**Supplemental Material Table 1:** Details for Table 1 of the paper.

| Ichnotaxon | Biological Counterpart (Trackmaker) |
|---|---|
| *Ameghinichnus* | advanced synapsid, possibly trithelodontid (*1*) |
| *Rhynchosauroides hyperbates* | lepidosauromorph or primitive archosauromorph (*2*,*3*) |
| *Rhynchosauroides* spp. | lepidosauromorphs (*2*,*3*) |
| *Chirotherium lulli* | crurotarsan, possibly aetosaurid (*4*) |
| *Procolophonichnium* | procolophonid parareptile (*5*) |
| *Gwyneddichnium* | tanystropheid (*6*) |
| *Apatopus* | phytosaur (*3*) |
| *Brachychirotherium parvum* | rauisuchian crurotarsan (*7*) |
| new taxon B | crurotarsan, possibly crocodylomorph (*8*) |
| *Batrachopus deweyii* | crocodylomorph (*9*) |
| "*Batrachopus*" *gracilis* | crocodylomorph (*9*) |
| unnamed dinosaurian genus 1 | unknown dinosaur, perhaps herrerasaurid |
| *Otozoum* | prosauropod dinosaurs (*10*,*11*) |
| "*Grallator*" | small theropod dinosaur (*12*) |
| "*Anchisauripus*" | small to medium sized theropod dinosaur (*12*) |
| *Eubrontes giganteus* | large theropod dinosaur (*12*) |
| *Atreipus* spp. | ornithischian dinosaur (*13*) |
| *Anomoepus scambus* | ornithischian dinosaur (*14*) |

**Supplementary Materials: Table 2:** Ages and localities for Figure 2 of paper and Figures 1 and 2 of supplementary materials. na, indicates that although many tracks are known from the locality and are in various institutions, we have not attempted to quantify their numbers for this study;
Maximum size is based on a survey of the largest of the specimens ([15]).

## Ichnotaxa

| age Ma | Formation | Abbrev -iation | Basin | Locality | Age | Ichnotaxa | #Non-Dino-saur Tracks | #Dino-saur Tracks | %Dino-saur Tracks | Max. Thero-pod Track Size | #Non Dino-saur Taxa | #Dino-saur Taxa | %Dino-saur Taxa | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 199 | Portland | 1 | Hartford | Stony Brook, Kelsey Furguson Quarry, Simsbury, CT | Hettangian-Sinemurian | *Batrachopus deweyii, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus, Otozoum moodii, Anomoepus scambus* | na | na | na | 34 | 1 | 5 | 83 | (*16*) |
| 199 | McCoy Brook | 2 | Fundy | Five Islands Provincial Park, Blue Sac shore | Hettangian-Sinemurian | *Batrachopus deweyii, Batrachopus gracilis, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus, Anomoepus scambus, Otozoum moodii* | na | na | na | 35 | 2 | 5 | 71 | (*14,27*) |
| 200 | Portland | 3 | Hartford | Chicopee, MA | Hettangian-Sinemurian | *Batrachopus deweyii, Grallator parallelus, Anchisauripus tuberosus, Anomoepus scambus* | na | na | na | 20 | 1 | 3 | 75 | (revised from ref. *17*) |
| 200 | Turners Falls | 4 | Deerfield | Stoughton Quarry, Montague, MA | Hettangian | *Batrachopus deweyii, Batrachopus gracilis, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus* | na | na | na | 35 | 2 | 3 | 60 | (revised from ref. *17*,) |
| 200 | Turners Falls | 5 | Deerfield | Barton Cove, Lily Pond, Gill, MA | Hettangian | *Batrachopus deweyii, Batrachopus gracilis, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus, Anomoepus scambus* | na | na | na | 35 | 2 | 4 | 67 | (revised from ref. *17*) |
| 201 | Portland | 6 | Hartford | Portland brownstone Quarry, Portland, CT | Hettangian | *Batrachopus deweyii, Grallator parallelus, Anchisauripus tuberosus, Anomoepus scambus, Otozoum moodii* | na | na | na | 25 | 1 | 4 | 80 | (revised from ref. *17*) |
| 201 | Boonton | 7 | Newark | Boonton Dam, Boonton, NJ | Hettangian | *Batrachopus deweyii, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus, Anomoepus scambus* | 1 | 9 | 82 | 35 | 1 | 4 | 80 | youngest Newark basin assemblage (*16*) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | Towaco | 8 | Newark | Riker Hill Quarry, Roseland, NJ | Hettangian | *Ameghinichnus* n. sp., *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, *Anomoepus scambus* | 100 | 1400 | 93 | 35 | 2 | 4 | 67 | the most densely sampled locality in Newark basin (*17)* |
| 201 | Towaco | 9 | Newark | Stephen Drive, Montville, NJ | Hettangian | *Rhynchosauroides* sp., *Grallator parallelus*, *Anchisauripus tuberosus* | 1 | 9 | 82 | 20 | 1 | 2 | 67 | LA Rhynchosauroides (*16*) |
| 201 | East Berlin and lower Turners Falls | 10 | Hartford | | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, *Anomoepus scambus* | na | na | na | 36 | 1 | 4 | 80 | (revised from ref.*17*) |
| 201 | Towaco | 11 | Newark | Vreeland Quarry, Montville, NJ | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, *Anomoepus scambus* | 1 | 404 | 100 | 35 | 1 | 4 | 80 | (*16*) |
| 201 | Towaco | 12 | Newark | Toms Point, Lincoln Park, NJ | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, *Anomoepus scambus* | 1 | 99 | 98 | 35 | 1 | 4 | 80 | (*16*) |
| 201 | Feltville | 13 | Newark | Shrump Quarry, Roseland, NJ | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Anomoepus scambus* | 1 | 9 | 82 | 25 | 1 | 3 | 75 | (*16*) |
| 201 | Turkey Run | 14 | Culpeper | Oak Hill Estate, Aldie, VA | Hettangian | *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, cf. *Anomoepus scambus* | na | na | na | 35 | 0 | 4 | 100 | (*27*) |
| 201 | Feltville | 15 | Newark | Exeter Golf Course, Exeter, PA | Hettangian | *Grallator* cf. *G. parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus* | 0 | 4 | 100 | 33 | 0 | 3 | 100 | (*16*) |
| 201 | McCoy Brook | 16 | Fundy | Wasson Bluff | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus*, *Anomoepus scambus*, *Otozoum moodii* | na | na | na | 35 | 1 | 5 | 83 | (*27*) |
| 201 | Shuttle Meadow | 17 | Hartford | | Hettangian | *Batrachopus deweyii*, *Grallator parallelus*, *Anchisauripus tuberosus*, *Eubrontes giganteus* | na | na | na | 34 | 1 | 3 | 75 | (revised from ref. *17*) |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | Midland | 18 | Culpeper | Licking Run Reservoir, Midland, VA | Hettangian | *Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus, Batrachopus deweyii* | na | na | na | 34 | 1 | 4 | 80 | (*16*) |
| 201 | Feltville | 19 | Newark | Vosseller Rd., Martinsville, NJ | Hettangian | *Anchisauripus tuberosus, Eubrontes giganteus* | 0 | 6 | 100 | 35 | 0 | 2 | 100 | oldest interflow assemblage (*16*) |
| 201 | Passaic | 20 | Newark | Exeter Village, Exeter, PA | Hettangian | *Rhynchosauroides* sp., *Grallator parallelus* | 1 | 3 | 60 | 11 | 1 | 1 | 50 | (*16*) |
| 201 | Passaic | 21 | Newark | R. H. Hamilton Quarry, and Montclair State Univ., Clifton and Paterson, NJ | Hettangian | *Rhynchosauroides* n. sp., *Batrachopus deweyii, Grallator parallelus, Anchisauripus tuberosus, Eubrontes giganteus* | 200 | 1000 | 83 | 35 | 2 | 3 | 60 | FA, *Eubrontes giganteus*; superb specimens of all taxa (*16*) |
| 202 | Passaic | 22 | Newark | Exeter Village, Exeter, PA | Rhaetian | *Batrachopus deweyii, Rhynchosauroides* sp., *Grallator parallelus, Anchisauripus tuberosus* | 50 | 2 | 4 | 20 | 2 | 2 | 50 | (*16*) |
| 202 | Passaic | 23 | Newark | Exeter Village, Exeter, PA | Rhaetian | *Rhynchosauroides* sp., *Grallator parallelus* | 120 | 60 | 33 | 23 | 1 | 1 | 50 | (*16*) |
| 202 | Passaic | 24 | Newark | Friendship Home, Exeter, PA | Rhaetian | *Rhynchosauroides sp., Batrachopus gracilis, Apatopus* sp., *?Brachychirotherium*, New taxon B, *Grallator parallelus, Anchisauripus tuberosus* | 20 | 10 | 33 | 20 | 5 | 2 | 29 | LA, definite *Apatopus* sp. modified from ref. (*18*) |
| 202 | Passaic | 25 | Newark | Friendship Home, Exeter, PA | Rhaetian | *Brachychirotherium* sp., *Grallator parallelus* | 1 | 1 | 50 | 13 | 1 | 1 | 50 | LA, definite *Brachychirotherium* (*16*) |
| 202 | Passaic | 26 | Newark | Friendship Home, Exeter, PA | Rhaetian | *Rhynchosauroides, Batrachopus gracilis, Brachychirotherium*, New taxon B, *Grallator parallelus, Anchisauripus tuberosus* | 150 | 200 | 57 | 22 | 4 | 2 | 33 | very good and abundant *Brachychirotherium*. Modified from ref. (*18*) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 202 | Passaic | 27 | Newark | Wingspread, Exeter, PA | Rhaetian | *Rhynchosauroides* sp., *Gwyneddichnium* sp., *Batrachopus gracilis, Brachychirotherium*, New Taxon B, *Grallator parallelus, Anchisauripus tuberosus* | ~50 | 100 | 67 | 20 | 5 | 2 | 29 | LA, *Gwyneddichnium*, very good *Anchisauripus tuberosus*. Modified from ref. (*18*) |
| 202 | Passaic | 28 | Newark | Type Pine Ridge, Exeter, PA | Rhaetian | *Grallator parallelus* | 0 | 4 | 100 | 12 | 0 | 1 | 100 | (*16*) |
| 202 | Passaic | 29 | Newark | Pathfinder Meadows, Exeter | Rhaetian | *Grallator parallelus* | 0 | 2 | 100 | 11 | 0 | 1 | 100 | (*16*) |
| 202 | Passaic | 30 | Newark | Pathfinder Meadows, Exeter Township | Rhaetian | NewTaxon B, *?Brachychirotherium* sp., *Rhynchosauroides* sp., *Grallator parallelus* | 5 | 30 | 86 | 17 | 3 | 1 | 25 | major reptile bone site (*26*,*16*) |
| 202 | Passaic | 31 | Newark | West Orange, NJ | Rhaetian | *Apatopus* sp. | 1 | 0 | 0 | na | 1 | 0 | 0 | (*19*) |
| 204 | Passaic | 32 | Newark | Heister's Creek, Exeter Township, PA | Rhaetian | *Rhynchosauroides* sp., New Taxon B, *?Gwyneddichnium* sp., *Grallator parallelus* | 4 | 75 | 95 | 9 | 3 | 1 | 25 | Modified from ref. (*8*) |
| 204 | Passaic | 33 | Newark | Tulpehocken Rd., Exeter Township | Rhaetian | *Grallator parallelus* | 0 | 2 | 100 | 16 | 0 | 1 | 100 | (*16*) |
| 204 | Passaic | 34 | Newark | Shelbourn Square, Exeter Township, PA | Rhaetian | *Rhynchosauroides* sp., New Taxon B, *Batrachopus gracilis, Brachychirotherium* sp., *Grallator parallelus* | 10 | 20 | 67 | 9 | 4 | 1 | 20 | Modified from ref. (*8*) |
| 205 | Passaic | 35 | Newark | Valley Ridge, Exeter Township, PA | Rhaetian | *Grallator parallelus* | 0 | 12 | 100 | 9 | 0 | 1 | 100 | (*16*) |
| 205 | Passaic | 36 | Newark | Fairview Chapel, Exeter Township, PA | Rhaetian | *Rhynchosauroides* sp. | 20 | 0 | 0 | na | 1 | 0 | 0 | (*16*) |
| 206 | Passaic | 37 | Newark | Passaic, NJ | Rhaetian | *Procolophonichnium* sp., *?Gwyneddichnium* sp. | 3 | 0 | 0 | na | 2 | 0 | 0 | (*19*) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 206 | Passaic | 38 | Newark | Furnace Hill, Exeter Township, PA | Rhaetian | *Rhynchosauroides* sp., *Batrachopus cf. B. gracilis*, *Brachychirotherium* sp., *Chirotherium lulli*, *Atreipus* sp., *Grallator parallelus* | 75 | 40 | 35 | 10 | 6 | 1 | 14 | modified from Szajna and Hartline (*20)* LA *C. lulli*, LA *Atreipus* |
| 206 | Blomidon | 39 | Fundy | Red Head, Rossway, Nova Scotia | ?Rhaetian | *Rhynchosauroides* sp., *Apatopus cf. A. lineatus*, *Brachychirotherium, cf. Atreipus* sp., *Grallator parallelus*, *Anchisauripus tuberosus* | na | na | na | 18 | 3 | 3 | 50 | (*27*) |
| 207 | Passaic | 40 | Newark | Monacacy Hill , Amity Township, PA | ?Rhaetian | *Rhynchosauroides* sp., *Brachychirotherium* sp., *Atreipus* sp. | 8 | 2 | 20 | na | 2 | 1 | 33 | (*16*) |
| 208 | Passaic | 41 | Newark | Victoria Hill, Amity Township, PA | ?Rhaetian | *Rhynchosauroides* sp., *Apatopus lineatus*, New Taxon B, *Grallator parallelus*, *Anchisauripus tuberosus* | 7 | 5 | 42 | 25 | 3 | 2 | 40 | FA *Batrachopus cf. B. gracilis* (*16*) |
| 208 | Passaic | 42 | Newark | Douglassville, Amity Township, PA | ?Norian | *Rhynchosauroides* sp., *Gwyneddichnium* sp., *?Batrachopus sp.*, *Brachychirotherium* sp., *Atreipus* sp., *Grallator parallelus* | 5 | 200 | 98 | 10 | 4 | 2 | 33 | modified from ref. (*8*) |
| 209 | Balls Bluff | 43 | Culpeper | Floris, VA | Norian | *Apatopus sp.* | na | na | na | na | 1 | 0 | 0 | (*21)* |
| 209 | Balls Bluff | 44 | Culpeper | Manassas National Park, VA | Norian | *Rhynchosauroides* sp. | na | na | na | na | 1 | 0 | 0 | (*22)* |
| 210 | Passaic | 45 | Newark | East Greenville | Norian | *Atreipus* sp. | 0 | 6 | 100 | 14 | 0 | 1 | 100 | (*16*) |
| 211 | Balls Bluff | 46 | Culpeper | Culpeper Crushed Stone Quarry, Stevensburg. VA | Norian | *Rhynchosauroides sp.*, *Brachychirotherium spp..* *Anchisauripus tuberosus*, *Anchisauripus sp.* | na | na | na | 25 | 2 | 2 | 50 | (*23)* |
| 211 | Passaic | 47 | Newark | Rutherford, NJ | Norian | *Rhynchosauroides* sp., *Apatopus* sp., *Brachychirotherium* sp., unnamed dinosaurian genus 1, *Atreipus* sp., *Grallator parallelus*, *Anchisauripus tuberosus* | 50 | 50 | 50 | 16 | 3 | 4 | 57 | FA *Anchisauripus tuberosus* Modified from ref. (*13*) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 214 | Passaic | 48 | Newark | Limrick Airport Business Campus, Limerick, PA | Norian | *Rhynchosauroides* sp., *Atreipus* sp., *Grallator parallelus* | 6 | 6 | 50 | 5 | 1 | 2 | 67 | (*16*) |
| 214 | Passaic | 49 | Newark | Sanatoga Commons, Liberty Hill, Sanatoga, PA | Norian | *Gwyneddichnium* sp., *Atreipus* sp. | 2 | 2 | 50 | 11 | 1 | 1 | 50 | (*16*) |
| 214 | Passaic | 50 | Newark | Sanatoga Auto Body Shop, Sanatoga, PA | Norian | *Rhynchosauroides* sp., *Brachychirotherium* sp., *Atreipus* sp. | 32 | 8 | 20 | 14 | 2 | 1 | 33 | (*16*) |
| 215 | Passaic | 51 | Newark | Smith-Clark Quarry, Milford, NJ | Norian | *Rhynchosauroides* sp., *R. hyperbates*, *Apatopus lineatus*, *Chirotherium lulli*, *Brachychirotherium* sp., *Atreipus* sp., *Grallator parallelus*, *new genus 2* | 25 | 200 | 89 | 12 | 5 | 4 | 44 | FA *C. lulli*. Modified from ref. (*13*) |
| 215 | Passaic | 52 | Newark | Sanatoga Quarry, Sanatoga, PA | Norian | *Rhynchosauroides* sp., *Brachychirotherium* sp., *Atreipus acadianus*, New Genus 1 | 900 | 250 | 22 | 10 | 2 | 2 | 50 | Modified from ref. (*13*) |
| 215 | Blomidon | 53 | Fundy | Paddy Island area, Medford, Nova Scotia | Norian | *Rhynchosauroides* sp., *R. hyperbates*, *Apatopus lineatus*, *Chirotherium lulli*, *Brachychirotherium*, *Atreipus*, unnamed dinosaurian genus 1 | na | na | na | na | 5 | 3 | 38 | |
| 216 | Passaic | 54 | Newark | Heather Glen, Limerick, PA | Norian | *Rhynchosauroides* sp, *Atreipus* sp | 12 | 3 | 20 | 12 | 1 | 1 | 50 | (*16*) |
| 216 | Passaic | 55 | Newark | Graterford Prison, Graterford, PA | Norian | *Rhynchosauroides* sp., *Atreipus* sp. | 20 | 200 | 91 | 12 | 1 | 1 | 50 | |
| 217 | Passaic | 56 | Newark | Nishisackawick Creek, | Carno-Norian | *Rhynchosauroides* sp., *Brachychirotherium* sp., *Atreipus* sp. | 50 | 80 | 62 | 13 | 2 | 1 | 33 | Modified from ref. (*13*) |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 217 | Passaic | 57 | Newark | Mainland, PA | Carno-Norian | *Rhynchosauroides* sp., *Gwyneddichnium* sp., *Brachychirotherium* sp., *Atreipus* sp., *Grallator parallelus* | 20 | 25 | 56 | 10 | 3 | 2 | 40 | (*16*) |
| 217 | Passaic | 58 | Newark | Ridge Pike & Township Ln. Rd., Trappe, PA | Carno-Norian | *Rhynchosauroides* sp., *Brachychirotherium* sp., *Atreipus* sp., *Grallator parallelus* | 38 | 12 | 24 | 10 | 2 | 2 | 50 | (*16*) |
| 218 | Passaic | 59 | Newark | Blooming Glen Quarry, Blooming Glen, PA | Carnian | *Rhynchosauroides* sp., *Apatopus lineatus*, *Gwyneddichnium* sp., *Brachychirotherium* sp., *Atreipus* sp. | 21 | 6 | 22 | 15 | 4 | 1 | 20 | (*16*) |
| 219 | Lockatong | 60 | Newark | Upper Fairview, PA | Carnian | *Rhynchosauroides* sp., *Brachychirotherium* sp., indt. dinosaur | 28 | 2 | 7 | na | 2 | 1 | 33 | (*16*) |
| 221 | Lockatong | 61 | Newark | Arcola, PA | Carnian | *Rhynchosauroides* sp., *R. hyperbates*, *Gwyneddichnium* sp., *Apatopus* sp., *Brachychirotherium* sp., *Atreipus* sp., *Grallator parallelus* | 200 | 10 | 5 | 12 | 5 | 2 | 29 | FA *R. hyperbates*, Modified from ref. (*13*) |
| 222 | Lockatong | 62 | Newark | Gwynedd, PA | Carnian | *Gwyneddichnium* sp., *?Atreipus* sp. | 20 | 2 | 9 | 12 | 1 | 1 | 50 | FA *Gwyneddichnium* (*13*) |
| 222 | Stockton | 63 | Newark | Grandview and South Nyack, NY | Carnian | *Brachychirotherium* sp., *Atreipus* sp. | 4 | 2 | 33 | 12 | 1 | 1 | 50 | (*16*) |
| 222 | Stockton | 64 | Newark | Haverstraw (south), NY | Carnian | *Brachychirotherium* sp., *Grallator parallelus* | 3 | 2 | 40 | 7 | 1 | 1 | 50 | FA *Grallator parallelus*. Modified from ref. (*24*) |
| 222 | Stockton | 65 | Newark | Haverstraw (north), NY | Carnian | *Rhynchosauroides* sp., *Apatopus* sp., *Brachychirotherium* sp., *Atreipus* sp., *?Grallator parallelus* sp. | 10 | 4 | 29 | 9 | 3 | 2 | 40 | FA listed taxa; oldest Newark basin track assemblage? Modified from ref. (24) |

Table 2, continued: Osteological Taxa

| Age Ma | Formation | Abbrev-iation | Basin | Locality | Age | Osteological Taxon | Comments |
|---|---|---|---|---|---|---|---|
| 199 | Portland | 66 | Hartford | Hines Quarry, Longmeadow, MA | Sinemurian | protosuchian *Stegomus longipes* | type specimen, partial skeleton and skull (*17*) |
| 201 | McCoy Brook | 67 | Fundy | Wasson Bluff, Cumberland County, Nova Scotia | Hettangian | protosuchian *Protosuchus micmac* | Abundant skeleteal elements, site also has produced abundant prosauropod dinosaurs, rare ornithischian and possible theropod dinosaur teeth and bones, and abundant sphenosuchian skeletons and elements, and rare trithelodonts (*25*) |
| 202 | Passaic | 68 | Newark | Pathfinder Meadows, Exeter Township | Rhaetian | protosuchian *Protosuchus* sp., *Hypsognathus fennerii* | *Protosuchus*: osteoderms, jaw, postcranial fragments. *Hypsognathus*, abundant skulls, partial skeletons and individual bones and teeth (*16*) |
| 202 | Passaic | 69 | Newark | Walnut Street, Exeter Township, PA | Rhaetian | phytosauria indet. | teeth (*16*) |
| 202 | Passaic | 70 | Newark | Clifton, NJ | Rhaetian | *Hypsognathus fennerii* | type specimen, partial skeleton and mandibles (*26*) |
| 205 | Passaic | 71 | Newark | Passaic, NJ | Rhaetian | *Hypsognathus fennerii* | several partial skulls and skeletons (*26*) |
| 206 | Passaic | 72 | Newark | Passaic, NJ | Rhaetian | *Hypsognathus fennerii* | partial skull (*26*) |
| 206 | Blomidon | 73 | Fundy | Red Head, Rossway, Annapolis Co., Nova Scotia | Norian-Rhaetian | phytosauria indet. | rostrum, fragmentary mandible, osteoderm (*27*) |
| 210 | Passaic | 74 | Newark | East Greenville | Norian | *Hypsognathus fennerii* | partial skull (*26*) |
| 211 | Passaic | 75 | Newark | Hosensack Creek, lower Milford, PA | Norian | phytosaur: *Clepsysaurus pennsylvanicus* | teeth, skull and postcranial fragments (*28*) |
| 214 | Passaic | 76 | Newark | Sanatoga Auto Body Shop, Sanatoga, PA | Norian | phytosauria indet. | postcranial elements and teeth (*16*) |
| 215 | Passaic | 77 | Newark | Smith-Clark Quarry, Milford, NJ | Norian | phytosauria indet. | tooth (*16*) |
| 215 | Blomidon | 78 | Fundy | Paddy Island area, Medford, Nova Scotia | Norian | *Hypsognathus* cf. *H. fennerii* | Complete skull and fragmentary postcranial elements , partial mandible (26) |
| 221 | Lockatong | 79 | Newark | Granton Quarry, North Bergen, NJ | Carnian | phytosaur, cf. *Rutiodon* | partial juvenile skull (*29*) |
| 222 | Stockton | 80 | Newark | Edgewater, NJ | Carnian | *Rutiodon manhattanensis* | partial postcranial skeleton (*30*) |

**Supplemental Material, Table 3:** Concentrations of elements at the four sections shown is Supplemental Material Figure 3 (*31*,*32*,*33*). LOI, represents loss on ignition and corresponds roughly to organic matter content plus water. Depth is depth above (+) or below (-) base of blue-gray sandstone: first number is top of sample, second is bottom. (--), indicates problems with the mechanics of processing the sample (e.g. vial damage). The prefixes 1, 2, 3, and g correspond to samples from sections I, II, III, and Grist Mills sections. Coordinates for localities given in ref. *34*.

| Sample | 1TJ-1 | 1TJ-2 | 1TJ-3 | 1TJ-4 | 1TJ-5 | 1TJ-6 | 1TJ-7 | 1TJ-8 | 1TJ-9 | 1TJ-10 | 1TJ-11 | 2TJ-12 | 2TJ-13 | 2TJ-14 | 2TJ-15 | 2TJ-16 | 2TJ-17 | 2TJ-18 | 2TJ-19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth (cm) | 0,+10 | 0, -5 | -5,-10 | -10,-14 | -14,-22 | -22,-34 | -34,-42 | -42,51 | -51,-60 | -60,-79 | -79,-111 | +8,0 | 0,-9 | -9,-14 | -14,-25 | -25,-35 | -35,-43 | -43,-50 | -50,-56 |
| Ir ppt(*35*) | 97±19 | < 80 | 25±10 | 96±19 | 76±17 | 71±17 | 40±12 | 35±12 | 56±15 | -- | -- | 21±9 | 119±21 | 103±20 | <85 | 61±15 | 23±9 | 73±17 | 35±12 |
| SiO2 % | 75.1 | 31.0 | 49.2 | 62.7 | 64.2 | 53.3 | 56.8 | 68.6 | 69.3 | 70.8 | 77.7 | 44.4 | 77.9 | 53.0 | 52.6 | 56.1 | 58.9 | 70.2 | 56.6 |
| TiO2 % | 0.75 | 0.55 | 0.83 | 0.89 | 0.97 | 0.98 | 1.01 | 0.94 | 0.95 | 0.92 | 0.75 | 0.44 | 0.68 | 0.7 | 0.92 | 0.97 | 0.98 | 0.85 | 1.08 |
| Al2O3 % | 10.9 | 11.0 | 18.5 | 17.8 | 16.7 | 17.5 | 19.5 | 15.0 | 14.7 | 13.2 | 10.1 | 17.8 | 8.0 | 12.6 | 20.0 | 20.5 | 15.7 | 12.4 | 21.4 |
| Fe2O3 % | 5.10 | 4.13 | 8.06 | 4.96 | 5.92 | 13.4 | 8.77 | 4.50 | 4.72 | 3.59 | 3.36 | 5.83 | 6.21 | 9.12 | 9.06 | 7.95 | 13.14 | 7.30 | 6.05 |
| MnO % | 0.04 | 0.02 | <0.01 | 0.14 | 0.13 | <0.01 | 0.15 | 0.11 | 0.07 | 0.14 | 0.35 | 0.70 | <0.01 | 0.09 | 1.96 | <0.01 | 0.03 | 0.32 | <0.01 |
| MgO % | 0 .34 | 1.15 | 1.2 | 0.87 | 0.88 | 0.92 | 1.29 | 1.07 | 1.08 | 1.05 | 0.77 | 4.16 | 0.11 | 0.97 | 1.31 | 1.23 | 0.82 | 0.64 | 2.02 |
| CaO % | 0.19 | 2.24 | 1.34 | 0.37 | 0.53 | 0.23 | 0.32 | 0.28 | 0.29 | 0.28 | 0.24 | 20.0 | 0.19 | 1.66 | 0.62 | 0.41 | 0.25 | 0.23 | 0.52 |
| Na2O % | 0.31 | 1.76 | 0.36 | 0.40 | 0.48 | 0.66 | 0.32 | 0.85 | 0.86 | 3.84 | 0.88 | 0.85 | 0.55 | 0.47 | 0.24 | 0.26 | 0.58 | 0.92 | 0.53 |
| K2O % | 2.23 | 2.19 | 3.51 | 3.55 | 3.29 | 4.16 | 4.64 | 3.04 | 3.09 | 1.58 | 1.81 | 3.46 | 1.79 | 2.96 | 4.8 | 4.87 | 3.64 | 2.43 | 5.09 |
| P2O5 % | 0.11 | 0.09 | 0.12 | 0.04 | 0.06 | 0.12 | 0.13 | 0.10 | 0.10 | 0.10 | 0.07 | 0.16 | 0.10 | 0.19 | 0.15 | 0.13 | 0.17 | 0.21 | 0.13 |
| LOI % | 4.93 | 46.0 | 16.7 | 8.04 | 6.80 | 8.41 | 7.11 | 5.33 | 5.20 | 4.9 | 3.58 | 0.92 | 4.78 | 17.86 | 8.59 | 7.43 | 6.19 | 4.41 | 7.15 |
| TOTAL | 99.97 | 100.07 | 99.84 | 99.73 | 99.90 | 99.69 | 100.01 | 99.82 | 100.35 | 100.46 | 99.64 | 98.70 | 100.29 | 99.64 | 100.23 | 99.81 | 100.33 | 99.97 | 100.5 |
| Sc ppm | 10.0 | 21.5 | 22.4 | 19.7 | 19.0 | 16.8 | 19.3 | 14.5 | 13.2 | 12.0 | 8.75 | 9.17 | 7.22 | 15.4 | 19.8 | 18.8 | 15.3 | 10.6 | 22.1 |
| V ppm | 174 | 159 | 249 | 135 | 137 | 170 | 171 | 112 | 111 | 109 | 94 | 318 | 189 | 475 | 280 | 273 | 141 | 107 | 172 |
| Cr ppm | 66 | 221 | 151 | 98 | 98 | 93 | 102 | 76 | 73 | 70 | 48 | 110 | 51 | 49 | 111 | 106 | 84 | 64 | 111 |
| Co ppm | 4.5 | 13.4 | 12.9 | 2.9 | 3.9 | 3.9 | 6.2 | 6.8 | 7.3 | 7.8 | 43.5 | 1.8 | 2.7 | 3.4 | 4.5 | 3.9 | 4.3 | 6.1 | 19.6 |
| Ni ppm | 17 | 68 | 33 | 13 | 15 | 18 | 24 | 26 | 29 | 38 | 35 | 88 | 35 | 30 | 21 | 18 | 51 | 22 | 43 |
| Cu ppm | 7 | 485 | 180 | 21 | 45 | 71 | 49 | 28 | 45 | 30 | 110 | 147 | 5 | 106 | 52 | 54 | 30 | 31 | 107 |
| Zn ppm | 169 | 185 | 146 | 86.4 | 100 | 153 | 167 | 134 | 163 | 166 | 142 | 155 | 133 | 304 | 230 | 169 | 246 | 179 | 186 |
| As ppm | 61 | 30 | 272 | 77 | 78 | 42 | 69 | 24 | 25 | 49 | 10 | 16 | 111 | 34 | 134 | 92 | 72.7 | 26 | 23 |
| Se ppm | 10 | 9 | 6 | 3 | 3 | 3 | 2 | 2 | < 3 | 3 | 1 | 16 | 18 | 35 | 22.5 | 10 | 2.35 | 6 | 2 |
| Br ppm | 1.6 | 0.3 | 10.9 | 2.5 | 0.8 | 0.6 | 1.0 | 0.8 | 0.5 | 1.4 | 0.6 | 19.9 | 1.1 | 9.3 | 3.6 | 2.6 | 0.67 | 0.7 | 1.2 |
| Rb ppm | 96.1 | 102 | 202 | 201 | 199 | 180 | 202 | 136 | 123 | 109 | 73.1 | 25.8 | 75.7 | 110 | 222 | 194 | 146 | 93.7 | 236 |
| Sr ppm | 74 | 142 | 122 | 119 | 111 | 102 | 119 | 83 | 87 | 81 | 58 | 111 | 49 | 78 | 111 | 117 | 84 | 66 | 147 |
| Y ppm | 20 | 274 | 80 | 35 | 35 | 28 | 33 | 34 | 35 | 37 | 35 | 94 | 24 | 32 | 26 | 32 | 29 | 31 | 44 |
| Zr ppm | 233 | 426 | 138 | 294 | 242 | 220 | 217 | 386 | 417 | 441 | 365 | 340 | 297 | 150 | 143 | 224 | 207 | 354 | 267 |
| Nb ppm | 13 | 6 | 12 | 22 | 21 | 16 | 17 | 20 | 19 | 20 | 14 | 3 | 12 | 12 | 16 | 19 | 16 | 14 | 22 |
| Sb ppm | 2.73 | 8.88 | 11.9 | 4.94 | 7.71 | 2.60 | 4.02 | 1.68 | 1.63 | 6.50 | 0.83 | 2.07 | 3.40 | 7.55 | 4.11 | 4.68 | 6.69 | 1.63 | 1.96 |
| Cs ppm | 4.41 | 6.45 | 12.5 | 12.1 | 10.4 | 9.81 | 12.0 | 6.82 | 6.30 | 5.53 | 3.57 | 2.08 | 2.81 | 7.89 | 13.5 | 11.8 | 7.00 | 4.26 | 15.4 |
| Ba ppm | 363 | 286 | 465 | 431 | 473 | 504 | 549 | 450 | 468 | 388 | 295 | 492 | 284 | 334 | 551 | 538 | 476 | 345 | 607 |
| La ppm | 36.7 | 66.2 | 70.4 | 66.3 | 57.5 | 50.5 | 64.8 | 51.5 | 51.3 | 53.4 | 39.7 | 16.5 | 35.7 | 42.9 | 66.5 | 57.9 | 45.0 | 41.7 | 74.8 |
| Ce ppm | 72.3 | 125 | 151 | 116 | 102 | 104 | 132 | 95.4 | 97.6 | 90.8 | 80.9 | 49.8 | 70.8 | 87.2 | 118 | 108 | 83.2 | 80.4 | 147 |
| Nd ppm | 32.4 | 148 | 91.3 | 61.6 | 46.0 | 47.2 | 58.0 | 45.7 | 47.4 | 43.9 | 40.5 | 75.8 | 33.1 | 44.3 | 51.6 | 50.1 | 36.8 | 36.8 | 71.9 |
| Sm ppm | 5.63 | 57.5 | 23.7 | 9.93 | 9.29 | 7.21 | 9.42 | 7.48 | 7.54 | 7.74 | 8.58 | 31.8 | 5.68 | 10.6 | 8.51 | 8.15 | 6.84 | 6.08 | 10.8 |
| Eu ppm | 1.10 | 12.8 | 4.43 | 1.54 | 1.51 | 1.32 | 1.53 | 1.24 | 1.30 | 1.34 | 1.82 | 6.53 | 1.07 | 2.38 | 1.28 | 1.37 | 1.18 | 1.17 | 1.95 |
| Gd ppm | 3.87 | 49.6 | 17.6 | 6.5 | 6.51 | 4.93 | 6.07 | 6.56 | 6.54 | 6.30 | 6.69 | 24.1 | 3.98 | 8.12 | 4.96 | 5.03 | 5.16 | 5.46 | 8.34 |
| Tb ppm | 0.55 | 8.19 | 2.65 | 0.90 | 0.94 | 0.70 | 0.84 | 1.06 | 1.05 | 0.98 | 1.02 | 3.67 | 0.57 | 1.23 | 0.65 | 0.74 | 0.77 | 0.89 | 1.27 |
| Tm ppm | 0.38 | 2.40 | 1.15 | 0.63 | 0.54 | 0.48 | 0.52 | 0.66 | 0.67 | 0.68 | 0.55 | 1.32 | 0.38 | 0.58 | 0.45 | 0.45 | 0.46 | 0.54 | 0.76 |
| Yb ppm | 2.75 | 16.5 | 7.32 | 4.53 | 3.71 | 3.48 | 3.65 | 4.64 | 4.70 | 4.80 | 3.68 | 8.02 | 2.71 | 3.76 | 3.20 | 3.09 | 3.18 | 3.79 | 5.27 |
| Lu ppm | 0.44 | 2.16 | 1.03 | 0.71 | 0.55 | 0.56 | 0.56 | 0.68 | 0.73 | 0.73 | 0.56 | 1.16 | 0.41 | 0.57 | 0.48 | 0.48 | 0.48 | 0.60 | 0.77 |
| Hf ppm | 6.68 | 4.26 | 4.87 | 7.01 | 7.29 | 5.15 | 5.98 | 11.2 | 12.3 | 12.6 | 9.66 | 14.4 | 8.47 | 9.39 | 4.46 | 4.83 | 6.40 | 10.9 | 6.81 |
| Ta ppm | 0.89 | 0.77 | 1.18 | 1.49 | 1.40 | 1.37 | 1.24 | 1.38 | 1.36 | 1.23 | 0.85 | 0.23 | 0.72 | 0.95 | 0.48 | 1.05 | 1.07 | 1.04 | 1.60 |
| Ir ppb(*36*) | < 1 | < 1 | < 2 | < 1 | < 1 | 0.1 | < 1 | < 1 | < 2 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 2 |
| Au ppb | 2 | 0.4 | 3 | 2 | 3 | 1 | 2 | < 5 | < 5 | 5 | 0.8 | 2 | < 4 | 1 | 2 | 1 | 0.4 | 0.4 | 1 |
| Th ppm | 10.1 | 10.2 | 18.2 | 18.4 | 17.5 | 15.2 | 17.2 | 15.2 | 15.2 | 14.6 | 11.5 | 3.36 | 8.98 | 11.7 | 17.0 | 15.5 | 13.2 | 12.9 | 18.1 |
| U ppm | 6.11 | 18.6 | 46.4 | 13.2 | 12.8 | 6.57 | 8.76 | 7.13 | 7.77 | 25.4 | 5.04 | 28.5 | 6.08 | 33.3 | 12.9 | 10.3 | 11.3 | 7.11 | 8.43 |
| K / U | 3030 | 977 | 628 | 2233 | 2134 | 5256 | 4397 | 3539 | 3301 | 516 | 2981 | 1008 | 2444 | 738 | 3089 | 3925 | 2674 | 2837 | 5012 |
| Th / U | 1.65 | 0.55 | 0.39 | 1.39 | 1.37 | 2.31 | 1.96 | 2.13 | 1.96 | 0.57 | 2.28 | 0.12 | 1.48 | 0.35 | 1.32 | 1.50 | 1.17 | 1.81 | 2.15 |
| La / Th | 3.63 | 6.49 | 3.87 | 3.60 | 3.29 | 3.32 | 3.77 | 3.39 | 3.38 | 3.66 | 3.45 | 4.91 | 3.98 | 3.67 | 3.91 | 3.74 | 3.41 | 3.23 | 4.13 |
| Zr / Hf | 34.9 | 100.0 | 28.3 | 41.9 | 33.2 | 42.7 | 36.3 | 34.4 | 33.9 | 35.0 | 37.8 | 23.6 | 35.1 | 16.0 | 32.1 | 46.3 | 32.3 | 32.5 | 39.2 |
| Hf / Ta | 7.51 | 5.53 | 4.13 | 4.70 | 5.21 | 3.76 | 4.82 | 8.12 | 9.04 | 10.2 | 11.4 | 62.6 | 11.8 | 9.88 | 9.29 | 4.60 | 5.98 | 10.5 | 4.26 |
| La / Yb | 13.3 | 4.01 | 9.62 | 14.6 | 15.5 | 14.5 | 17.8 | 11.1 | 10.9 | 11.1 | 10.8 | 2.06 | 13.2 | 11.4 | 20.8 | 18.7 | 14.2 | 11.0 | 14.2 |
| Eu/ Eu* | 0.72 | 0.73 | 0.66 | 0.59 | 0.59 | 0.68 | 0.62 | 0.54 | 0.57 | 0.59 | 0.73 | 0.72 | 0.69 | 0.78 | 0.60 | 0.65 | 0.61 | 0.62 | 0.63 |

TABLE 3, CONTINUED: CONCENTRATIONS OF ELEMENTS AT THE FOUR SECTIONS SHOWN IN FIGURE 8

| Sample | 3TJ-20 | 3TJ-21 | 3TJ-22 | 3TJ-23 | 3TJ-24 | 3TJ-25 | 3TJ-25A | gTJ-26 | gTJ-27 | gTJ-28 | gTJ-29 | gTJ-30 | gTJ-31 | gTJ-32 | gTJ-33 | gTJ-34 | gTJ-35 | gTJ-36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth (cm) | +15,0 | 0,-5 | -5,-9 | -9,-13 | -13,-22 | -22,-29 | -29,-36 | +3,0 | 0,-5 | -5,-9 | -9,-21 | -21,-31 | -31,-40 | -40,-47 | -47,-51 | -51,-57 | -57,-62 | -62,-65 |
| Ir ppt (*35*) | 158±25 | 285±33 | 87±18 | 114±21 | 34±11 | 48±14 | 39±12 | 60±15 | 83±18 | 177±26 | 113±21 | 116±21 | 19±9 | 83±18 | 97±19 | 28±10 | **30** | **25** |
| SiO2 % | 74.3 | 57.3 | 60.1 | 57.2 | 76.5 | 17.5 | 75.1 | 78.8 | 58.4 | 65.1 | 71.4 | 61.2 | 60.3 | 70.9 | 51.8 | 54.5 | 71.2 | 72.8 |
| TiO2 % | 0.9 | 1.17 | 1.22 | 1.22 | 0.86 | 0.26 | 0.90 | 0.75 | 1.00 | 0.94 | 0.85 | 0.94 | 0.94 | 0.12 | 0.87 | 0.93 | 0.97 | 0.77 |
| Al2O3 % | 11.0 | 19.9 | 20.2 | 19.8 | 11.9 | 5.22 | 12.2 | 9.7 | 20.8 | 16.4 | 12.6 | 17.0 | 18.4 | 11.7 | 20.5 | 20.9 | 14.1 | 12.1 |
| Fe2O3 % | 5.57 | 7.59 | 4.81 | 6.14 | 3.42 | 2.34 | 4.04 | 3.19 | 5.24 | 6.07 | 5.50 | 8.10 | 6.76 | 3.29 | 6.17 | 5.55 | 4.02 | 3.99 |
| MnO % | <0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.68 | <0.01 | 0.04 | <0.01 | <0.01 | 0.02 | <0.01 | 0.01 | <0.01 | 0.07 | 0.05 | <0.01 | <0.01 |
| MgO % | 0.49 | 1.18 | 1.15 | 1.25 | 0.45 | 1.63 | 0.52 | 0.56 | 2.16 | 1.58 | 1.22 | 1.9 | 1.94 | 0.48 | 2.70 | 2.86 | 1.34 | 1.26 |
| CaO % | 0.25 | 0.35 | 0.34 | 0.52 | 0.25 | 41.8 | 0.27 | 0.52 | 0.66 | 0.49 | 0.45 | 0.52 | 0.5 | 0.25 | 1.48 | 1.37 | 0.47 | 1.27 |
| Na2O % | 0.80 | 0.42 | 0.46 | 0.61 | 0.93 | 0.93 | 1.04 | 0.80 | 0.39 | 0.31 | 0.77 | 0.27 | 0.35 | 0.11 | 0.22 | 0.24 | 0.86 | 0.84 |
| K2O % | 2.21 | 4.81 | 5.05 | 4.68 | 2.59 | 1.07 | 2.19 | 2.01 | 5.12 | 4.09 | 2.91 | 4.26 | 4.67 | 2.43 | 5.12 | 5.19 | 3.32 | 2.63 |
| P2O5 % | 0.13 | 0.11 | 0.09 | 0.12 | 0.07 | 0.10 | 0.08 | 0.11 | 0.21 | 0.13 | 0.26 | 0.14 | 0.13 | 0.12 | 0.13 | 0.22 | 0.07 | 0.08 |
| LOI % | 4.78 | 7.19 | 6.82 | 8.88 | 3.55 | 28.5 | 3.83 | 3.44 | 5.76 | 4.72 | 4.15 | 5.94 | 5.96 | 8.63 | 11.14 | 7.44 | 4.46 | 4.43 |
| TOTAL | 100.38 | 100.02 | 100.19 | 100.38 | 100.42 | 100.04 | 100.15 | 99.86 | 99.71 | 99.88 | 100.15 | 100.25 | 99.92 | 97.98 | 100.19 | 99.27 | 100.80 | 100.17 |
| Sc ppm | 10.9 | 18.9 | 20.2 | 23.5 | 11.0 | 10.8 | 11.5 | 8.32 | 21.8 | 16.4 | 11.1 | 17.1 | 16.0 | 5.8 | 17.2 | 20.3 | 12.7 | 9.23 |
| V ppm | 187 | 316 | 232 | 330 | 124 | 223 | 118 | 107 | 179 | 143 | 99 | 138 | 154 | 29 | 182 | 198 | 100 | 85 |
| Cr ppm | 92 | 165 | 145 | 183 | 83 | 81 | 73 | 49 | 109 | 89 | 59 | 87 | 84 | 21 | 87 | 86 | 68 | 48 |
| Co ppm | 4.9 | 4.2 | 3.3 | 4.9 | 3.7 | 3.5 | 3.3 | 11.0 | 24.2 | 16.7 | 12.4 | 17.7 | 14.6 | 5.5 | 21.9 | 20.8 | 10.3 | 9.7 |
| Ni ppm | 33 | 23 | 17 | 21 | 18 | 18 | 19 | 32 | 52 | 48 | 49 | 52 | 51 | 17 | 48 | 14 | 29 | 26 |
| Cu ppm | 10 | 45 | 19 | 49 | 7 | 20 | 19 | 55 | 242 | 74 | 16 | <2 | 43 | 48 | 392 | 227 | 66 | 42 |
| Zn ppm | 264 | 486 | 379 | 441 | 188 | 233 | 222 | 49.1 | 104 | 93.4 | 72.7 | 107 | 99.1 | 27.1 | 124 | 147 | 76.1 | 40.3 |
| As ppm | 33 | 56 | 35 | 52 | 31 | 33 | 27 | 8 | 26 | 13 | 8 | 94 | 10 | 9 | 16 | 30 | 8 | 5 |
| Se ppm | 4 | 4 | 3 | 6 | 3 | 2 | 4 | < 1 | 2 | 1 | 1 | < 2 | 1 | 2 | < 2 | 2 | 2 | 1 |
| Br ppm | 0.9 | 1.9 | 1.9 | 8 | 0.5 | 1.1 | 0.9 | 0.6 | 0.3 | 0.5 | 0.5 | 2.6 | 0.2 | 0.5 | 0.6 | 0.6 | 0.5 | 0.4 |
| Rb ppm | 98.1 | 163 | 197 | 194 | 100 | 101 | 102 | 93.7 | 251 | 184 | 129 | 211 | 179 | 39.7 | 212 | 18.0 | 155 | 105 |
| Sr ppm | 83 | 194 | 203 | 158 | 84 | 89 | 86 | 57 | 100 | 79 | 64 | 80 | 85 | 348 | 106 | 106 | 78 | 363 |
| Y ppm | 33 | 48 | 44 | 67 | 31 | 36 | 38 | 30 | 44 | 40 | 42 | 40 | 35 | 28 | 35 | 39 | 37 | 70 |
| Zr ppm | 350 | 263 | 215 | 220 | 366 | 428 | 396 | 363 | 271 | 254 | 335 | 246 | 177 | 106 | 153 | 156 | 479 | 29 |
| Nb ppm | 18 | 22 | 24 | 21 | 17 | 17 | 18 | 13 | 21 | 20 | 17 | 19 | 18 | <3 | 18 | 19 | 20 | 304 |
| Sb ppm | 1.92 | 6.06 | 3.74 | 3.91 | 3.15 | 2.75 | 2.50 | 1.26 | 1.81 | 2.13 | 1.22 | 4.78 | 2.02 | 0.74 | 1.08 | 1.66 | 1.15 | 16 |
| Cs ppm | 4.57 | 8.77 | 11.0 | 12.6 | 4.47 | 4.49 | 4.26 | 4.80 | 13.7 | 9.80 | 6.47 | 12.6 | 10.6 | 1.89 | 11.7 | 14.0 | 8.45 | 5.19 |
| Ba ppm | 324 | 459 | 504 | 503 | 414 | 495 | 361 | 349 | 552 | 484 | 358 | 576 | 508 | 132 | 521 | 545 | 563 | 435 |
| La ppm | 41.9 | 49.9 | 60.2 | 61.0 | 44.8 | 50.4 | 45.8 | 45.8 | 62.4 | 47.7 | 40.0 | 58.6 | 43.9 | 17.1 | 56.5 | 54.6 | 52.4 | 36.2 |
| Ce ppm | 74.9 | 90.9 | 99.3 | 106 | 75.8 | 88.9 | 87.6 | 89.0 | 108 | 92.0 | 80.5 | 98.8 | 87.3 | 38.4 | 97.7 | 99.4 | 102 | 70.1 |
| Nd ppm | 33.8 | 49.0 | 48.6 | 60.3 | 39.1 | 44.5 | 42.1 | 43.6 | 51.8 | 43.1 | 44.9 | 52.5 | 34.8 | 24.9 | 44.1 | 40.3 | 49.7 | 34.9 |
| Sm ppm | 7.01 | 9.15 | 9.67 | 13.3 | 7.16 | 7.68 | 7.27 | 8.12 | 11.9 | 8.42 | 8.77 | 9.47 | 7.14 | 7.56 | 7.70 | 9.08 | 7.97 | 5.93 |
| Eu ppm | 1.35 | 1.69 | 1.46 | 2.79 | 1.11 | 1.39 | 1.48 | 1.49 | 1.93 | 1.73 | 1.79 | 1.94 | 1.27 | 1.63 | 1.50 | 2.02 | 1.38 | 1.12 |
| Gd ppm | 5.68 | 6.43 | 6.41 | 10.7 | 5.41 | 6.86 | 6.66 | 6.01 | 9.1 | 6.69 | 7.17 | 7.65 | 5.14 | 6.38 | 5.36 | 7.96 | 7.15 | 5.03 |
| Tb ppm | 0.88 | 0.93 | 0.90 | 1.66 | 0.81 | 1.12 | 1.10 | 0.89 | 1.38 | 1.03 | 1.12 | 1.19 | 0.75 | 1.01 | 0.77 | 1.29 | 1.17 | 0.82 |
| Tm ppm | 0.52 | 0.56 | 0.56 | 0.87 | 0.49 | 0.67 | 0.69 | 0.52 | 0.68 | 0.57 | 0.63 | 0.66 | 0.45 | 0.39 | 0.52 | 0.62 | 0.70 | 0.49 |
| Yb ppm | 3.63 | 3.85 | 3.89 | 5.86 | 3.41 | 4.62 | 4.85 | 3.58 | 4.50 | 3.88 | 4.33 | 4.50 | 3.10 | 2.43 | 3.72 | 4.05 | 4.81 | 3.43 |
| Lu ppm | 0.55 | 0.58 | 0.60 | 0.92 | 0.52 | 0.70 | 0.72 | 0.53 | 0.62 | 0.59 | 0.64 | 0.67 | 0.47 | 0.37 | 0.53 | 0.60 | 0.72 | 0.52 |
| Hf ppm | 10.8 | 5.28 | 5.79 | 7.27 | 7.88 | 13.5 | 12.3 | 10.4 | 6.42 | 6.55 | 8.77 | 6.37 | 4.46 | 1.22 | 4.18 | 11.4 | 13.2 | 8.90 |
| Ta ppm | 1.05 | 1.16 | 1.32 | 1.41 | 1.21 | 1.22 | 1.23 | 0.82 | 1.24 | 1.10 | 1.01 | 1.35 | 0.92 | 0.21 | 1.03 | 1.28 | 1.54 | 0.96 |
| Ir ppb (*36*) | < 1 | < 1 | < 1 | 0.5 | < 1 | 0.2 | 0.2 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 0.2 | < 1 | < 1 | < 1 |
| Au ppb | 1 | 0.4 | 6 | 10 | 0.2 | 0.4 | 1 | 0.4 | < 20 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 0.4 | 0.5 |
| Th ppm | 11.8 | 13.3 | 15.0 | 16.2 | 12.2 | 14.3 | 13.8 | 11.5 | 17.7 | 13.9 | 12.1 | 15.5 | 12.2 | 3.17 | 14.5 | 15.1 | 16.2 | 10.9 |
| U ppm | 6.15 | 7.22 | 9.09 | 15.0 | 7.07 | 5.12 | 5.17 | 2.87 | 6.52 | 3.3 | 3.47 | 10.6 | 4.06 | 4.29 | 3.80 | 7.21 | 5.00 | 3.24 |
| K / U | 2983 | 5530 | 4612 | 2590 | 3041 | 1735 | 3516 | 5814 | 6519 | 10289 | 6962 | 3336 | 9549 | 4702 | 11185 | 5976 | 5512 | 2141 |
| Th / U | 1.92 | 1.84 | 1.65 | 1.08 | 1.73 | 2.79 | 2.67 | 4.01 | 2.71 | 4.21 | 3.49 | 1.46 | 3.00 | 0.74 | 3.82 | 2.09 | 3.24 | 3.36 |
| La / Th | 3.55 | 3.75 | 4.01 | 3.77 | 3.67 | 3.52 | 3.32 | 3.98 | 3.53 | 3.43 | 3.31 | 3.78 | 3.60 | 5.39 | 3.90 | 3.62 | 3.23 | 3.32 |
| Zr / Hf | 32.4 | 49.8 | 37.1 | 30.3 | 46.4 | 31.7 | 32.2 | 34.9 | 42.1 | 38.7 | 38.2 | 38.6 | 39.7 | 86.5 | 36.6 | 13.7 | 36.3 | 3.26 |
| Hf / Ta | 10.3 | 4.55 | 4.39 | 5.16 | 6.51 | 11.1 | 10.0 | 12.7 | 5.18 | 5.95 | 8.68 | 4.72 | 4.85 | 5.81 | 4.06 | 8.91 | 8.57 | 9.27 |
| La / Yb | 11.5 | 13.0 | 15.5 | 10.4 | 13.1 | 10.9 | 9.44 | 12.8 | 13.9 | 12.3 | 9.24 | 13.0 | 14.2 | 7.04 | 15.2 | 13.5 | 10.9 | 10.6 |
| Eu/ Eu* | 0.65 | 0.67 | 0.57 | 0.72 | 0.55 | 0.59 | 0.65 | 0.65 | 0.57 | 0.70 | 0.69 | 0.70 | 0.64 | 0.72 | 0.71 | 0.73 | 0.56 | 0.63 |

**Supplemental Material Table 4:** Average Ir values for the four sites in Supplemental Material Figure 3 and Table 4 (*32*).

| Depth (cm) | average IR |
|---|---|
| -2 | 59.0 |
| -1 | 84.0 |
| 0 | 84.0 |
| 1 | 141.2 |
| 2 | 91.1 |
| 3 | 80.9 |
| 4 | 109.8 |
| 5 | 121.9 |
| 6 | 118.1 |
| 7 | 101.5 |
| 8 | 77.0 |
| 9 | 75.8 |
| 10 | 75.8 |
| 11 | 75.8 |
| 12 | 75.8 |
| 13 | 62.0 |
| 14 | 62.0 |
| 15 | 66.3 |
| 16 | 65.0 |
| 17 | 65.0 |
| 18 | 65.0 |
| 19 | 55.5 |
| 20 | 60.8 |
| 21 | 60.8 |
| 22 | 36.5 |
| 23 | 30.0 |
| 24 | 46.7 |
| 25 | 43.7 |
| 26 | 43.7 |
| 27 | 43.7 |
| 28 | 65.0 |
| 29 | 61.0 |
| 30 | 61.0 |
| 31 | 61.0 |
| 32 | 61.0 |
| 33 | 68.0 |
| 34 | 68.0 |
| 35 | 68.0 |
| 36 | 33.5 |
| 37 | 33.5 |
| 38 | 33.5 |
| 39 | 33.5 |
| 40 | 34.5 |
| 41 | 34.5 |
| 42 | 34.5 |
| 43 | 34.5 |
| 44 | 32.0 |
| 45 | 25.0 |

**Captions for Supplemental Material**

**Supplemental Material Figure 1**, Detailed locality information for Figure 1 of paper. Numbers adjacent to ticks at specific stratigraphic levels refer to localities listed in Supplemental Material Table 2.

**Supplemental Material Figure 2:** Detailed sections for footprint localities (numbers), pollen- and spore-producing levels (P), and macrofossil plant localities (M). Numbers for footprint localities refer to Supplemental Material Table 2.

**Supplemental Material Figure 3:** Measured sections for four along strike sections and the average Ir concentrations (*34. 35*). Data from Supplemental Material Tables 2, 3, and 4. Note that the highest Ir levels tend to be associated with the white-weathering claystone or adjacent coaly unit (Sections 1-III). However, in the Grist Mills section, the highest Ir is within a red claystone under a light gray siltstone. We believe this red claystone correlates with some part of the white claystone in the other sections, but contains hematite because it was formed under a more oxidizing environment, closer to the border fault. In addition, there is another gray claystone lower in the Grist Mills section without an adjacent an Ir anomaly. Because, red units have the lowest organic C content (oxidizing depositional and diagenetic environment) and black units the highest organic C content (reducing depositional and diagenetic environment), it is clear that there is no consistent pattern between the Ir anomaly and redox state of the strata, arguing against a diagenetic origin of the Ir anomaly. Note also that the uppermost Ir maximum in Section I, is within a gray sandstone containing visible clasts of white claystone, and the relatively high Ir levels probably reflect a reworked clast eroded from the underlying white claystone.

**Supplemental Material Figure 4:** Detail and added contextual information for Figure 2 of text showing position detail of boundary section in the Jacksonwald Syncline Composite section as well as correlation to two other Newark basin boundary sections, paleomagnetic polarity data, and footprint and pollen and spore assemblage distribution. Note that “new taxon B” is the term applied to an unnamed form by (*8*), and cly, md, and ss, refer to claystone, mudstone, and sandstone, respectively. Average Ir and pollen and spore percentages from Supplemental Material Figure 3. Interval of time represented by Jacksonwald syncline detailed section based on linear extrapolation from the average accumulation rate implied by the astronomical calibration of the Jacksonwald syncline composite section. Correlation throughout the Newark basin is based on the distinctive magnetic polarity and cycle stratigraphy and the basalts.

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32. Common datum for averaging is the base of the "blue-gray sandstone" at 0 m. Averaging performed by interpolated Ir values to common depth scale, in 1 cm increments in columns and then averaging across equal depths in rows.
33. Material consisted of channel samples ( i.e. contiguous, continuously sampled intervals) covering an average of 3 cm. Samples were manually crushed in plastic wrap, then mechanically in an alumina (ceramic) jaw crusher, and powdered using an automatic agate mill. Analyses for major and selected trace elements was done by standard X-ray fluorescence spectrometry (XRF) procedures (for information on standards, procedures, accuracy and precision, see W. U. Reimold, C. Koeberl, J. Bishop, Geochim. Cosmochim. Acta, **58**, 2689, 1994). The rest of the elements, except the ICS Ir (see ref. *36*), were measured using instrumental neutron activation analysis (INAA). For details on the method, instrumentation, procedures, standards, data reduction, accuracy, precision, etc., see C. Koeberl, J. Radioanalytic. Nuclear Chem., **168**, 47 (1993). Samples were irradiated at the TRIGA Mark II type reactor at the Atominstitut der Österreichischen Universitäten in Vienna for 7 hours at a flux of about $2 \times 10^{12}$ $ncm^{-2}s^{-1}$.
34. Section I, lat 40°18’76”, long 075°50’56”; Section II, lat 40°18’76”, long 075°50’55”; Section III, lat 40°18’81”, long 075°50’38”; Grist Mills, lat 40°18’85”, long 075°51’20”.
35. Ir content was measured with the ICS (iridium coincidence spectrometry) system at the Institute of Geochemistry at the University of Vienna. Crushed and powdered samples of about 50 mg each, as well as standards, were sealed into high purity quartz glass tubes, packed into aluminum foil and an aluminum capsule, and irradiated for 24 to 48 at a flux of about 7 x 1013 ncm-2s-1. After a cooling period of about ten weeks, the samples were first measured for five to eight hours. The lines of 192Ir at 316 and 468 keV were used, and the method requires that only coincident signals at both lines are used for further processing. Samples that yielded results close to the detection limit (ca. 5 ppt) were measured for at least another 24 hours. The precision of the Ir measurements follows a logarithmic error function with the lowest relative errors in the highest concentrations (e.g., 21±9 ppt vs. 285±33 ppt). For details on this method (standards, instrumentation, data reduction, precision, accuracy, etc.), see C. Koeberl, and H. Huber, *J. Radioanalytic. Nuclear Chem*., **244**, 655. (2000).
36. INAA data for Ir have detection limits of 1 - 2 ppb and are hence not reliable.