

Small fish in a big pond



Lessons Learned in Digitizing a Small Paleontology Collection

Julie Rousseau

Collection Manager, University of Alaska Museum, Fairbanks AK

A big small collection

The University of Alaska Museum

- Museum of the University of Alaska system
- Established 1926
- 11 collections
- 1.6 million objects/specimens
- 35 employees + student positions
- Official state repository of natural and cultural history collections



Photo: Patricia Fisher



UAM Earth Sciences Collection

Collection description:

The University of Alaska Museum of the North Earth Sciences collection (UAMES) focuses on Alaskan fossils. It contains more than 65,000 specimens in two sub-collections: paleontology and geology. The paleontology collection houses both vertebrate and invertebrate specimens, ranging from Cambrian archaeocyathids to Quaternary mammals. Significantly, it is the largest collection of polar dinosaurs in the world with 10,000 specimens, primarily from the North Slope of Alaska. It also comprises a diverse assortment of Alaskan Quaternary mammals, including a large portion of the material collected throughout Alaska by Otto W. Geist between the late 1920s and the 1960s. The collection also contains a variety of paleobotanical specimens and a large collection of invertebrates (both micro- and macrofossils). It is home to 39 holotypes and 409 paratypes, most of which are invertebrates. The collection is growing through active research projects in different regions of Alaska and collaboration with state and federal agencies.



Data management systems

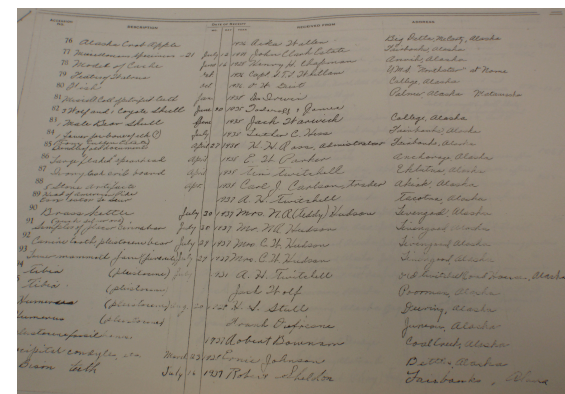
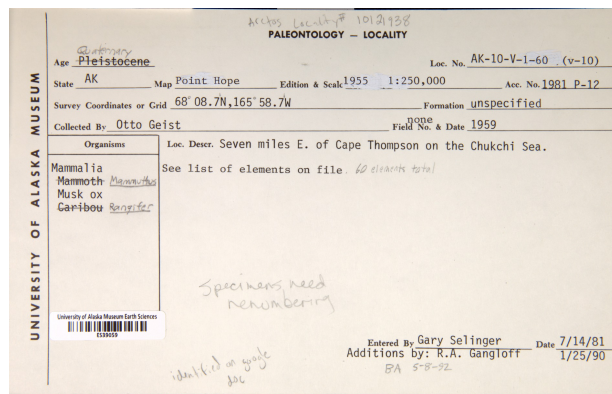
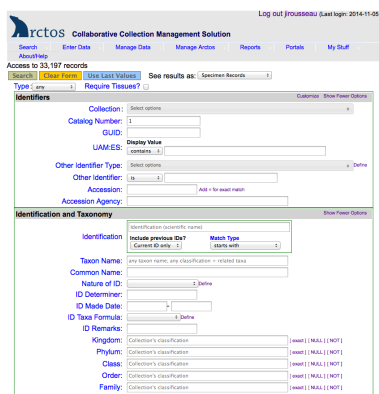
- Hand-written ledger dating back to 1920s
- Card catalog for accessions and localities established in 1971
- Joined Arctos in 2008
- Now:

All accession cards digitized

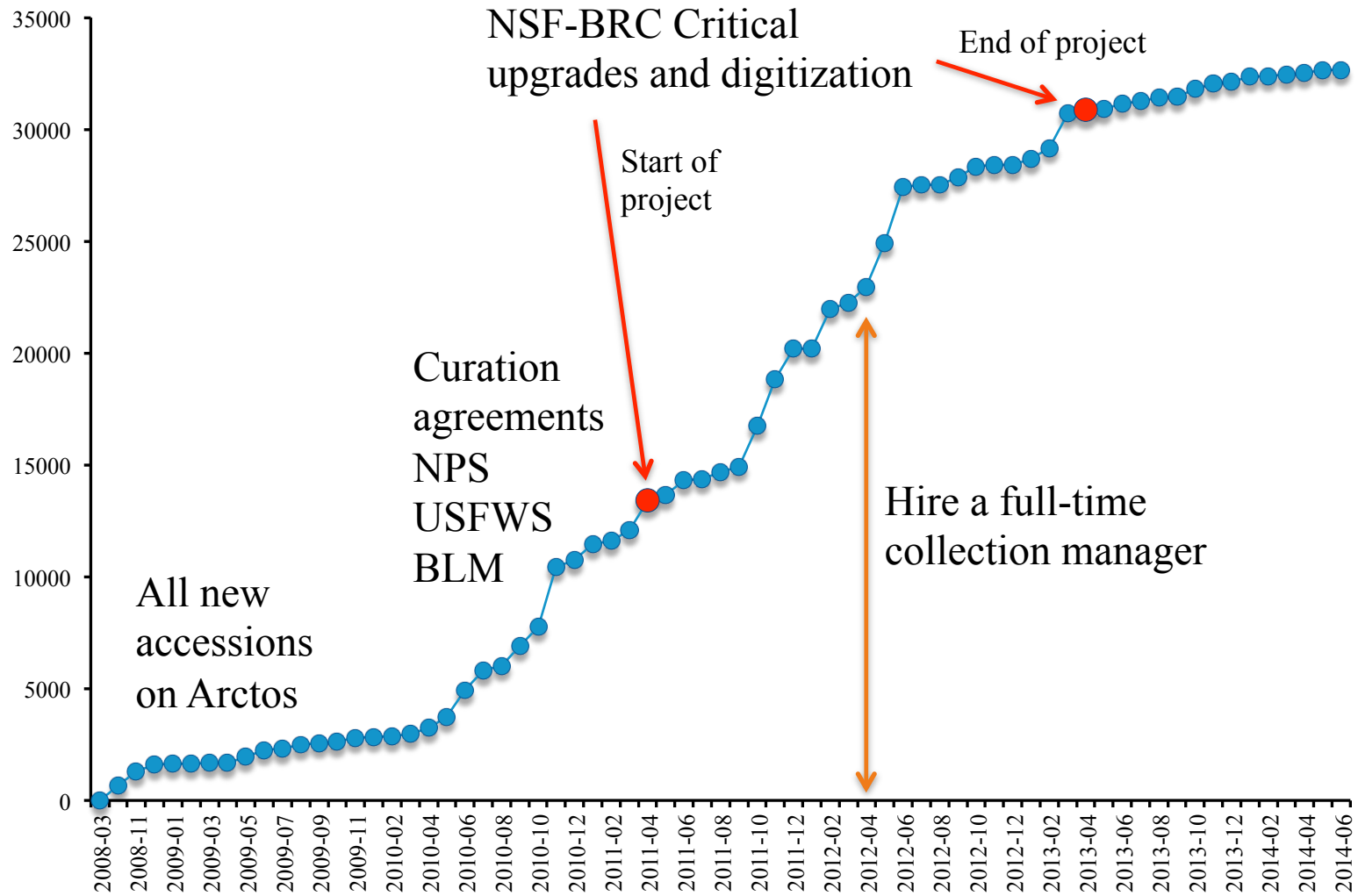
All locality cards digitized

> 33,250 databased specimens

> 40,600 specimen images online



Speeding up digitization



NSF-BRC grant (now ADBC program)

- 3 years
- 8 students, 4000 hours of work
- 20,434 specimens databased
- 42,341 media files uploaded
 - 668 accession cards
 - 2,016 locality cards
 - 39,657 specimen photos
- 22,783 specimens have photos (70% of databased specimens)
- 78% fully georeferenced
- All specimens have coordinates and geology attributes



Arctos Multi-Institution, Multi-Collection Museum Database

UAM Earth Science 13293 Liscomb Bone Bed, Colville River, Alaska ilium
 UAM:ES: Hadrosauridae North America, United States, Alaska, Harrison Bay Quad 1987 (1987-07-26 - 1987-08-16)

Log out Jirousseau (last login: 2014-06-17)

Taxa | Accession | Locality | Agents | Parts | Part Locs | Attributes | Other IDs | Media | Encumbrances

Identifiers: original identifier: AK-83-V-285

Part Name	Condition	Disposition	Qty	Label	Remarks
ilium	partial	being processed	1	ES23347	Partial right ilium

Remarks: Hadrosauridae partial right ilium.
 Entered By: Kevin Slack on 2011-04-08
 Last Edited By: JIROUSSEAU on 2014-06-17

Accession: 1987 P006

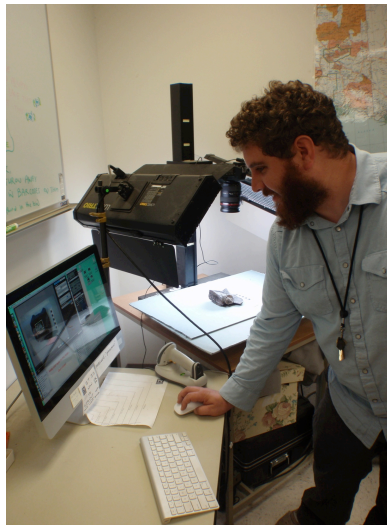
Media:

image (image/jpeg) Media Details UAM:ES:13293 Hadrosauridae
 image (image/jpeg) Media Details UAM:ES:13293 Hadrosauridae

Collectors: Dr. Carol W. Allison, William A. Clemens

Standard workflow

- Data entry on Arctos, barcode
- Physically label specimen, place in tray, write card
- Take photos
- Store and track in collection range



All creatures great and small

VP, IP, paleobotany, microfossils, etc.

→ Heterogeneity of specimens!

- Thin sections to mammoth skeletons
- Huge size range
- Completely flat to 3D
- 1 part vs. skeletons vs. slabs



Locality data for paleontology

Much more than just latitude/longitude!

- Should include geology attributes

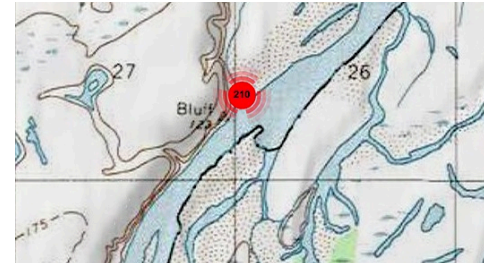
Ex: [UAMES 7983](#)

- *In situ* vs. *ex situ* specimens
- Locality extend?

Quarry

Bone Bed

Eroded material

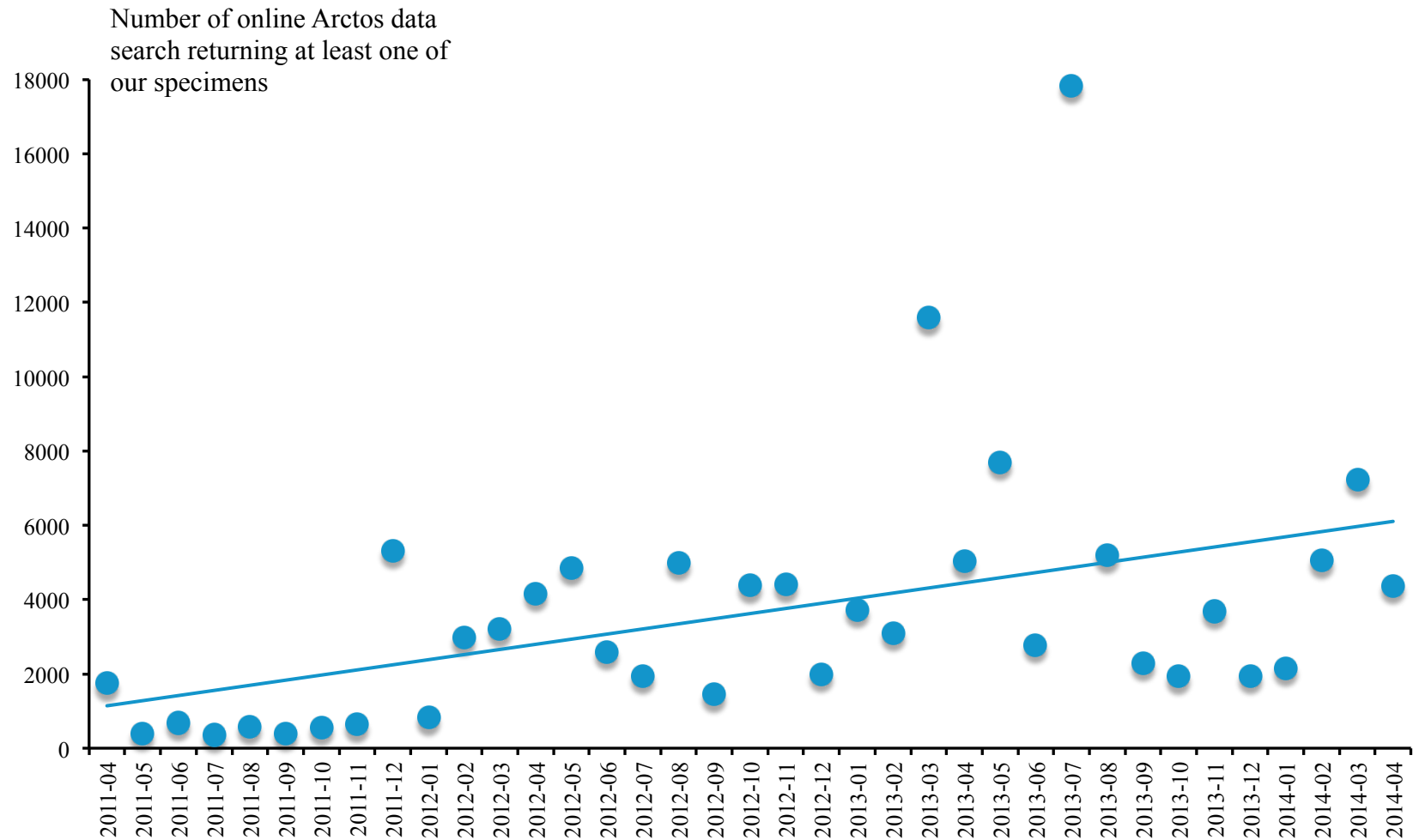


Databasing bottlenecks

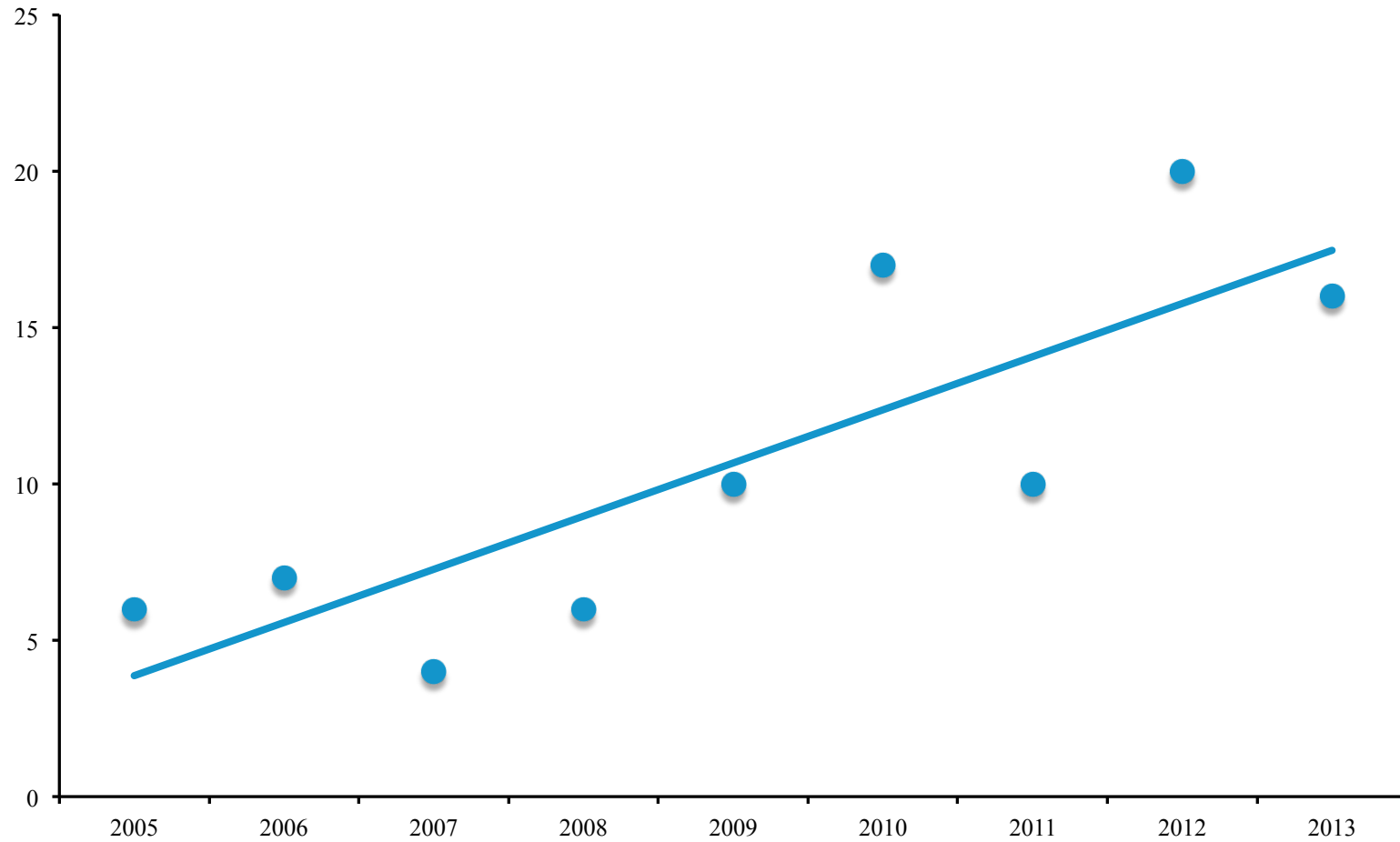
- Changes in workflow because of heterogeneity of specimens
- New volunteers training
- Equipment failures
- Bad metadata
- Specimen handling time
- Other projects needs



Increase in data usage over time



Annual number of loans for 2005-2013

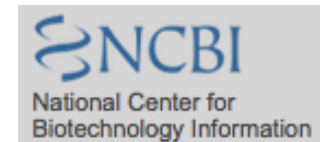


Mobilizing your digital data

- “Type in” once, then distribute widely!
- Collection networks (SPNHC, iDigBio, SCNet, etc.)
- Data Portals/Aggregators (iDigBio, VertNet, GBIF, etc.)
 - Link separate databases under a common search engine
 - Specimen-based, Publication-based, special interest, etc.



The Paleobiology Database



Data mobilization

UAM Earth Science 2414

UAM:ES:

Mammot americanum

[Return to results](#)
[get a DOI](#)

Ikpikpuk River
North America, United States, Alaska
01-Jul-1999 (1999-07-01 - 1999-07-31)

tooth



Taxa Accn Locality Agents Parts Part Locn Attributes Other IDs Media Encumbrances

Mammot americanum

Animalia Chordata Mammalia Proboscidea Mammulidae Mammot americanum
American mastodon; mastodon
Identified by Rohland et al. 2007
Identified by Paul Matheus
Nature of ID: expert

Mammot
Animalia Chordata Mammalia Proboscidea Mastodontidae Mammot
sensu Mann et al. 2013
Identified by Grant D. Zazula
Nature of ID: expert
Remarks: Personal communication

Mammot americanum
Animalia Chordata Mammalia Proboscidea Mammulidae Mammot americanum
American mastodon; mastodon
Identified by Paul Matheus
Nature of ID: expert
Remarks: Also known as Mastodon

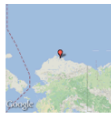
Citations

basis of illustration of *Mammot americanum*, page 3 in Rohland et al. 2007
basis of illustration of *Mammot* in Mann et al. 2013

Determination Type: accepted place of collection

inspired by Amanda Hanson on 2009-07-03

Higher Geography: North America, United States, Alaska
Verbatim Locality: Collected as float along the Ikpikpuk River on the North Slope of Alaska
Specific Locality: Ikpikpuk River
Collecting Source: wild caught
Event Date: 01-Jul-1999 (1999-07-01 - 1999-07-31)
Verification Status: unverified
Event Coordinates: 70.819754/-154.3096288
Datum: North American Datum 1983
Original Coordinate Format: decimal degrees
Error: 42 km
Georeference Source: BioGeomancer
Georeference Protocol: BioGeomancer



Stage/Age: Pleistocene

Determined by unknown

Collectors

Bureau of Land Management

Identifiers

Dol.D barcode ID: GBMA839-07/R
GenBank: EF632344/R
collector number: IK-99-23

Part Name	Condition	Disposition	#	Label	Remarks
tooth	partial	being processed	1	ES 014085	

Remarks: Part of the root has been removed for mitochondrial DNA analysis (Rohland et al. 2007).
Entered By: Amanda Hanson on 2009-02-09
Last Edited By: JIROUSSEAU on 2013-09-16

Accession
2009.001.ESCI

Media



image (image/peg)
UAM.ES.2414: Mammot



image (image/peg)
UAM.ES.2414: Mammot

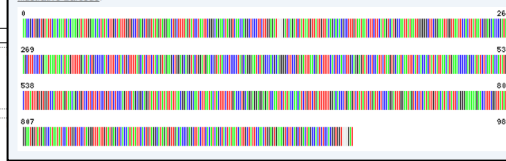
SEQUENCE: COI-SP [Funding Source: N/A]
Sequence ID: GBMA839-07.COI-SP GenBank Accession: EF632344
Last Updated: 2013-09-12 Genome: Mitochondrial
Locus: Cytochrome Oxidase Subunit 1 5' Region
Nucleotides: 990 bp

```
AACCGGTGGCTGTATTCAACAATCAAAAGATATGGAACTACTTGTCTATTGGCTGGCTGGGTATA  
GTAGGACTCTCTTTAGTATCCATTCGGGCAAGACTAGGCTACACAGGCTCCCTCTGGAGAT---GATCAG  
ATCTATAAGTGTATGTAGAGCAGCCCTTTATATATTTTTCATAGCTACGCCAATATATATGGGGC  
TTCGAAATGGTTAATCCACTATAATCGGAGCCCGGATAGCTTCCCGAATAAATACATAATGTTT  
TACTACTGCCCCCACTTCTCTACTGCTTTTAGCATCTCTACAGTAGAGGCTGGGACAGTACTGGATGACC  
GTATACCTCCCTTAGCGGGAATCTAGCCAGCCAGGGCTCTCCGATATAGAGTCTTTTACTCAGCTT  
CAGAGATATCCCTCATCTTAGTGCATCAATTTTCATACCATATCATTAACATGAAACCCCGCATATCT  
CAATACATATGGCTTATTTGGTGGTCAATTTTGTAGAGGCTCTCTCTCTCTCTCTCTCTCTCTCTCT  
GGGCGAGTATFACATATATTAACGGAGCCAACTCTAATACACTCTTCTTGACCTCAGGAGGAGAT  
CCAAATCTATACACACTCTCTCTGATTTTGGACCCCTGAGTCTATATCTGATCTCCAGAGATTGGA  
ATATCTCTCATCTTACTACTATTCAGGAAABAGACTTTTCGCTATATAGAGAGCTGTATAGCCCTA  
ATATCCATGGCTCTAGGGTTATGTATAGCTACCATATTTCTGATAGCTAGATATGACACCGCA  
GCTTATTCATAGCTACTATATATCTGATTTCCACCTGGAGTGAAGCTTCCAGCTGATGCCACTCTC  
CACGGTGT---GAT
```

Amino Acids:

```
RWLYSTNHKIDITLYLLFGAWAGMVTAFSILIRBELGQPSLIGD--DQLYNVIYTABAFVHIFPVMPIMIGGP  
GNGILPLMIGADMAFPRMNNKSNFLPFFSLLASSTVADAGCTGWTYVPLMGLRLAAGASVDTLTIFFLELA  
QVSLLELAISFTTIIISKPPANKIDYLPWILVYVLLLELVLVLAAGTMLTIDRNLATFTTTPAGGGDY  
LLYQLRFPFGRPEVYLLLPQFMVSHVYYSKKEPFYGMVWAMHSIGLQFLVWAIHNFVGMVDVYTRA  
YFTSATKLIATPQVYVSWLALRGG-D
```

Illustrative Barcode:



NCBI Resources | How To | Sign In to NCBI

Nucleotide | Nucleotide | Links | Advanced | Search | Help

Display Settings: GenBank | Best | Change region shown | Customize view

GenBank: EF632344.1

FASTA | GenInfo

Details

LOCUS EF632344 1649 bp DNA circular MM 18-SEP-2007

DEFINITION Mammot americanum mitochondrial, complete genome.

ACCESSION EF632344

VERSION EF632344.1 GI:14849328

KEYWORDS mitochondrial Mammot americanum (American mastodon)

ORGANISM Mammot americanum

EXPOSITORY Eukaryota; Metazoa; Chordata; Craniata; Vertebrata; Eumammalia; Mammalia; Eutheria; Afrotheria; Proboscidea; Elephantidae; Mammot.

REFERENCES 1 (base 1 to 1649)
Rohland, K., Malaplate, A.-S., Pollack, J.L., Stalkin, M., Matheus, P. and Brenner, J.: Proboscidea mitogenomics: chronology and mode of elephant speciation using mastodon as outgroup. *Mol Biol Evol*, 5 (9), 2597 (2007)

JOURNAL PLOS ONE 11(7):e0171137

PMID 23751137

REFERENCES 2 (base 1 to 1649)
Rohland, K., Malaplate, A.-S., Pollack, J.L., Stalkin, M., Matheus, P. and Brenner, J.: Direct Submission

JOURNAL PLoS ONE 11(7):e0171137 2017 Molecular Biology, MPI EVN, Deutscher Platz 6, Leipzig 04103, Germany

FEATURES

source 1..1649
/organism="Mammot americanum"
/segment="mitochondrion"
/db_xref="genbank:EF632344.1"
/db_xref="taxon:10031"
1..49
/product="18S rRNA-18S"
51..1032
/product="12S ribosomal RNA"
1033..1350
/product="16S rRNA-16S"
1351..1649

Related information | Full text in PMC | Gene | Genome | Identical RefSeq | Protein | PubMed | Taxonomy

Recent activity | Tax. Off. Clear | Mammot americanum mitochondrial, complete genome

Shameless self-promotion

- State/regional museum associations
- iDigBio, SPNHC, SCNet, etc.
- Keep your website updated
- Flyers on campus, classrooms announcements (bio, geo, arts, IT)
- Google Scholar page
- Make your own scale bar with logo



Thank you



Small Collections Network

Serving, Supporting, Connecting Small Natural History Collections



UNIVERSITY OF
ALASKA

