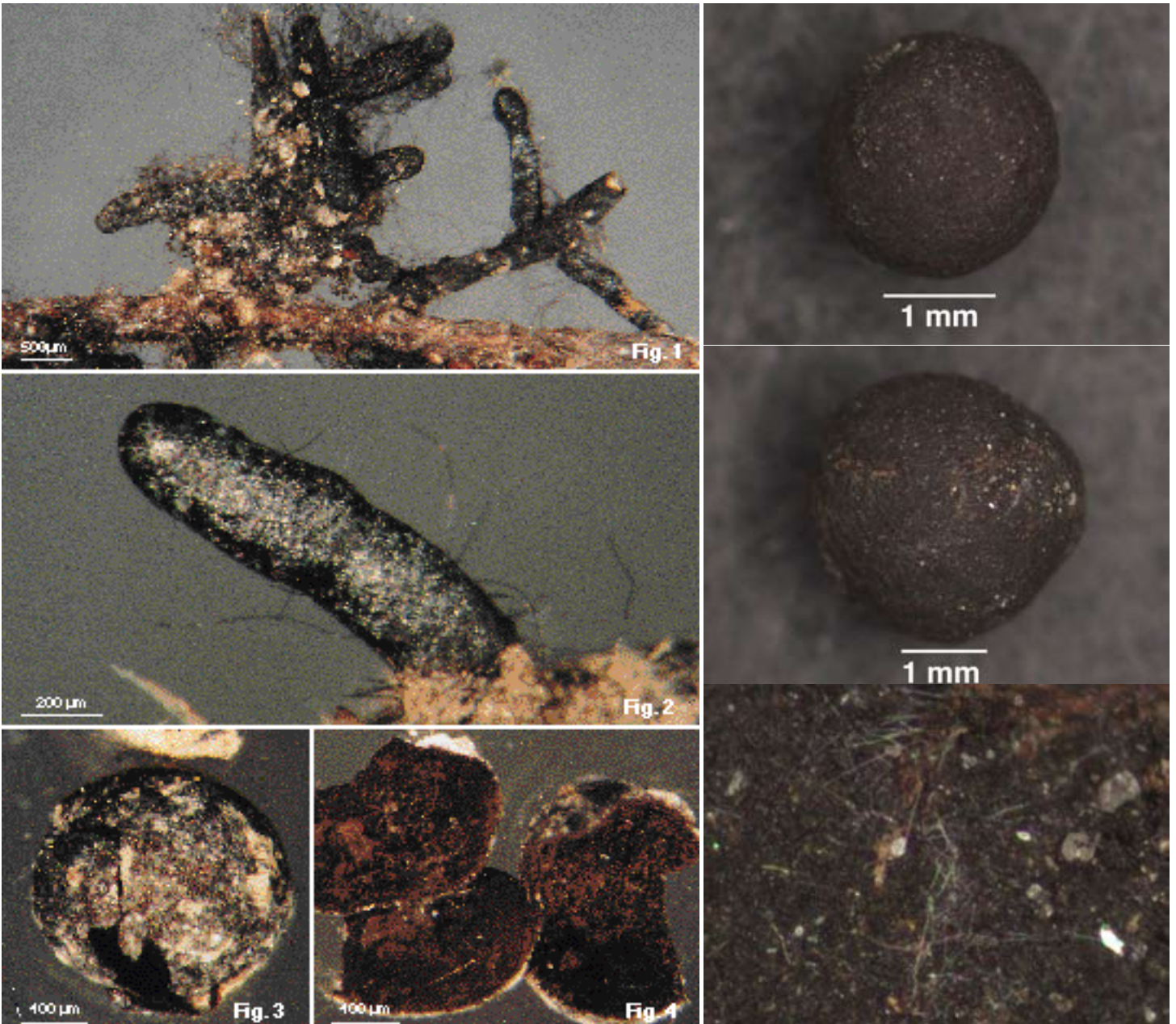


Figure 7. Left: Photos of ectomycorrhizal system on a root caused by the fungus *Cenococcum geophilum*. Top left: Inset Fig.1:ectomycorrhizal system with abundant emanating hyphae; Fig.2: ectomycorrhizal root tip with shiny mantle; Fig.3: sclerotium; Fig.4: inside of sclerotium. Right: fungal sclerotia from BCW-SC-M1 & M1A and close-up of sclerotium surface showing younger aged ‘spider webbing stringers’ (white coloured) and fine mycorrhizal roots (brown coloured).

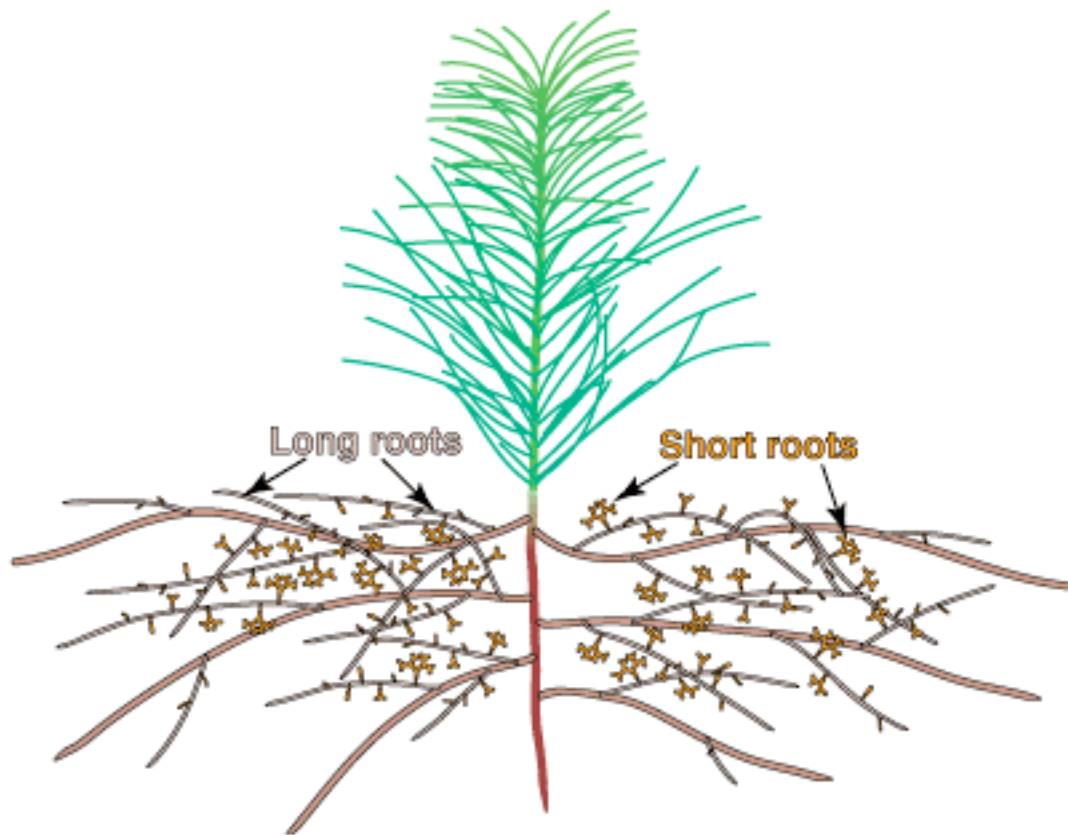


Figure 8. Drawing of a magnified view of typical pine seedling ectomycorrhizal (ECM) root system with long (lateral) mycorrhizal roots and characteristically branched short roots. Note: What is missing from this drawing is the insertion of the associated roots of pine. Only the ECM root types are depicted in this image.

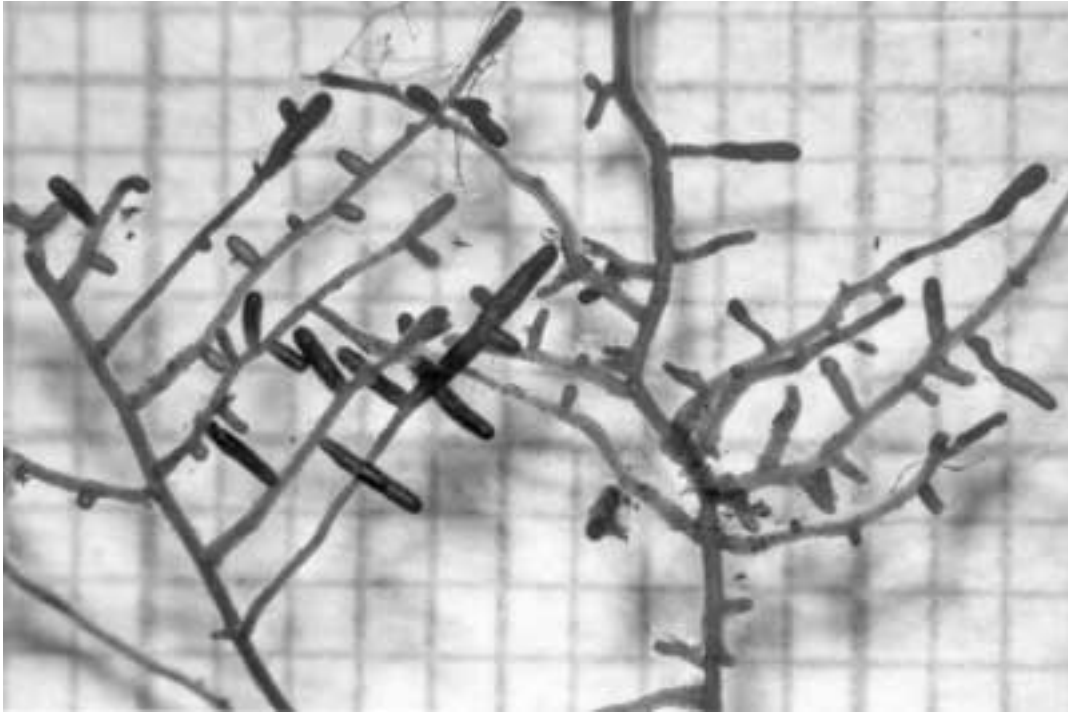


Figure 9. ECM long (lateral) and short roots with emanating hyphae of yellow birch (*Betula alleghaniensis*), an angiosperm tree. Background grid lines are 1 mm by 1 mm.



Figure 10. Close up of dichotomously branched mycorrhizal short roots of *Pinus*. Note the external ECM structures covered in white, fuzzy-looking 'stringers'.



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

Sample Nos.: 09DTSC11: -M2, M3, M5, M7

Lab No.: 12-92 to 12-95

Locality: Silver Creek, Y.T.

Latitude: Longitude:

Collector: Derek Turner

Submitter: Derek Turner & Brent Ward

General Comments:

Nine bulk samples collected by Derek Turner from the Silver Creek section (**Figure 1** and **Figure 2**) were submitted for plant and insect macrofossil analysis and potential isolation of macrofossils suitable for AMS radiocarbon dating. Four of the nine samples from the SC11 section were prioritized for AMS radiocarbon dating. This report is a brief overview of the macrofossil content of the prioritized samples and recommendations for AMS dating. AMS dating of sample –M5 is recommended. Although the other samples contain wood/twig fragments, dating of these samples should proceed with caution.

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample was soaked in warm water then sieved through nested 20, 40 and 60 mesh Canadian Standard Tyler series sieves (mesh openings: 0.85 mm, 0.425 and 0.250 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and insect fossil remains were isolated for identification. Macrofossils were identified using modern reference material (plants and insects) housed in the Geological Survey of Canada (GSC), 601 Booth St., Ottawa. A literature bibliography of taxonomic keys and macrofossil illustrations were also used as guides for macrofossil identifications.

Sample 09DTSC11-M2

Stratigraphic unit: Unit 3 MIS 3 Boutellier non-glacial

Material: gravelly sand, near base of Unit 3 above diamicton (**Figure 3**)

Sample volume: 1150 ml processed; wt. ~ 2338 g (archive wt. 86 g)

PLANT MACROFOSSILS:

Fungal Remains:

fungal balls +++ 'soft & spongy' type

Vascular Plants:

Cyperaceae "sedge family"

Eriophorum? sp. + seeds: 3

Juncaceae? "rush family"

Juncus?/*Luzula?* sp. + capsule valves: 5, half capsule valves: 7, capsule valve fragments: 7

Salicaceae "willow family"

Salix sp. + persistent buds: 3

Betulaceae "birch family"

Betula? sp. + half seed: 1

Rosaceae "rose family"

Potentilla sp. + seed: 1

Unidentified macrofossil taxa

+ similar seed 'skins': 3, smaller seeds (not similar): 3

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

Other:

wood/twigs (**Figure 4**) + small wood/twig fragments, many rust coloured fragments that are brittle and splinter easily

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

COLEOPTERA "beetles"

Curculionidae "weevils"

Connatichela artemisiae? Anderson

Lepidophorus lineaticollis Kirby

Isochnus? sp.

+ tibia: 1, mandible: 1

+ elytron fragment: 1, pronotum fragment: 1, sternites: 1, femur: 1

+ elytron fragments: 3

+ head fragments: 7, rostrum ('nose') fragment: 1, pronota: 5, pronotum fragments: 7, half elytron: 1, elytron fragments: 4,

+ pronotum fragment: 1, half elytron: 1, elytron fragment: 1

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 250 microns (0.25 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

-organic content very low (~12 ml, wet) but concentrated residue is almost entirely of macrofossils (mostly insect fossils)

-large volume of rocks and sand (225 ml); largest rock 3.5 cm long by 2.5 cm wide)

-preservation of **all** fossils is poor; many of the insect fossils consist of small fragments (contributing to the uncertainty of some of the identifications); almost all of the insect fossils show evidence of pitting and bleaching that precedes final decay of the insect cuticle

-although no carbonate precipitate was noted in this sample, some of the small wood/twig fragments are brittle (calcified) and easily fragment into splinters, especially those that are rust coloured (Fe stained)

-wood/twig fragments are mm-sized

AMS: largest wood fragment that is rectangular-shaped, flattened, measuring ~5 mm long by ~1.5 mm wide by ~0.5 mm deep weighing 1.9 mg has been submitted to the Keck AMS Dating Facility (**Figure 5**)

-most abundant plant macrofossil are *Juncus/Luzula?* capsule valves that are normally robust (thick) capsules but in this sample they are so thin resembling netting material (you can see through them); the capsule valves could also belong to the phlox family (Polemoniaceae, *Phlox hoodii.*); Juncaceae are predominantly found in wet places (*Juncus*) whereas *Phlox hoodii* are xerophilous plants found on south facing slopes in Alaska and Yukon Territory

-macrofossil seeds are difficult to identify; they are thin 'skins' or embryos (outer seed coat is worn/weathered) or fragmented

-a lot of fungal 'spongy' balls

-insect fossils comprise mostly weevils:

Lepidophorus lineaticollis: this phytophagous weevil species occur at xeric sites within forest and tundra regions, including river shorelines. They are commonly collected in alder leaf litter and various other treeless habitats throughout the species range from Alaska and Yukon Territory (Anderson, 1997)

Isochnus?: larvae are leaf miners of plants from the willow family (Salicaceae, *Salix* and *Populus*); they appear to associate primarily with riparian habitats (Anderson, 1989)

Connatichela artemisiae?: This species is found in southern steppe including river shorelines. It has been collected along dry river banks and on dry south-facing slopes from plants of *Artemisia*, probably *A. frigida* Willd. (Anderson, 1997). Anderson (1984) observed adults copulating on *Artemisia* suggesting the larvae feed on the roots of this plant.

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

-little can be said about the depositional environment based on the poor preservation of macrofossils-
willows with the weevil (*Lepidophorus lineaticollis*) that lives along sandy floodplains beneath willows
where it likely feeds on roots

References:

Anderson, R.S., 1984. *Connatichela artemisiae*, a new genus and species of weevil from the Yukon Territory (Coleoptera: Curculionidae: Leptopiinae): Taxonomy, paleontology, and biogeography. Can. Ent. 116:1571-1580.

Anderson, R.S., 1989. Revision of the subfamily Rhynchaeninae in North America (Coleoptera: Curculionidae). Transactions of the American Entomological Society Vol. 115: 207-312.

Anderson, R.S., 1997. Weevils (Coleoptera: Curculionoidea, excluding Scolytinae and Platypodinae) of the Yukon. In: Insects of the Yukon, eds. H.V. Danks and J.A. Downes, p. 523-556.

Sample **09DTSC11-M3**

Stratigraphic unit: Unit 3 MIS 3 Boutellier non-glacial

Material: sandy gravel, near base of Unit 3 above -M2 ([Figure 6](#))

Sample volume: 1100 ml processed; wt. ~ 2379 g (archive wt. 229 g)

PLANT MACROFOSSILS:

Fungal Remains:

 fungal sclerodia + 7

Non Vascular Plants:

 Bryophytes "mosses" + stem fragments only

Vascular Plants:

 Cyperaceae "sedge family"

Carex lenticular type + seeds: 2 (poorly preserved)

 Salicaceae "willow family"

Salix sp. + persistent buds: 48 (bleached, thin 'skins'-
only 4 are not bleached)

Unidentified macrofossil taxa + seed 'skin' (possibly *Carex* lenticular type): 2

Other:

 wood/twigs ([Figure 7](#)) + small 'gnarly' fragments, some are Fe
stained (rust coloured), others are
blackened'

 carbonate precipitate ++ small 'concretion-like' fragments with holes

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

 COLEOPTERA "beetles"

 Curculionidae "weevils" + tiny pronotum frg.: 1, small elytron frg.: 1, leg
femur: 1

Lepidophorus lineaticollis Kirby + elytra fragments: 3

Unidentified animal taxa + mandible: 1

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

Comments:

- organic content very low (~17 ml, wet) therefore very few macrofossils
- large volume of rocks and sand (380 ml); smaller mineral grains are cemented to form 'chunks' (~1 inch in size)
- organic residue consists of plant tissue fragments that are thin and bleached (transparent) probably caused by carbonate leaching or have undergone a long history of weathering
- dominant macrofossils are willow persistent buds that are bleached, transparent 'skins' and moss stem fragments only (none with leaves and no individual leaves seen)
- ~30 willow persistent buds weighing 3.5 mg have been submitted for AMS radiocarbon dating to the Keck AMS Dating Facility ([Figure 8](#)); small willow twig with bark intact, weighing 1.2 mg has been archived for potential AMS dating ([Figure 8](#))
- small wood/twig fragments that are 'gnarly-looking' flattened flakes, some are rust coloured (Fe stained) while others are 'blackened' ([Figure 9](#) and [Figure 10](#))
- small carbonate precipitate fragments prevalent in finer fraction (.425-0.85 mm fraction) (dissolved in 10% HCl) ([Figure 9](#))
- little can be said about the depositional environment based on the scarcity of macrofossils-abundant willows with the weevil (*Lepidophorus lineaticollis*) that lives along sandy floodplains beneath willows where it likely feeds on roots
- harsh depositional environment
- AMS:** willow persistent buds ([Figure 8](#))

Sample **09DTSC11-M5**

Stratigraphic unit: Unit 3 MIS 3 Boutellier non-glacial

Material: clay-silt, middle of Unit 3 ([Figure 11](#) and [Figure 12](#))

Sample volume: 800 ml processed; wt. ~ 1727 g (archive wt. 172 g)

PLANT MACROFOSSILS:

Non Vascular Plants:

Bryophytes "mosses" + fragments and leaves (one type)

Vascular Plants:

Equisetaceae "horsetail family" + stem fragment: 1
Equisetum sp.

Potamogetonaceae .. "pondweed family" + seeds: 4 (one is poorly preserved)
Potamogeton sp.

Cyperaceae "sedge family" + seeds: 10
Carex trigonous type + seeds: 34, half seeds: 4
Carex lenticular type

Rosaceae "rose family" + seeds: 2
Potentilla (smooth type)

Unidentified macrofossil taxa + small 'marshmallow shape' capsules (all the same): ~25

Other:

wood/twigs ([Figure 13](#)) + flat rectangular shaped fragments (<5 mm in length x 1 mm wide); largest fragment (6 mm x 1 mm) isolated for AMS dating

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

COLEOPTERA "beetles" + misc. fragments: sternites, femurs, tibia
 Carabidae "ground beetles" + elytron fragment: 1, prosternum: 1, sternite: 1
Pterostichus(*Cryobius*) sp. + pronotum fragment: 1 (poorly preserved, worn)
 Dytiscidae "predaceous diving beetles" + small elytron fragment: 1
Hydroporus sp. + elytron: 1, pronotum: 1

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

| | | |
|---------------------------------|---|--|
| Genus? | + | half elytron: 1, elytron fragments: 2 |
| Genus? | + | half elytron |
| Curculionidae "weevils" | + | elytron fragment: 1 |
| TRICHOPTERA "caddisflies" | + | larva: half head capsule: 1, head frontoclypeal apotome: 1, case 'net' fragment: 1, misc. fragments: 7 |
| DIPTERA "flies" | + | pupa fragment: 1 |
| Tipulidae "crane flies" | | |
| <i>Tipula</i> sp. | + | larva half head: 1 |
| Chironomidae "midges" | + | adult thorax fragment: 1 |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

- very little organic content (~28 ml wet) after sieving 800 ml of sediment
- very difficult to break down, compacted sediment and organics were manually broken apart; soaking in water overnight did nothing to disaggregate the sediment
- many organic peds that could not be broken down further without destroying the fossils (vol. of hard organic peds not examined: 160 ml)
- difficult processing (2 hrs.) and not all macrofossils could be isolated (possibly missing some inside peds)
- compared to all SC11 samples examined, this sample had the best preserved material
- background residue: mostly mosses (well preserved) and leaves of one type of moss ([Figure 14](#))
- AMS:** small, square-shaped wood fragment ([Figure 14](#)) weighing 5.0 mg has been submitted to the Keck AMS Dating Facility for AMS radiocarbon dating; small twig/wood fragments <5 mm in length by 1 mm wide; all are flattened; largest two fragments (~6 mm x ~1 mm) have been set aside for potential AMS dating ([Figure 15](#))
- dominant macrofossils are sedges, *Carex* lenticular type ([Figure 16](#)) and *Carex* trigonous type
- poorly drained site of possibly a small pool/pond or slowly flowing stream; shoreline is dominated by sedges, moss and horsetail; submerged pondweeds growing in water that is at least a meter deep; aquatic insects dominate the animal macrofossils: predaceous diving beetle (*Hydroporus* sp.) ([Figure 17](#)) and two other genera; aquatic immatures of caddisflies that build cases; crane flies that live in shallow pools

Sample **09DTSC11-M7**

Stratigraphic unit: Unit 3 MIS 3 Boutellier non-glacial

Material: gravel-sand, middle of Unit 3 ([Figure 18](#))

Sample volume: 1000 ml processed; wt. ~ 1095 g (archive wt. ~169 g)

PLANT MACROFOSSILS:

Non Vascular Plants:

Bryophytes "mosses" + stem fragments only

Vascular Plants:

Cyperaceae "sedge family"

Carex lenticular type + seed: 1

Unidentified macrofossil taxa + seed embryo: 1

Other:

wood/twigs + flattened 'strips', all are rust coloured (Fe stained)

reworked Eocene? coal + small fragments: 5

ARTHROPODA

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 10-08

INSECTA

LEPIDOPTERA "butterflies/moths" + larva mandible: 1

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

-organic content very small (~15 ml wet)

-a lot of rocks, sand (vol. ~300 ml)

-long time to process sample (~2 hrs.)

-wood fragments are flattened strips, small (<1 cm long by 1 mm wide) and all are rust coloured (Fe stained)

-moss stems only, all leaves 'sheared off', none with leaves

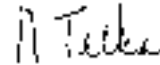
-note: reworked Eocene? coal

-little can be said about the depositional environment based on the rarity of macrofossils

-harsh depositional environment

AMS: wood fragments

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February 12, 2010

Updated: February 21, 2010



Figure 3. Close up of 09DTSC11-M2, basal most sample (above diamict) from Unit 3 MIS 3 Boutellier non-glacial analyzed for macrofossils and AMS radiocarbon dating potential. Photo credit: Derek Turner.



Figure 4. Sample 09DTSC11-M2 coarse (>0.85 mm) fraction wood fragments. For scale, the largest orange/rust coloured wood fragment (top left) is ~ 4 mm long.



Figure 5. Sample 09DTSC11-M2 wood fragment (top and bottom, opposite views). This wood fragment weighing 1.9 mg has been submitted to the Keck AMS Dating Facility, University of California, Irvine for AMS radiocarbon dating (Feb., 2010).



Figure 6. Close up of 09DTSC11-M3 near base of Unit 3 showing tephra. This sample was analyzed for macrofossils and material for AMS dating. Photo credit: Derek Turner.



Figure 7. Sample 09DTSC11-M3 coarse (>0.85 mm) wood fraction showing 'blackened' wood fragments and Fe stained (rust coloured) wood fragments. Five larger blackened wood fragments weighing 10.2 mg have been archived for potential AMS radiocarbon dating. For scale, the rust coloured rectangular wood fragment in the center surrounded by blackened fragments is 2.5 mm long.

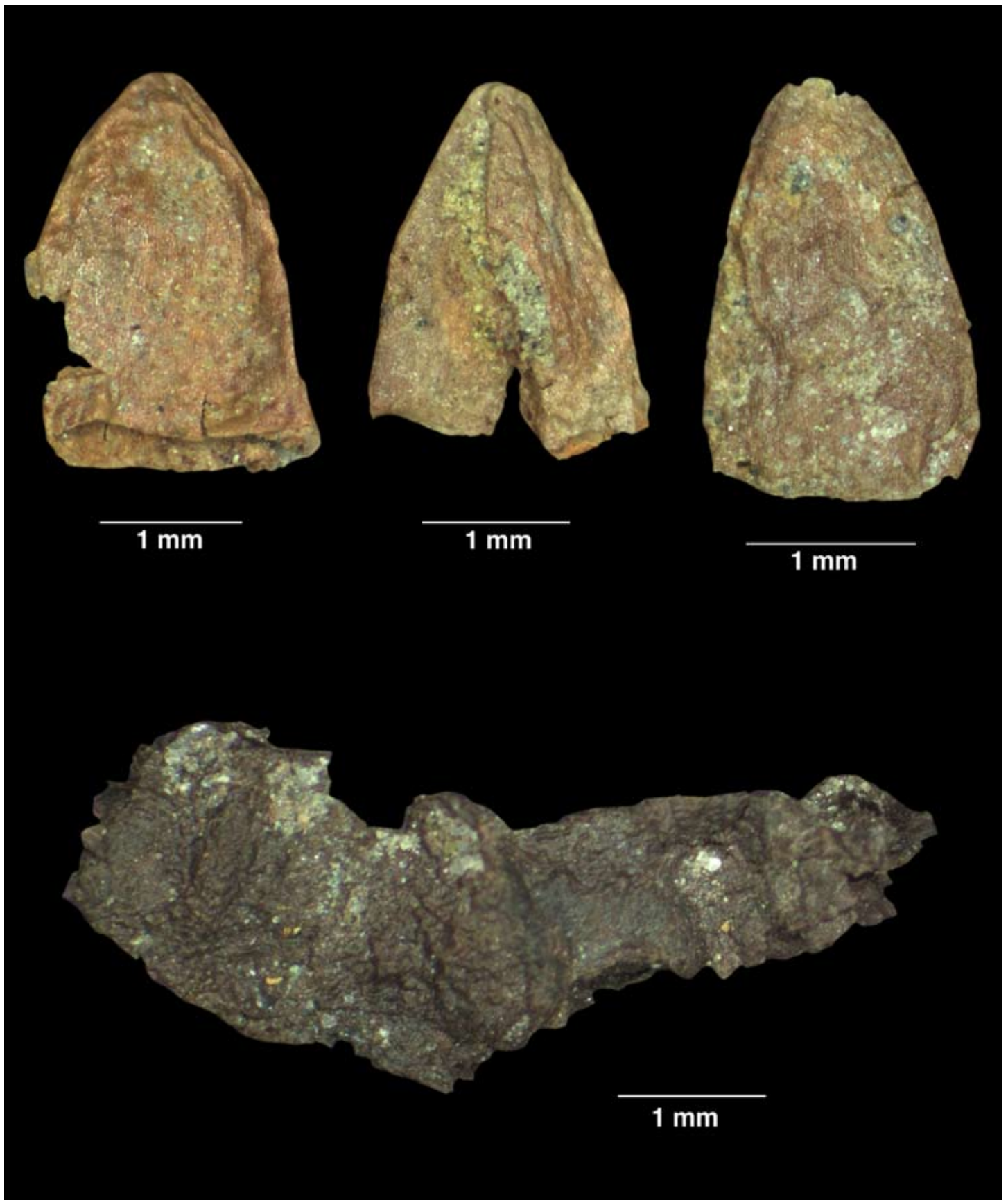


Figure 8. Top: Sample 09DTSC11-M3 willow (*Salix* sp.) persistent buds. Approximately 30 willow persistent buds weighing 3.5 mg have been submitted to the Keck AMS Dating Facility, University of California, Irvine for AMS radiocarbon dating (Feb., 2010). Bottom: Sample 09DTSC11-M3 flattened willow (*Salix* sp.) twig with bark weighing 1.2 mg has been archived for potential AMS radiocarbon dating.

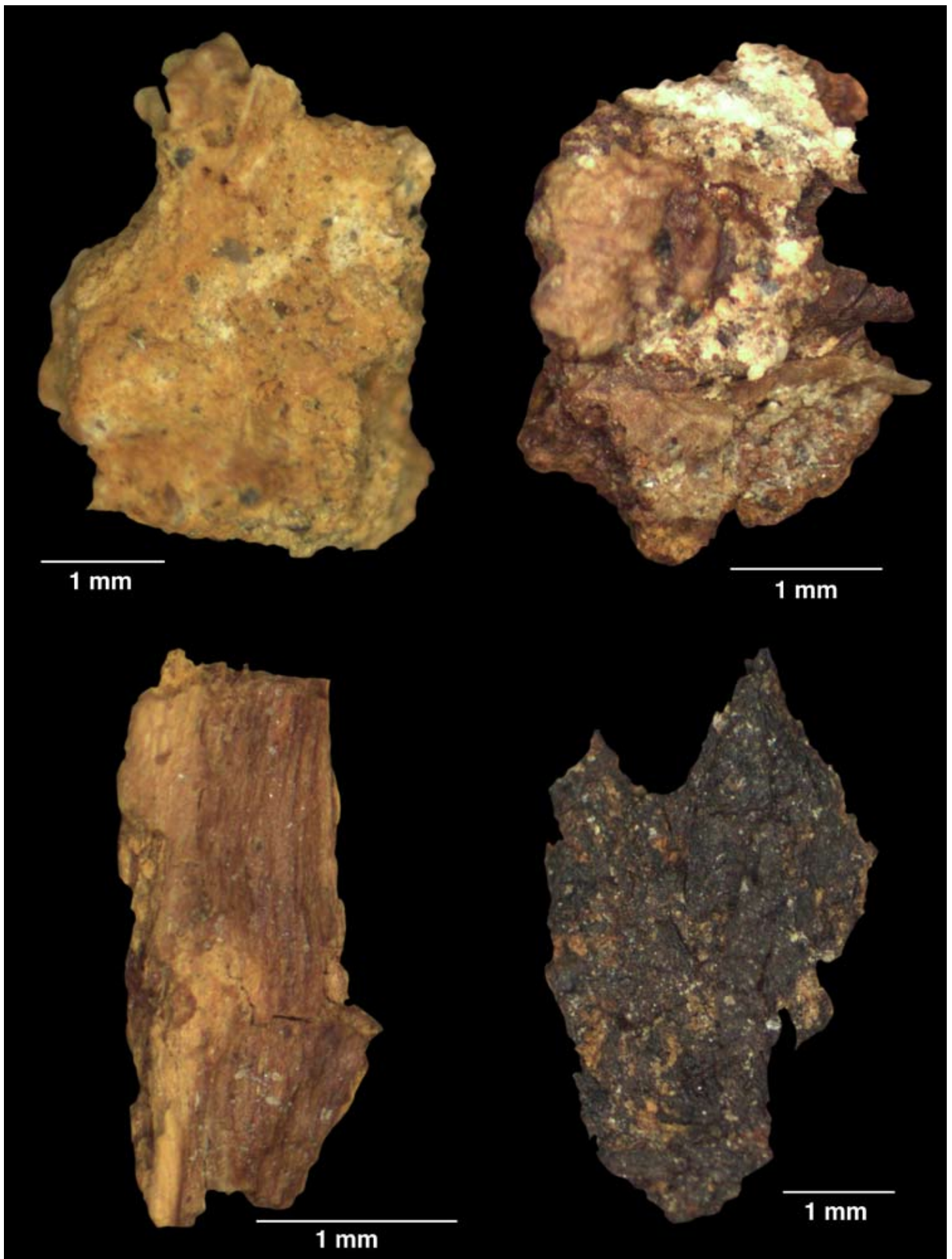


Figure 9. Sample 09DTSC11-M3. Top left: carbonate precipitate fragment. Top right: carbonate encrusted organics. Bottom left: iron-stained wood fragment. Bottom right: 'blackened' wood flake.



Figure 10. Sample 09DTSC11-M3. Top left & right: 'blackened' flakes of wood weighing 2.4 mg each have been archived for potential AMS radiocarbon dating. Bottom: iron-stained wood fragment with 'cellular hairs/fibers'. For scale, background grid lines are 4 mm by 4 mm.



Figure 11. 09DTSC11-M5 on bottom. Photo credit: Derek Turner.



Figure 12. Close up of 09DTSC11-M5, clayey silt sample from midway within Unit 3. This sample had the highest potential for AMS dating based on the better preservation of the macrofossils analyzed. Photo credit: D. Turner.



Figure 13. Sample 09DTSC11-M5 coarse (>0.85 mm) fraction wood fragments. Note the 'flatness' and small size of the wood fragments as seen in all SC11 samples. For scale, the rounded fragment (top, center) is ~ 4 mm long.

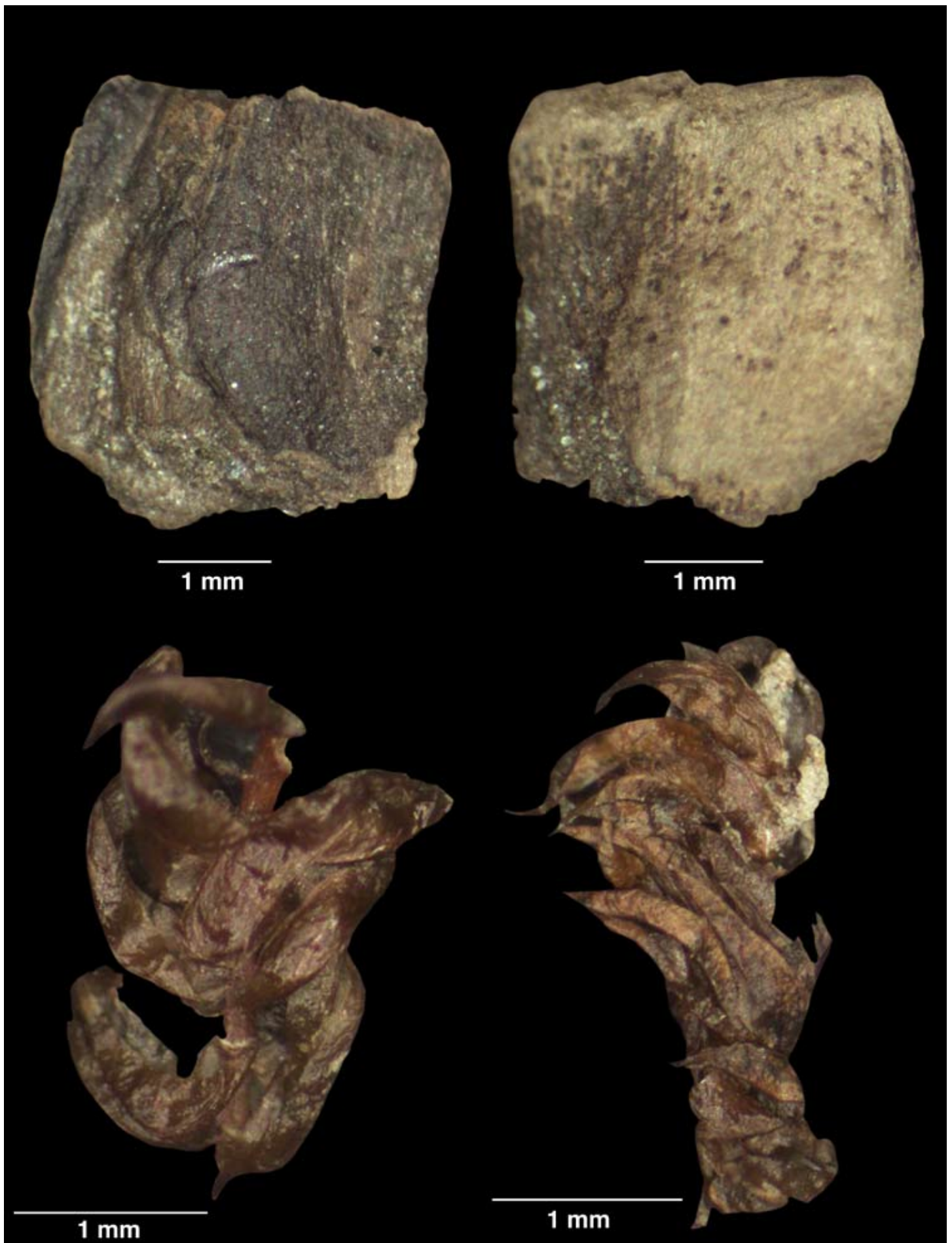


Figure 14. Sample 09DTSC11-M5. Top left & right: opposite views of wood fragment. This wood fragment, weighing 5.0 mg has been submitted to the Keck AMS Dating Facility, University of California, Irvine for AMS radiocarbon dating (Feb., 2010). Bottom left & right: moss fragments.



Figure 15. Sample 09DTSC11-M5. Top two photos: opposite view of the same flattened wood fragment weighing 1.2 mg. Bottom two photos: opposite view of the same flattened wood fragment weighing 1.4 mg. These have been archived for potential AMS radiocarbon dating.



Figure 16. Inset: *Carex* lenticular type achene from sample 09DTSC11-M5. This achene was common in this sample with ~34 achenes of the same type of sedge isolated. Background photo: sedge, *Carex rostrata*, a wide-ranging woodland swamp species commonly growing in water along sheltered lake margins, north to the limit of continuous forest.



Figure 17. Left: Image of predaceous diving beetles, *Hydroporus striola*. Center: Photo of *Hydroporus morio* that occurs in small pools with peaty substrates, mossy banks and not too dense emergent sedges or rushes. They prefer cool water temperatures and can be found in open pools in alpine and tundra habitats as well as in small pools in black spruce—sphagnum bogs (Larson et al., 2000). Right: fossil right elytron of *Hydroporus* sp. from sample 09DTSC11-M5. Larson, D.J., Alarie, Y. and R.E. Roughley, 2000. Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region, with emphasis on the fauna of Canada and Alaska. NRC Research Press, Ottawa, Ontario, Canada. 982 pp.



Figure 18. 09DTSC11-M7, sampled approximately midway in Unit 3. This sample was analyzed for macro-fossil content and availability of material for AMS dating. Photo credit: Derek Turner.

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-02

Sample No.: BCW-SC-M2
 Site No.: SC11
 Lab No.: 14-35
 Locality: Silver Cr., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Derek Turner & Jeff Bond
 Stratigraphic Unit: MIS 3 Boutellier non-glacial
 Material:
 Sample volume: ~ 500 mL (dry), wt. ~1969 grams (dry)

PLANT MACROFOSSILS:

| | | |
|---------------------------------------|----|--|
| Fungal Remains: | | |
| fungal sclerotia | + | 8 |
| Non Vascular Plants: | | |
| Bryophytes "mosses" | ++ | fragments (two types) |
| Vascular Plants: | | |
| Cyperaceae "sedge family" | | |
| <i>Carex</i> lenticular type | + | seeds: ~100 |
| <i>Carex</i> trigonous type | + | seeds: 7 |
| Juncaceae "rush family" | | |
| <i>Juncus/Luzula</i> type | + | capsule lobe: 1 |
| Salicaceae "willow family" | | |
| <i>Salix</i> sp. | + | persistent buds: 2 |
| Ranunculaceae "crowfoot family" | | |
| <i>Ranunculus</i> sp. | + | seeds: 9 |
| Rosaceae "rose family" | | |
| <i>Potentilla</i> smooth type | + | seeds: 8 |
| Unknown plant macrofossil taxa | ++ | small 'marshmallow shape' capsules (all the same): ~100 |
| Other: | | |
| wood/twig | + | small fragments: ~40 (worn, rounded edges, none with bark) |

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

ORTHOPTERA....." cockroaches, grasshoppers etc."

 Acrididae....."grasshoppers" + half nymph case: 1

COLEOPTERA "beetles" + metasternum: 1

 Carabidae "ground beetles" + half head: 1, pronotum fragment: 1, prosternum: 1, sternites: 1

 Dytiscidae "predaceous diving beetles"

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-02

| | | |
|--|---|---|
| <i>Hydroporus</i> sp. | + | elytra: 2, metacoxal plates: 2 |
| Genus 1 | + | pronotum: 1, elytron: 1 |
| Genus 2 | + | elytron: 1, half elytron: 1 |
| Hydrophilidae "water scavenger beetles" | + | elytron fragment: 1, pronotum: 1, |
| <i>Helohporus</i> sp. | + | head: 1, pronotum: 1 |
| Curculionidae "weevils" | + | metasternum: 1 |
| TRICHOPTERA "caddisflies" | + | larvae thoracic fragments: 4 |
| DIPTERA "flies" | + | pupa fragment: 1 |
| Tipulidae "crane flies" | | |
| <i>Tipula</i> sp. | + | larva head capsule: 1, larva half head capsule: 1 |
| HYMENOPTERA "wasps and ants" | | |
| Ichneumonoidea "ichneumons and braconids" | | |
| Ichneumonidae | + | thoracic fragment: 1 |
| ARACHNIDA | | |
| Araneae "spiders" | + | cephalothorax: 1 |
| Erigonidae | | |
| <i>Erigone</i> sp. | + | male cephalothorax: 1 |
| Other: | | |

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

One bulk sample collected by Derek Turner from White R., Y.T. was submitted for plant macrofossil and insect fossil analyses and isolation of suitable material for AMS radiocarbon dating. This sample represents sediments from an ice wedge.

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water displacement technique. The entire sample, excluding a small archive was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was swirl sieved concentrating the organic material on nested 20 and 40 mesh Tyler sieves (mesh openings 0.85 mm and 0.425 mm respectively). All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification. Microscopic digital photography of macrofossils was done using an Infinity digital camera mounted on a binocular microscope.

In preparation for AMS radiocarbon dating, suitable organic material from this sample was isolated, weighed and photographed. Prior submission to a dating facility, the isolated material deemed suitable for dating was inspected and in some cases cleaned using an ultra sonic bath. The dried material was packaged using freshly cut, small square pieces of aluminum tin foil, folded into small packets and placed in labeled sterilized covered 3.5 cm diameter petri dishes for shipment to Keck Carbon Cycle AMS Laboratory.

This sample contains a large organic component in relation to other MIS 3 Boutellier samples studied from the Silver Creek sections amounting to 20% (wet volume). What is more revealing is the similarity of the floral and faunal assemblage to the already dated MIS 3 Boutellier sample, 09DTSC11-M5 which yielded an AMS radiocarbon date of 36,240 ± 310 (UCIAMS-74727). The only difference is this sample contains no submergent aquatics, specifically pondweed (*Potamogeton* sp.) that was isolated in 09DTSC11-M5 (four achenes).

PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-02

Overall the background residue consists of many mosses (two types), small wood fragments, which are worn, with rounded edges containing no outer bark and fragments of sedge rhizomes (underground roots). The dominant plant macrofossils are sedges (abundant lenticular type, with lesser trigonous types). These sedge seeds have been isolated for potential AMS dating. Wood fragment(s) is another option for AMS dating. Other plant macrofossils include herbs of buttercup (*Ranunculus* sp.) and cinquefoil (*Potentilla* sp.). The floral assemblage lacks treed species including conifers, birch and alder, but does contain shrub willow (*Salix* sp.).


Insect fossils are predominately aquatic forms. Interestingly the sample does not contain the ubiquitous midges (Chironomidae) and water fleas (*Daphnia*) common in all aquatic environments. The aquatic forms include three genera of predaceous diving beetles. Members of *Hydroporus* can be found in many shallow aquatic habitats, especially near the water margin amongst emergent vegetation (Larson et al., 2000). Another aquatic beetle is the water scavenger beetle, *Helophorus*. Species of *Helophorus* mostly prefer standing shallow water with plenty of organic debris that is found in the littoral zone. Many species occur in the transition zone between water and land, in moss or other vegetation as long as the habitat is very wet (Smetana, 1985). Other insect fossils include crane flies (*Tipula* sp.) and spiders (*Erigone* sp.). Larvae of crane flies are associated mostly with moist environments feeding on organic detritus such as decaying leaves, plant fragments and associated organisms that accumulate on bottoms of shallow aquatic environments (Merritt and Cummins, 1984). Species of the spider *Erigone* are not aquatic but live near water or in damp areas.

The combined macrofossil evidence suggests a poorly drained site (e.g. floodplain) that has temporary small, shallow pools with emergent sedges and mosses. With comparison to sample 09DTSC11-M5, the poorly drained site contains small, shallow pond(s) that reach depths of up to 3 meters where submerged pondweeds are growing. On drier areas that are not inundated with water, herbs of buttercup and cinquefoil are growing. The presence of shrub willow and absence of treed species including conifers suggests a cool climate. Pollen analysis is recommended for this sample to further substantiate the depositional environment and provide evidence of the regional environment in particular to trees and shrubs.

Reference:

- Larson, D.J., Alarie, Y. and R.E. Roughley, 2000. Predaceous Diving Beetles (Coleoptera: Dytiscidae) of the Nearctic Region, with emphasis on the fauna of Canada and Alaska. NRC Research Press, Ottawa, Ontario, Canada. 982 pp.
- Merritt, R.W. and Cummins, K.W., Eds., 1984. An Introduction to the Insects of North America, 2nd Edition, Kendall/Hunt Publishing Co., Dubuque, Iowa, pp. 722.
- Smetana, A., 1985. Revision of the Subfamily Helophorinae of the Nearctic Region (Coleoptera: Hydrophilidae). Memoirs of the Entomological Society of Canada. No. 131. 154 pp. Biosystematics Research Institute, Agriculture Canada, Ottawa, Ontario, Canada.

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March 11, 2012



PLANT MACROFOSSIL & FOSSIL ARTHROPOD REPORT MFRPT: 12-03

Sample No.: BCW-SC-M4
 Site No.: SC11
 Lab No.: 14-36
 Locality: Silver Cr., Y.T.
 Latitude: Longitude:
 Collector: Brent Ward
 Submitter: Derek Turner & Jeff Bond
 Stratigraphic Unit: Unit 3 MIS 3 Boutellier non-glacial
 Material:
 Sample volume: 835 mL (dry), wt. 1756 grams (dry)

PLANT MACROFOSSILS:

Vascular Plants:

No plant macrofossils.

Other:

| | | |
|------|---|--|
| wood | + | small fragments, all <1 cm in size; largest fragment 7 mm long x 3 mm wide; Fe stained (rust coloured); surfaces with cemented silt/sand |
|------|---|--|

ANIMAL MACROFOSSILS:

ARTHROPODA

INSECTA

HEMIPTERA "bugs"

| | | | |
|--------------------|---------------|---|---------|
| Cicadellidae | "leafhoppers" | + | head: 1 |
|--------------------|---------------|---|---------|

COLEOPTERA "beetles"

| | | | |
|----------------------|------------------|---|---|
| Carabidae | "ground beetles" | + | adult mandibles: 2, head frg.: 1 |
| <i>Bembidion</i> sp. | | + | pronota: 2, half elytron: 1 (chitin heavily pitted) |

| | | | |
|---|-----------|---|--|
| Curculionidae | "weevils" | + | head frg.: 1, pronota frgs.: 3, elytra frgs.: 4 (all frgs. are 1 mm in size or less) |
| <i>Lepidophorus lineaticollis</i> Kirby | | + | head frg.: 1, pronota frgs.: 3, elytra frgs.: 4 (all frgs. are 1 mm in size or less) |

| | | | |
|---------------|---------|---|------------------|
| DIPTERA | "flies" | + | fly pupa frg.: 1 |
|---------------|---------|---|------------------|

Key: +=taxon present, +++=taxon is abundant

Note: The term seed is used generically to include all forms of seeds including achenes, nutlets etc.

Report based upon examination of organics greater than 425 microns (0.425 mm)

If the information provided above proves critical for the submitter's work, A. Telka should be consulted concerning the possibility of more detailed determinations or updates on the validity of the original conclusions.

Comments:

One bulk sediment sample collected by Brent Ward from site SC11, Silver Creek, Y.T. was submitted for plant macrofossil and insect fossil analyses and potential recovery of AMS dateable material.

The procedure for isolating macrofossils for analysis involved the standard technique of sieving with warm tap water. Initially the sample was weighed and a starting volume approximated using water

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displacement technique. The entire sample, excluding a small archive was soaked in warm water and the organic material floating on the surface was gently decanted into a 100 mesh Tyler sieve (mesh opening 0.15 mm). The remaining sample was sieved through nested 20, 40 and mesh Tyler sieves (mesh openings 0.85 mm and 0.425 mm respectively) using a swirling technique to separate the organic fraction from the sand/silt component. All material greater than 0.425 mm (Tyler 40 mesh sieve) was examined using a binocular microscope and plant and animal fossil remains were isolated for identification and potential AMS radiocarbon dating.

In preparation for AMS radiocarbon dating, suitable organic material from this sample was isolated, weighed and photographed. Prior submission to a dating facility, the isolated material deemed suitable for dating was inspected and in some cases cleaned using an ultra sonic bath. The dried material was packaged using freshly cut, small square pieces of aluminum tin foil, folded into small packets and placed in labeled sterilized covered 3.5 cm diameter petri dishes for shipment to Keck Carbon Cycle AMS Laboratory.

From the large amount of sample processed (~835 mL) very little organic material was isolated (2.39%). The coarse organic residue (>0.85 mm) consists mostly of wood fragments, all being smaller than one centimeter. The largest fragment is 7 mm long by 3 mm wide. The fragments are worn, with rounded edges and the majority have surfaces that are rust coloured suggesting deposition in an oxygen-deprived aquatic environment containing iron bacteria that oxidize dissolved ferrous oxide.

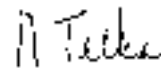
No plant macrofossils were recovered in this sample. From the few insect fossils isolated, the chitinous beetle parts are heavily pitted with some being bleached suggesting deposition in a harsh environment (pitting done by mineral grains in transport of the sediment) and or poor preservation with final decay of the insect cuticle. All insect fragments are mm-sized even though processing of the material was gentle providing further evidence of deposition in a harsh environment. Of the few beetles that were identifiable, species of the ground beetle *Bembidion* often inhabit relatively bare soil or sparsely vegetated areas on the border of standing or slowly running water (Lindroth, 1961-1969).

Based on the rarity of insect fossils and lack of plant macrofossils nothing meaningful can be ascribed to the depositional environment of this sample. The poor preservation of fossils can be attributed to weathering of the sediments (post-depositional) or deposition in a harsh environment.

Reference:

Lindroth, C.H., 1961-1969. The Ground-Beetles (Carabidae, excl. Cicindelinae) of Canada and Alaska, Opuscula Entomologica Supplementum XX, XXIV, XXIX, XXXIII, XXXIV, 1192 pp.

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