East Wolverine G-37

Nannofossils - new data
Scale: 1:2000
Weston *et al.* 2023 Atlantic Geoscience

Interval: 4200m - 6900m

Text Keys
*1 quantitative abundance (300 = 40mm, scale tick = 10 counts)

Boundary Types
Possible
Confident
Unconformable

Sampling
Cutting
Core

Sidewall Core

Taxon Categories
NA - Nannofossils

East Wolverine G-37

Scale | Chronostratigraphy (Period/Epoch, Age) | Gamma-Ray (Gamma Log (API) 0–150) | Sonic Log (Sonic Log (uS) 140–40) | Casing | Density & Diversity (Samples (m); (Cv excluded) *1; (Cv excluded) species richness) | Nannopalaeontology (Samples (m); quantitative abundance (100 = 20mm, scale tick = 10 counts)) | Biostrat Comments (Samples (m); Nanno.)

Measured depth (m)

Chronostratigraphy: Late Cretaceous (Campanian; Late Cretaceous - Early Cretaceous: Cenomanian - late Albian); Early Cretaceous (Albian, ?intra-Albian; Aptian; early Hauterivian - Valanginian; Valanginian - latest Berriasian); Middle Jurassic (Callovian; earliest Callovian - Bathonian; Bathonian, ?late Bathonian; Bathonian; ?Middle Jurassic)

Casing: 13 3/8 @ 4762.00m; 10 3/4 @ 5221.00m; 9 5/8 @ 6363.00m

Density & Diversity samples: 4250m CU, 4400m CU, 4520m CU, 4550m CU, 4610m CU, 4670m CU, 4700m CU, 4790m CU, 4820m CU, 4880m CU, 5120m CU, 5150m CU, 5180m CU, 5210m CU, 5540m CU, 5600m CU

Nannopalaeontology taxa: Barren; Angulodiscoaster allolirus; Arkhangelskiella cymbiformis; Braarudosphaera bigelowii; Broinsonia signata; Cyclagelosphaera rotaclypeata; Eiffellithus eximius; Lucianorhabdus cayeuxiformis; Lucinorhabdus maleformis; Micrantholithus hoschulzii; Nannoconus spp.; Rhagodiscus asper; Rotelapillus laffittei; Staurolithites crux; Zeugrhabdotus diplogrammus; Zeugrhabdotus sigmoides; Bifarinaria avitahi; Calculites obscurus; Calculites ovalis; Cretarhabdus conicus; Eprolithus floralis; Gartnerago obliquum; Lithastrinus septenarius; Microrhabdulus decorus; Watznaueria barnesae; Watznaueria fossacincta; Cretarhabdus striatus; Discorhabdus ignotus; Lithraphidites carniolensis; Parhabdolithus marthae; Rhagodiscus angustus; Staurolithites angustus; Staurolithites crucicentralis; Staurolithites mielniczukii; Staurolithites stradnerae; Tegumentum stradnerae; Zeugrhabdotus scutula; Zeugrhabdotus trivectis; Rhagodiscus infinitus; Staurolithites carinthus; Axopodorhabdus dietzmannii; Watznaueria britannica; Staurolithites multihastatus; Cretarhabdus pelitaus; Nannoconus quadriangulus; Nannoconus truncatus; Micrantholithus hoschulzii; Lapideacassis spp.; Tubodiscus verenae; Calculites ovalis; Calculites ob. l. lenticula Bown et al.; Nannoconus bucheri; Nannoconus spp. (large center); Nannoconus kamptneri; Conusphaera rothii; Odontochilo spp.; Polypodorhabdus escaigii; Jacquinda bowerii; Lithraphidites carniolensis; Haqius circumradiatus; Manivitella pemmatoidea; Zeugrhabdotus embergeri; Nannoconus steinmannii; Diazomatolithus lehmanii; Axifractus spp.; Calcicalathina oblongata; Nannoconus cornuta; Nannoconus kamptneri minor; Assipetra infracretacea; Cucullaefossa cucullieri; Gorkaella minuta; Speetonia colligata; Cyclagelosphaera deflandrei; Cretarhabdus striatus; Kokia spp.; Trapezopontius sarmatus; Tubodiscus verenae; Cyclagelosphaera tubulata; Schizosphaerella spp.; Stoverius eponitum; Podorhabdus grassei; Retecapsa incompta; Braarudosphaera bigelowii speciosum speciosum; Amuriellopsis helvetica; Axopodorhabdus cylindratus; Eiffellithus turriseiffelii; Ethmorhabdus gallicus; Lithastrinus septenarius; Lithraphidites quadratus; Pseudoconus enigma; Cretarhabdus crenulatus; Cretarhabdus conicus; Cretaceous/Tertiary boundary; Cribrosphaerella ehrenbergii; Prediscosphaera cretacea; Quadrum gothicum; Lithastrinus septenarius; Micula staurophora; Nannoconus frequens; Prediscosphaera grandis; Prediscosphaera spinosa; Prediscosphaera parvicauda; Prediscosphaera cretacea; Lithastrinus grillii; Eiffellithus eximius; Micrantholithus hoschulzii; Micrantholithus obtusus; Nannoconus wintereri; Watznaueria barnesae; Watznaueria fossacincta; Zeugrhabdotus diplogrammus; Zeugrhabdotus sigmoides; Bifarinaria avitahi; Calculites obscurus; Calculites ovalis; Cretarhabdus conicus; Eprolithus floralis; Gartnerago obliquum; Lithastrinus septenarius; Microrhabdulus decorus

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Scale: 1:2000
Weston et al 2023 Atlantic Geoscience

Interval: 2900m - 6900m

Test Keys
- *n* (#)a, Cu excluded)
- *n* quantitative abundance (2000 = 40mm, scale tick = 100 counts)
- *n* qualitative abundance

Rock Lithology
- claystone
- limestone
- sandstone
- siltstone

Boundary Types
- Possible
- Probable
- Unconformable
- Unconformable
- Conformable

Contact
- Cutting
- Core
- Sidewall Core

Taxon Categories
- MA - Marine/Brackish

East Wolverine G-37

Scale | Scale (mm) | Measured depth (ft) | Measured depth (m) | Chronostratigraphy: Period/Epoch | Age | Lithostratigraphy: Formation | Member | Biostrat Comments | Casing | Surfaces (Hasse et al 2012) | Picks | Gamma-Ray: Gamma Log (API) | Interpreted Lithology | Sonic: Sonic Log (us) | Neutron-Density: Bulk Density (g/cm3), Neutron Porosity | Resistivity: 20" Resistivity (ohmm) | Nannoplanktonology: Samples (m) | Density | Foraminifera

Period/Epoch: Tuzik Miocene; Middle to Early Miocene; Oligocene; Eocene; Late Cretaceous; Early Cretaceous; Middle Jurassic

Age: Tortonian; Langhian; early Langhian - late Burdigalian; Burdigalian - Aquitanian; Aquitanian; Chattian; Rupelian; Priabonian; Lutetian - late Ypresian; Campanian; Albian, Tithra-Albian; Aptian; early Hauterivian - Valanginian; Valanginian - latest Berriasian; Callovian; earliest Callovian - Bathonian; Bathonian; Middle Jurassic

Formation: Banquereau; Dawson Canyon; Wyandot; Shortland Shale; Verrill Canyon

Member: Verrill Canyon Chalk

Bioestrat Comments

- 3930 CU Sole D. bulla (into Tortonian to latest Serravallian, M9/10-M7)
- 2369 CU FOD F. latiorbulari latiorbulari, P. latiorbulari granulatum, C. encyrtra (into Pliocene or older)
- 2606 CU FOD D. axila (early Tortonian, M8& or older)
- 2970 CU *U. aquaeductus* in Ainsworth et al (2016) (Langhian to older; Treworthed)
- 3000 CU FOD S. bermudezianus top persistent C. floridanus (Langhian to late Burdigalian, M4b-M5a)
- 3050 CU Sole U. aquaeductus in Rutledge (2010) (Langhian)
- 3070 CU Sole D. praeatlantica (Langhian, M5b-top M4a)
- 3080 CU FON *U. amphapera* (early Langhian to Burdigalian, M4a-M4c)
- 3100 CU FOD G. Trawberdica (Treworthed Langhian, T6/M5, or older)
- 3170 CU FOD C. cantharellus (Burdigalian or older)
- 3175 CU LDO persistent common S. heterostrophus (no older than late Burdigalian, M4c or younger)
- 3180 CU FOD S. solennicus, S. distelencina (intra-Burdigalian, M4c)
- 3200 CU FOD C. operculatus (intra-Burdigalian to Oligocene, M0-P22/M0-O3)
- 3210 CU LDO S. solennicus (intra-Burdigalian, M4c)
- 3260 CU FOD T. clarisatus (early Burdigalian, M4c, or older)
- 3270 CU Sole D. dougji (no older than intra-Aquitanian, M4c)
- 3400 CU Sole G. delicacea, P. conticuosa (no older than Aquitanian, M4b/M1b)
- 3410 CU Influx R. floridana (Aquitanian)
- 3430 CU Increase in C. floridanus (Aquitanian, M4c)
- 3440 CU FOD Globorotalia Conoglobigerina spp. (late Chattian)
- 3540 CU FON *U. mirifa*, *Z. hippophae* (intra-Aquitanian, M4c, or older)
- 3470 CU FOD C. dispersum, C. tetraperinum (Chattian or older)
- 3570 CU FOD S. cipercensis (Chattian, M15-M13A)
- 3600 CU FOD C. alba (intra-Chattian, M13, or older)
- 3625 CU LDO S. cipercensis (Chattian, M15-M13A)
- 3650 CU FOD Westcottia spp. (early Chattian or older)
- 3655 CU FOD S. distelana, S. predistelana, H. ceriacanta (early Chattian, M13A, or older); LDO persistent C. attenatus (no older than Chattian, M13A)
- 3690 CU FOD C. magna (Rupelian or older)
- 3725 CU FOD T. inornatoserata (intra-Rupelian to Barbonian; P19-P14/O2-E13)
- 3760 CU FON *U. amphapelopsis* (intra-Rupelian, P19/O2, or older)
- 3780 CU FOD M. revenua (Rupelian, NP23, or older)
- 3810 CU FOD E. arcuata (intra-Rupelian or older)
- 3830 CU Common E. arcuata (intra-Rupelian or older); FOD O. collignoni (Treworthed)
- 3880 CU FOD C. victoria (earliest Rupelian, P18/O1, or older)
- 3900 CU FOD S. gr. knapsia (Eocene, P17/E16, or older)
- 3920 CU FOD C. formosus, C. recurvus (early Rupelian to latest Priabonian, NP21-NP20/19); FOD C. germanicus (Priabonian, intra-NP21-NP17)
- 3940 CU FOD A. dolyoptychum (Priabonian or older)
- 3960 CU FOD R. reticulata (Priabonian, intra-NP20/19, or older)
- 3980 CU Sole R. reticulata; FOD N. dubius (early Priabonian, NP19)
- 3990 CU Influx of Middle and Early Eocene Acarinina in Ainsworth et al (2016) (reworked)
- 4030 CU LDO abundant R. reticulata (Yearly Priabonian, NP19); FOD S. obliquus (earliest Priabonian, intra-NP19; or older)
- 4050 CU FOD S. spongir (Lutetian, NP16-NP14b)
- 4060 CU FOD A. bullbrooki, o. ola, A. spinosoinflata & O. subconglobata subconglobata (early Barbonian to Lutetian, P12-P10/E7-E4B)
- 4070 CU FOD S. Scrasdifferiola (earliest Barbonian to Lutetian, NP14-NP13)
- 4090 CU FOD T. aemaculeata fimbrata (early Barbonian, P12/E7), or older)
- 4110 CU FOD S. Scrasdifferiola (Lutetian or older)
- 4150 CU LDO S. subconglobata subconglobata (no older than Lutetian, NP13/E4b)
- 4170 CU LDO persistent S. spongir (Lutetian, NP16-NP14b)
- 4185 CU FON *S. lotica* (earliest Lutetian, NP14b)
- 4190 CU FOD C. kuepperi (late Ypresian, NP14a-NP12)
- 4200 CU FON *C. lodoensis* (Ypresian, NP14a-NP11/NP10)
- 4220 CU *T. lynsanchorum*, *H. nobilis* (Thanetian, NP9/7)
- 4230 CU *H. perfecta*, *N. nodosus* (Selandian, NP5/NP4); FOD *A. cymbiformis*, *B. ovata* (Selandian, NP5/NP4)
- 4270 CU FOD R. Sera, O. gallinum & top dominance of Late Cretaceous benthonitants (Late Campanian)
- 4320 CU Sole *A. cymbiformis* (Late Campanian)
- 4325 CU LDO persistent R. lacera (no older than Late Campanian); FOD L. Tyrilla (Yearly Campanian to latest Coniacian)
- 4330 CU FOD *A. cymbiformis* (Early to latest early Coniacian)
- 4350 CU Sole L. arcuatum, L. compactum, P. ellipsoidiformis (latest Albian)
- 4340 CU FOD abundant R. subtilisimens (late Albian)
- 4360 CU FON *R. ticinensis*
- 4365 CU FOD R. breggiensis (intra-late Albian to Aptian/Barremian boundary)
- 4380 CU LDO persistent R. frugida (Albian)
- 4390 CU FOD persistent R. frugida, R. roberti, common T. primula (Yearly Aptian to middle Albian)
- 4394 CU LDO R. frugida (Albian)
- 4395 CU Abundant M. planispira, common M. deltoiensis (No older than Albian)
- 4320 CU FOD S. gradata (No older than Albian)
- 4400 CU Sole R. breggiensis (early Albian to late early Aptian)
- 4395 CU Influx of nannoplankton
- 4380 CU FOD C. valvulata, P. petiliorum (intra-late Aptian or older)
- 4480 CU Change in nannofossil assemblages - persistent increase in proportion of nannoconids, change in depositional environment
- 4390 CU FOD S. fenestrarius in Ainsworth et al. (2016) (late Aptian)
- 4395 CU Sole S. fenestrarius in Rutledge (2010) (late Aptian)
- 4400 CU FOD Z. ventriniei (Aptian or older)
- 4460 CU FOD S. barremense (early Aptian to Barremian)
- 4490 CU Peaks in nannofossil density and diversity (TMF8)
- 4510 CU FOD H. orbij & persistent N. bucheri (intra-Aptian or older)
- 4520 CU FOD M. hoschulzi (intra-late Aptian or older)
- 4540 CU Minor influx of C. tetrabolis, sole A. cretaria; FOD D. albertii (early Aptian)
- 4550 CU FOD C. elegansiform (early Aptian or older)
- 4580 CU Change in nannofossil assemblages - persistent increase in Microhelicosphaera & nannoconids
- 4590 CU FOD C. tetrabolis, sole A. cretaria (late Aptian)
- 4600 CU FOD M. hoschulzi in Ainsworth et al. (2016) (late Aptian)
- 4610 CU FOD C. tetrabolis (early Hauterivian to Valanginian); FOD C. Hoffstetti (early Hauterivian to Valanginian)
- 4680 CU FOD persistent C. tetrabolis (early Hauterivian to Valanginian)
- 4690 CU FOD C. crassis, o. ola, D. sigmoicoides (early Barremian to Hauterivian)
- 4620 CU FOD C. tullieri (Barremian or older)
- 4630 CU FOD C. crassis, L. cuvillierensis in Rutledge (2010) (Barremian to Hauterivian)
- 4640 CU FOD L. bukrainzki (Valanginian, reworked)
- 4670 CU FOD C. cuvillieri (Hauterivian to Tithonian)
- 4690 CU Persistent increase in C. margaretti (early Hauterivian to late Valanginian)
- 4700 CU FOD E. tenuiculata (early Hauterivian to Valanginian)
- 4760 CU Sole L. bukk (Hauterivian)
- 4827 CU FOD E. ainsli (early Hauterivian to early Valanginian)
- 4840 CU Sole L. saxonica (early Hauterivian to Valanginian)
- 4860 CU LDO E. ainsli (no older than Valanginian)
- 4870 CU FOD C. Hoffstetti (Valanginian or older)
- 4875 CU LDO N. bucheri (no older than Valanginian)
- 4875 CU FOD C. valendisensis, P. crepidulata (Yearly Valanginian to Berriasian)
- 4930 CU LDO C. valendisensis (Yearly Valanginian to Berriasian)
- 4950 CU Sole *N. curvata* (Yearly Valanginian to late Berriasian)
- 4990 CU FOD L. saxonica tithonica (Valanginian to Berriasian)
- 5095 CU Sole P. backmanni (early Berriasian to Tithonian, Treworthed)
- 5120 CU FOD C. deflandrei (Valanginian to Callovian); LDO Z. kneebs (No older than Berriasian)
- 5140 CU LDO M. velledarensis, P. deflandrei, C. valdeni (no older than Berriasian, Treworthed)
- 5140 CU H. strolax (Yearly Berriasian to late early Tithonian, Treworthed)
- 5160 CU N. beckschulzi (no older than Berriasian)
- 5190 CU Cretaceous/Cretaceous/Jurassic sp. L.Rhodes sp. (Jurassic)
- 5195 CU Endemic D. wetherell & Swissdinium spp. with D. jurassica (Callovian)
- 5150 CU Spread Late to Middle Jurassic nannofossil assemblage, with FOD L. Rhodes (Callovian or older, Treworthed)
- 5160 CU FOD abundant S. baltoniensis with D. Tuberculata (intra-Kimmeridgian to Bajocian, Treworthed)
- 5165 CU FOD L. angustata (typical of Middle Jurassic)
- 5175 CU FOD M. cylindrata (typical of early Callovian)
- 5210 CU FOD C. lulusata (Tithonian to late Bajocian)
- 5300 CU FOD L. quenstedti (no older than Callovian)
- 5310 CU FOD A. atlasferrata (earliest Callovian to latest Bajocian)
- 5420 CU FOD E. reginaria (Callovian to Bathonian)
- 5450 CU FOD D. bathoniana in Rutledge (2010) (Kimmeridgian to Bajocian, Yearly Callovian to Bathonian)
- 5550 CU FOD P. fefed with L. quenstedti (?Callovian)
- 5545 CU Sole S. speciosum speciosum, B. dorsetensis with FOD A. helvetica (early Callovian to latest Bathonian)
- 5550 CU FOD *C. combazi* (?earliest Callovian to late Bajocian)
- 5665 CU FOD T. shawensis (?Bathonian to Bajocian)
- 5665 CU LDO persistent L. quenstedti (?no older than Callovian)
- 5620 CU FOD C. combazi (earliest Callovian to late Bajocian); influx C. omatum (no older than Callovian)
- 5680 CU FOD G. balakhmatovae (intra-Kimmeridgian to intra-Bajocian)
- 6175 CU FOD P. enigma (early Callovian to latest Bajocian)
- 6217 CU LDO G. praesexa (no older than latest Bajocian)
- 6340 CU LDO common Callasporinites spp. (no older than Middle Jurassic); LDO persistent Systematophora spp. (no older than late Bathonian)
- 6370 CU Top persistent and relatively common O. bathoniana (?Bathonian); FOD P. subtilgena (Bathonian to Bajocian)
- 6380 CU LDO persistent D. nebenzahl (no older than latest Bajocian)
- 6400 CU FOD R. crassa crassa (Callovian to Bathonian)
- 6575 CU Top persistent and relatively common O. bathoniana (?Bathonian); FOD P. subtilgena (Bathonian to Bajocian)
- 6585 CU LDO persistent D. nebenzahl (no older than latest Bajocian)
- 6400 CU FOD R. crassa crassa (Callovian to Bathonian)
- 6575 CU Sole R. media (Bathonian)
- 6585 CU Sole B. incurvi (Bathonian to late Pliensbachian)
- 6620 CU Influx of nannofossils; Sole B. intermedium (Bathonian to Toarcian); LDO C. margaretti (no older than Bathonian/Bajocian boundary)
- 6620 CU Influx common C. bathoniana (?Bathonian; ?MF5); FOD M. quadrata (Bathonian; ?late Bathonian)
- 6665 CU LDO M. quadrata (Bathonian, ?late Bathonian)
- 6730 CU FOD L. contractus (Callovian to Aalenian)
- 6730 CU Abundant Nannosinoquadrum (?Bajocian to Bathonian, ?late Bathonian)
- 6730 CU LDO P. subtilgena (?Bathonian to Bajocian)
- 6760 CU LDO L. contractus (Callovian to Aalenian)
- 6820 CU Sole R. crassa in Rutledge (2010) (Callovian to Bathonian)
- 6867 CU LDO persistent W. barnesae, W. tithoriana (no older than Bajocian)

Casing: Casing 30.00 (20in); Casing 13.3/8 (13.3/8in)

Surfaces (Hasse et al 2012): Intra-Oligocene Unc 3B; Yorkshire Unc 3B; Top Eocene Unc 3B; Late Albian Unc 3B; Early Albian Unc 3B; Intra-Aptian MF3; Aptian Unc 3B; Hauterivian Unc 3B; Base Callovian MF3; Late Bathonian MF3

Gamma Log (API): 0 – 150

Sonic Log (us): 40 – 140

Bulk Density (g/cm3): 1.95 – 2.95; Neutron Porosity (%): 45 – -15

20" Resistivity (ohmm): 0.1 – 1000

Samples (m): 0 – 100

Density: 1.5 – 2.5

Foraminifera: 0 – 100