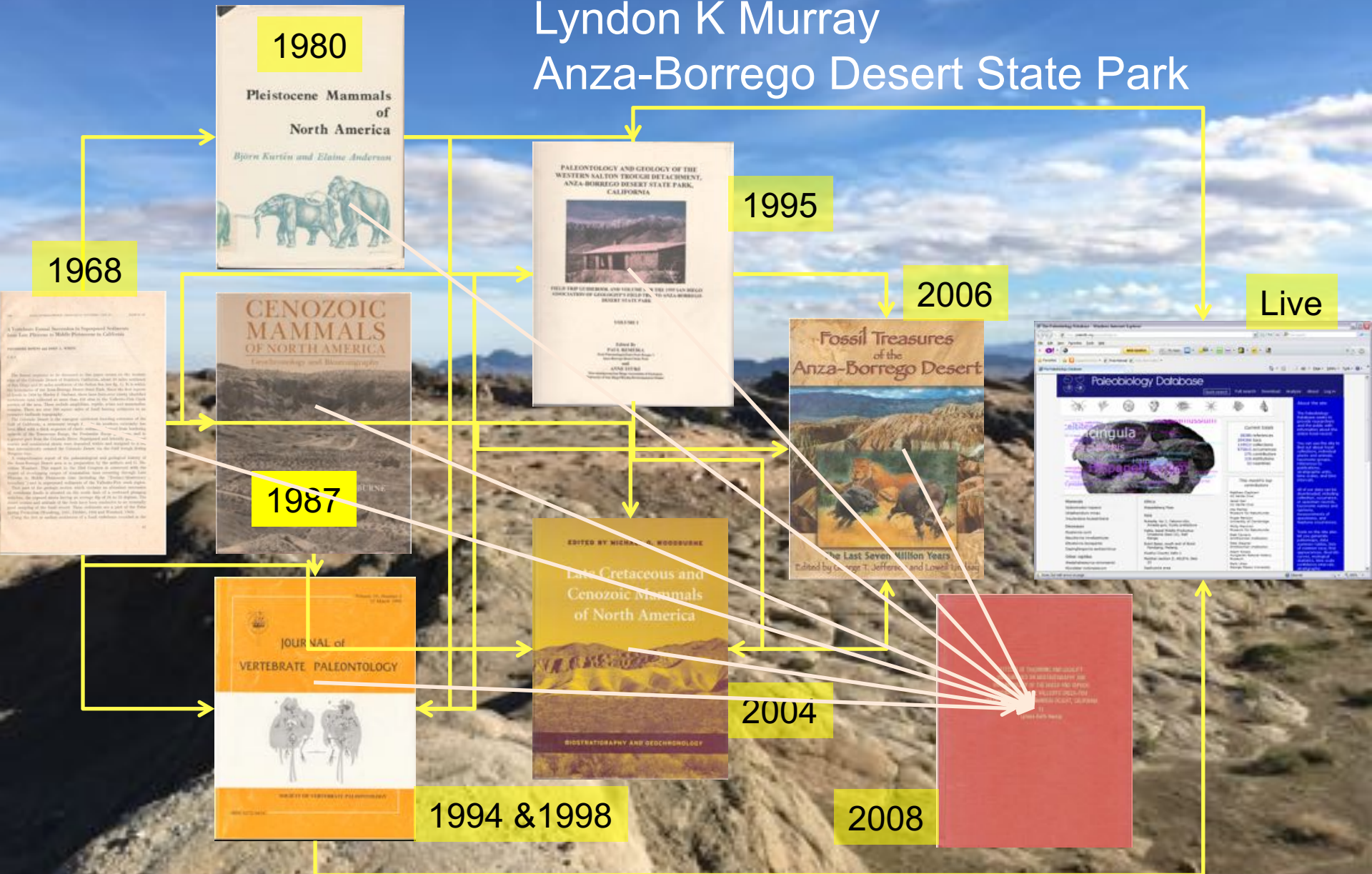


THE PROBLEM OF FAUNAL LISTS

Lyndon K Murray
Anza-Borrego Desert State Park



Primary Faunal List

- A list of taxa present in a stratigraphic context
 - used in--
 - Institutional List - general information
 - Biostratigraphy List - local, restricted stratigraphic context, range of geologic ages
 - Biochronology List - Compilation of multiple localities over large geographic range, of same geologic age

Types of Faunal Lists

INSTITUTIONAL



Report Venue	Source	Style	Target
<ul style="list-style-type: none">• Web-site• Brochures• Local news stories• Interpretive tour guides• Internal reports	<ul style="list-style-type: none">• In-house lists• Catalogue• Database• Specimen Labels• Field notes	<ul style="list-style-type: none">• Scientific• Informal• Hyperbolic• Wishful thinking	<ul style="list-style-type: none">• Public• Non-science• Administration• Archive

Types of Faunal Lists

BIOSTRATIGRAPHY

Report Venue	Source	Style	Target
<ul style="list-style-type: none">• Professional journal• Commercial book• Internal report	<ul style="list-style-type: none">• Catalogue• Database• Specimen Labels• Field Notes	<ul style="list-style-type: none">• Formal systematics• Informal (qualifiers may be stripped in text and figures)	<ul style="list-style-type: none">• Professional• Scientists• Administration• Archive

Types of Faunal Lists

BIOCHRONOLOGY

Report Venue	Source	Style	Target
<ul style="list-style-type: none">• Edited book• Website (Faunmap, Paleobiology Database)	<ul style="list-style-type: none">• Prior publications• Databases• Website (FaunMap, Paleobiology Database)• Personal Communication	<ul style="list-style-type: none">• Mixed formats based on published formats• Modified published formats	<ul style="list-style-type: none">• Professional• Scientists

TABLE 2.3. Seventeen types of data errors affecting the ABD collections, including the source, and proximate causes of the errors.

Number	Type of Data Error	Source of Error	Cause of Error
1	taxonomic misidentification	curation & publication	variable skills of persons identifying specimens
2	locality mis-placed	curation	locality provenience broken or lost
3	specimens & localities misnumbered	curation	multiple curation venues, unsupervised volunteer workers
4	specimen assigned to wrong locality	curation	misreading of handwritten field notes
5	same specimen number published for two separate taxa	curation	batch catalogued specimens
6	specimen data in database do not match published data	curation	published data not recorded in database
7	alteration of taxonomic ID	publication	inconsistent use of qualifiers (cf., nr., ?) and serial citation
8	unsupported resurrection of retired taxa	publication	citation of outdated published information through leap-frogging citation
9	specimen & locality numbers misreported	publication	author/editor typographic error
10	taxonomic mistranslation	database conversion	global database changes

11	field numbers scrambled	database conversion	table transcribed to spreadsheet, single column sorted, table transcribed back to database
12	deletion of entire record	database conversion	global database changes
13	plotted localities with incorrect or missing geographic coordinates	contractor	contracted digitization was incompletely or inaccurately executed
14	unsupported data	publication	personal communication
15	modern specimens interpreted as fossils	curation	misidentified in the field
16	parts of an individual skeleton separated in collection	curation	collection organized taxonomically
17	fossil morphology physically enhanced, masked, or otherwise altered	preparation	inexperienced preparator



Publication Venue

Lowest Ranked Authority

- In-house, not published
- Report, institutional, not published, limited access
- Academic thesis and dissertation
- Online publication (Wikipedia)

Medium Ranked Authority

- Gray literature 2nd tier institutional bulletin, in-house review
- Obscure, difficult to obtain, out of country
- Commercial book
- Edited volume (variable)
- Online institution-supported website, e.g. Faunmap

Highest Ranked Authority

- Peer-reviewed professional journal (includes online)

Volume 19, Number 1
15 March 1999

JOURNAL OF
VERTEBRATE PALEONTOLOGY

Accuracy of Identification

- Experience and expertise of person identifying
 - Research/ Museum professional, student, volunteer
- Completeness of specimen
- Condition of specimen
- Variety of comparative examples available
- Quality of technological tools available
- Taxonomic Rank desired

Resolution of Taxonomic Identification

- Taxonomic rank – genus/ species preferred
- Condition of specimen – missing identifiers
- Qualifiers complicate resolution and lists



Taxonomic Qualifiers

complicate comparative usefulness of list

- sp. – species indeterminate
- cf. – conforms with (direct comparison)
- nr. – near (similar to description)
- aff. – affinity (generally similar)
- ? – possibly (guess based on experience)
- When in doubt, assign next higher, well-supported rank

Resolution and Accuracy of Taxonomic Identifications

Resolution

Accuracy

LOW

Phylum

0-100%

HIGH

Order

0-100%

Family

0-100%

Genus

0-100%

HIGH

Species

0-100%

LOW

ID Evaluation - Canidae (Dogs)

100+ specimens

wolf, coyote, & fox

cats

badger, raccoon, +

not carnivoran

Resolution and Accuracy of Catalogued Canidae Identifications

Resolution

Accuracy

LOW

Mammalia

99%

HIGH

Carnivora

85%

Canidae

60%

Borophagus, Canis,
Urocyon

<50%

Species

<50%

HIGH

LOW



Local Faunas

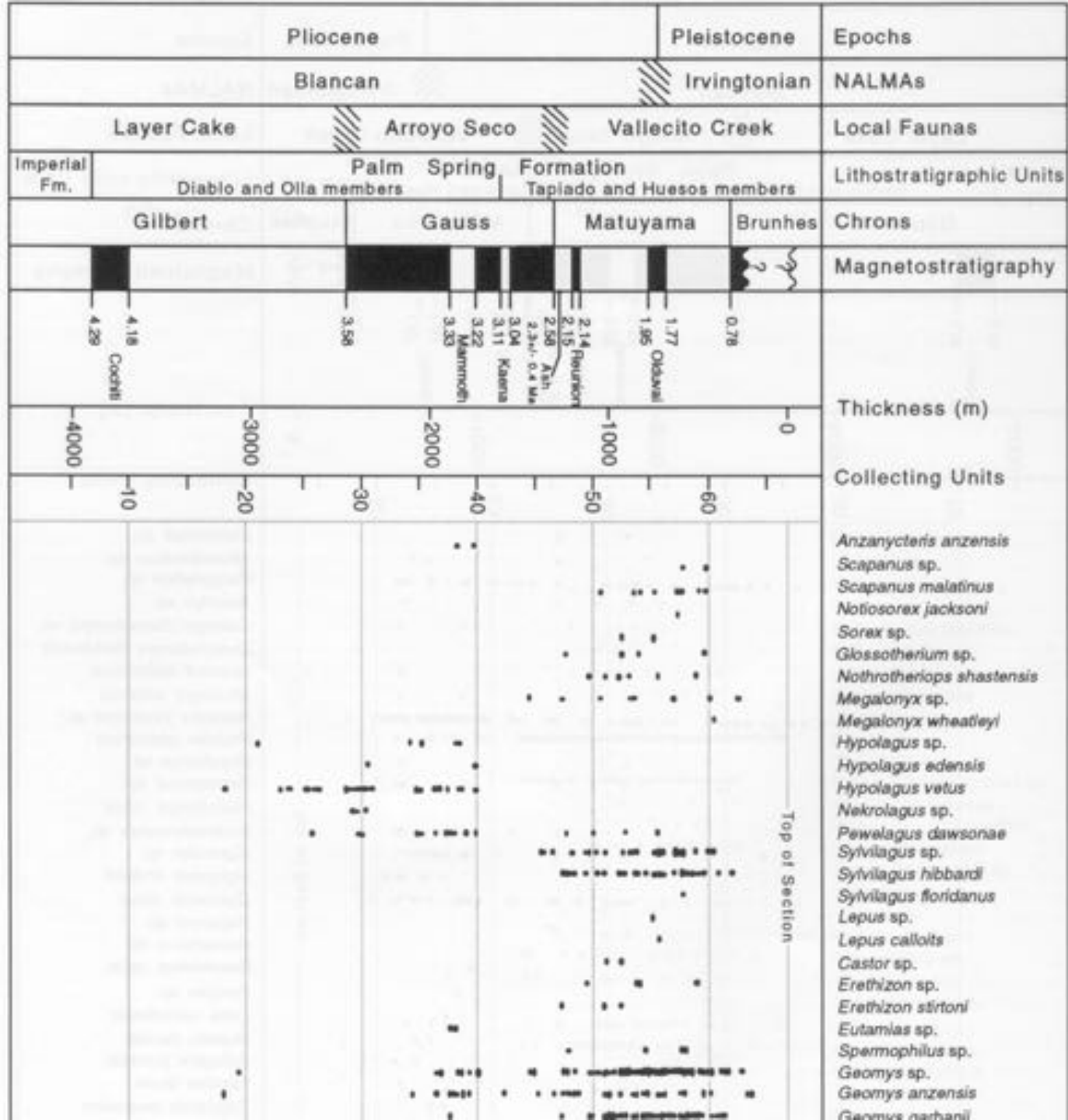
- Used as geographically/ stratigraphically restricted assemblage of taxa
 - ABDSP – 5+ local faunas, 8 geographic fossil areas, 16 geologic formations
- Multiple local faunas may be grouped into overall list
 - without geographic distinction (ABDSP)
 - Into larger stratigraphic or age group, e.g., Rancholabrean and Irvingtonian North American Land Mammal Ages into Pleistocene Epoch or Quaternary Period

Problems with Locality Data



- Pre-GPS protocols –
 - Topographic Quad sheet $\frac{1}{4}$ sections
 - distances & directions from roads & landmarks
 - Pinholes in aerial photograph or map
- Combining data from different institutional collections collected at different times

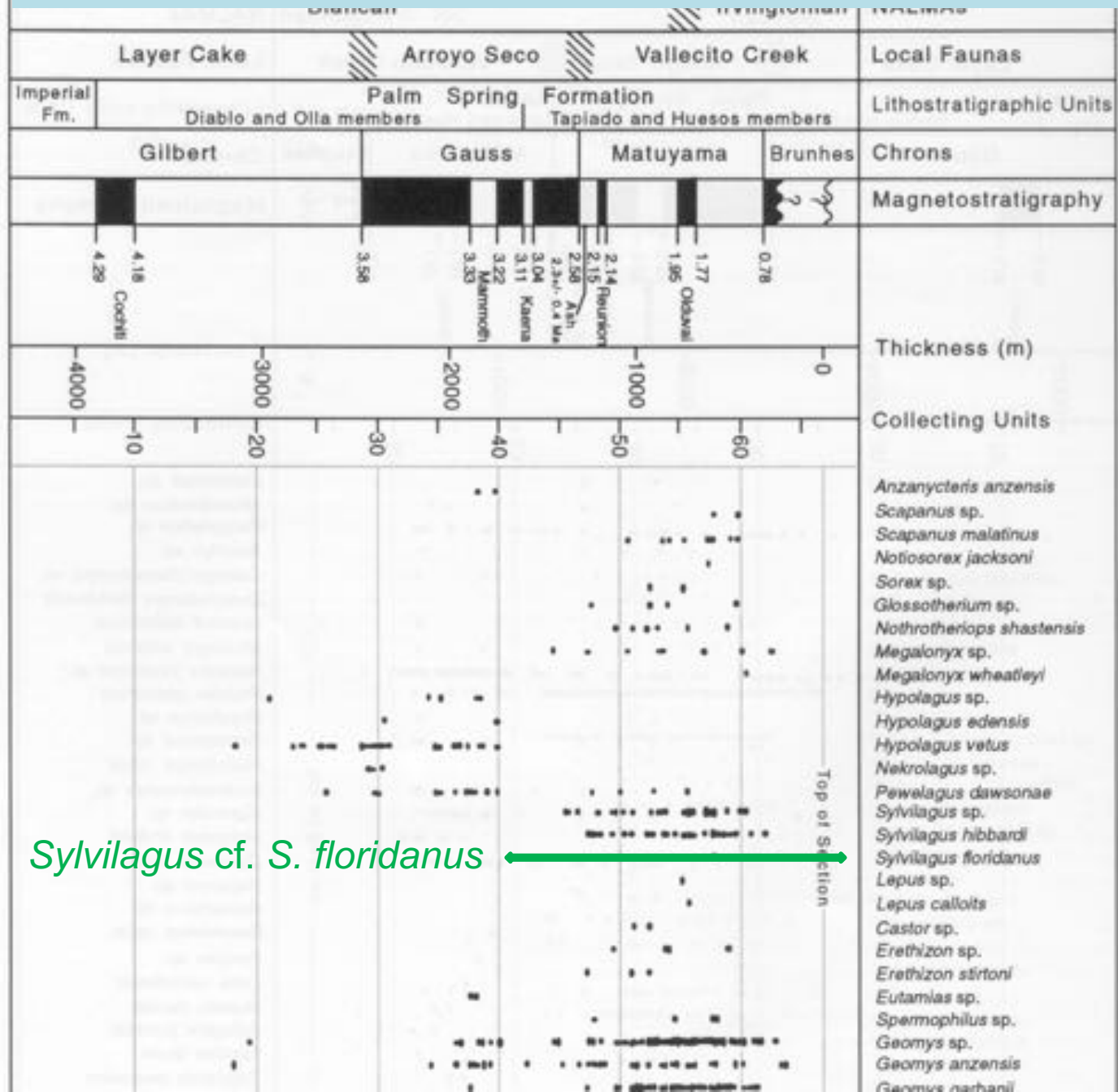
Taxon Locality Data Transposed to a Range Chart



Cassiliano, M. 1999. Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

- Qualifiers in text stripped away in chart

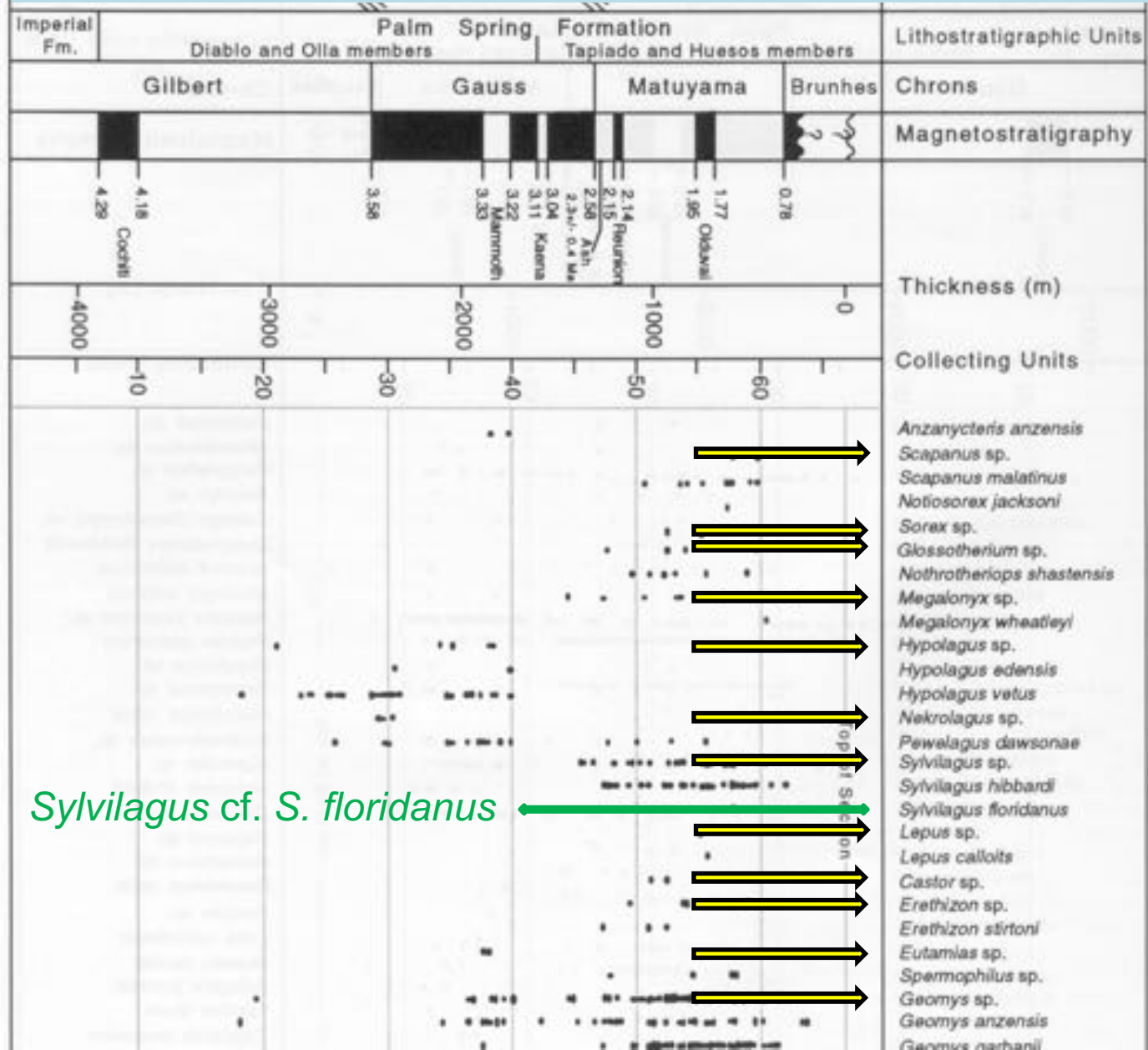
Taxon Locality Data Transposed to a Range Chart



Cassiliano, M. 1999. Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

Taxon Locality Data Transposed to a Range Chart

- Qualifiers in text stripped away in chart
- With the exception of 'sp.'



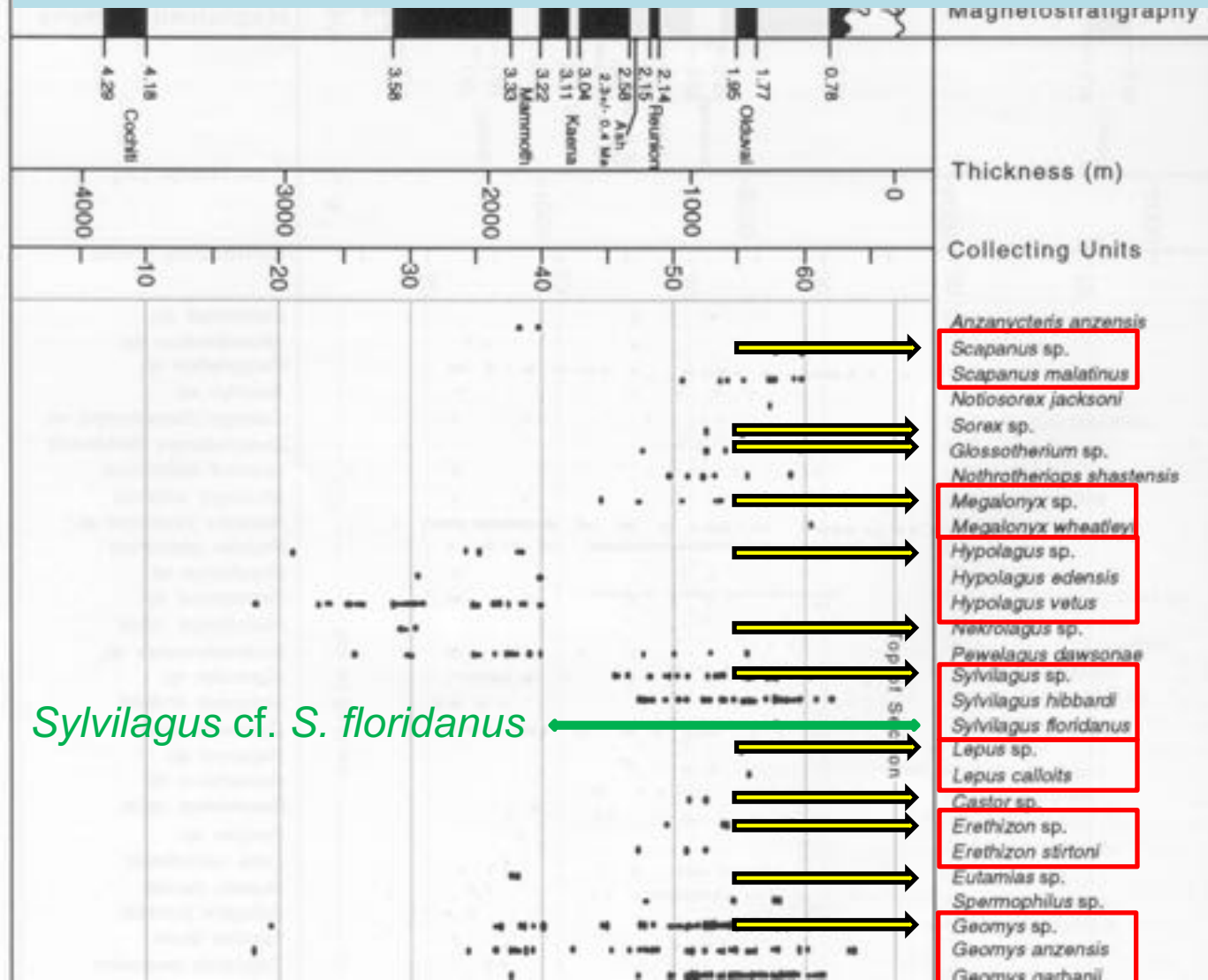
Sylvilagus cf. S. floridanus

Cassiliano, M. 1999. Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

Taxon Locality Data

Transposed to a Range Chart

- Qualifiers in text stripped away in chart
- With the exception of 'sp.',
- Which creates the possibility of non-existent ghost species.

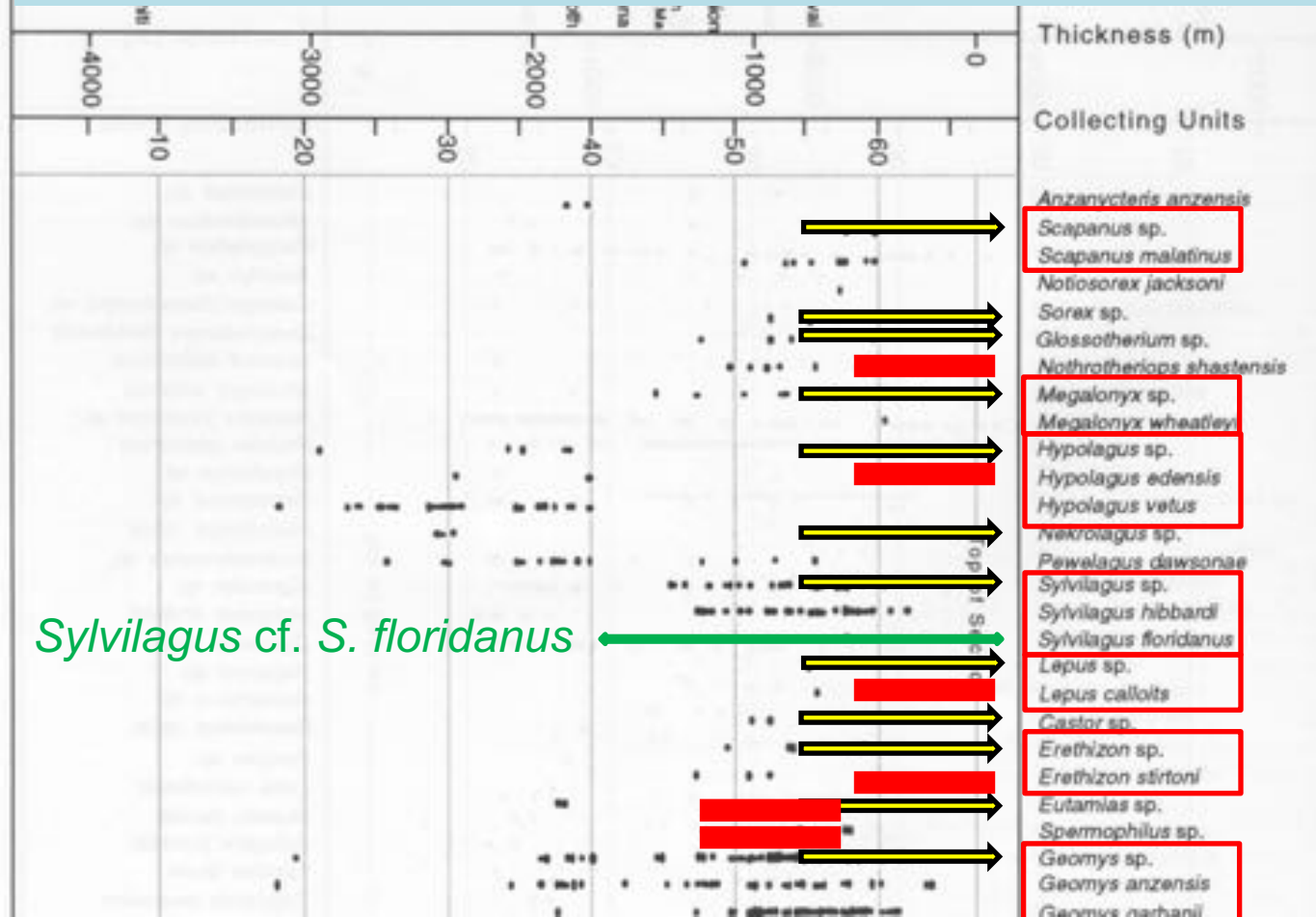


Sylvilagus cf. S. floridanus

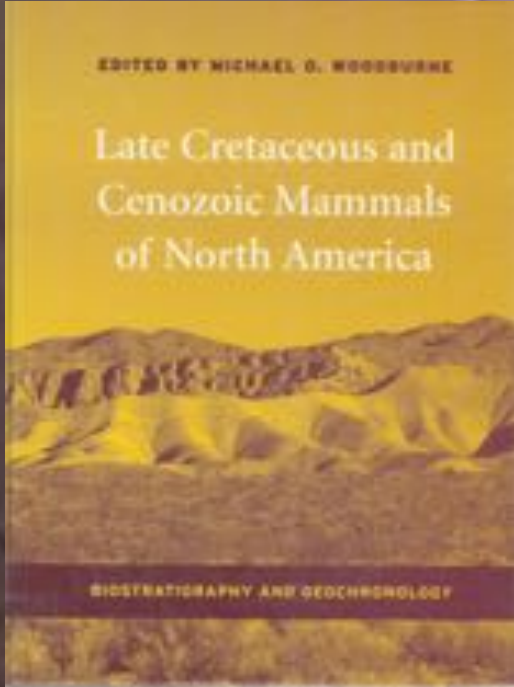
Cassiliano, M. 1999.
Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

Taxon Locality Data Transposed to a Range Chart

- Qualifiers in text stripped away in chart
- With the exception of 'sp.',
- Which creates the possibility of non-existent ghost species.
- Re-evaluation shows mis-identified, or invalid taxa.



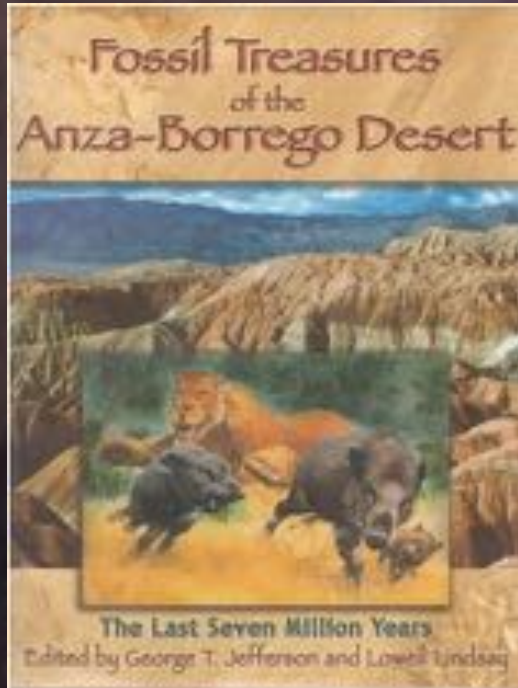
Cassiliano, M. 1999.
Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.



2004

- All of which may appear in subsequent publications without update or change

Live



2006





FOSSIL FRANKENSTEINS: Resurrecting Old Data

Universal Pictures, 1931;
Image Credit: www.doctormacro.com

A Fossil Frankenstein is –

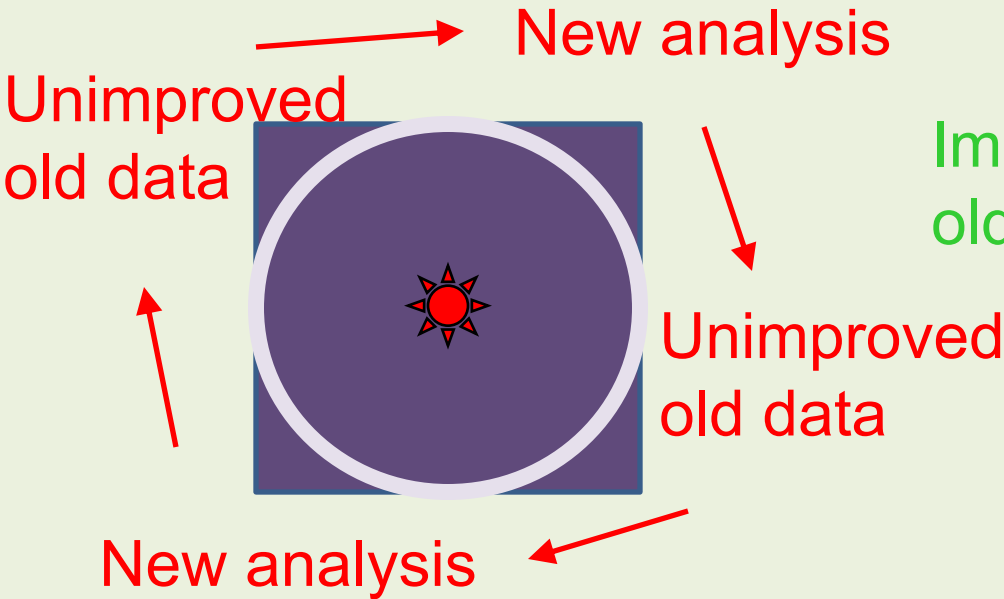
A false fossil record, i.e., the specimen as reported does not exist either corporeally (there is no specimen) or taxonomically (wrongly identified)

– These are –

Often resurrected from out-of-date (dead) published sources, i.e., later authors determined there is no specimen or changed the identification.

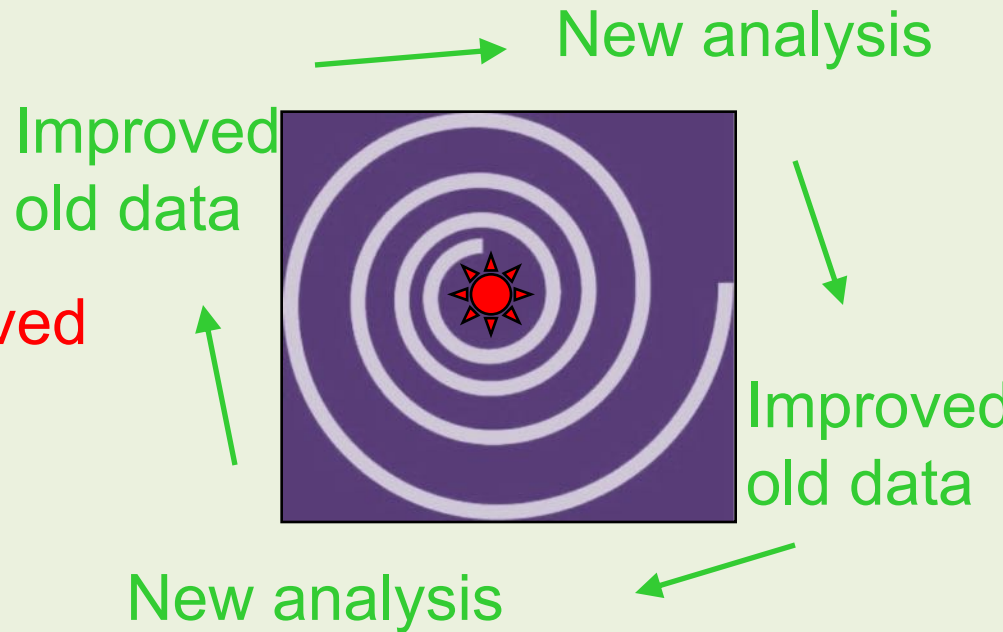
Sometimes a record is published (created) without proper support for its existence or ID.

Reiteration of unimproved old data



does not improve comparative analyses

Improvement of accuracy and resolution of old data



may improve comparative analyses

TAXONOMIC REVIEW

of ABDSP Faunal List

>150 publications and in-house faunal lists

>830 taxonomic variants

Before Validation

After Validation

~100	taxonomic names	110
~65	genus names (w/o qualifier)	66
~45	species names (w/o qualifier)	46

178 retired taxonomic names & groups of
equivalent nomenclatural variations

SOLUTIONS

Faunal lists used for scientific studies or broader compilations must include the following, explicitly stated for each taxon:

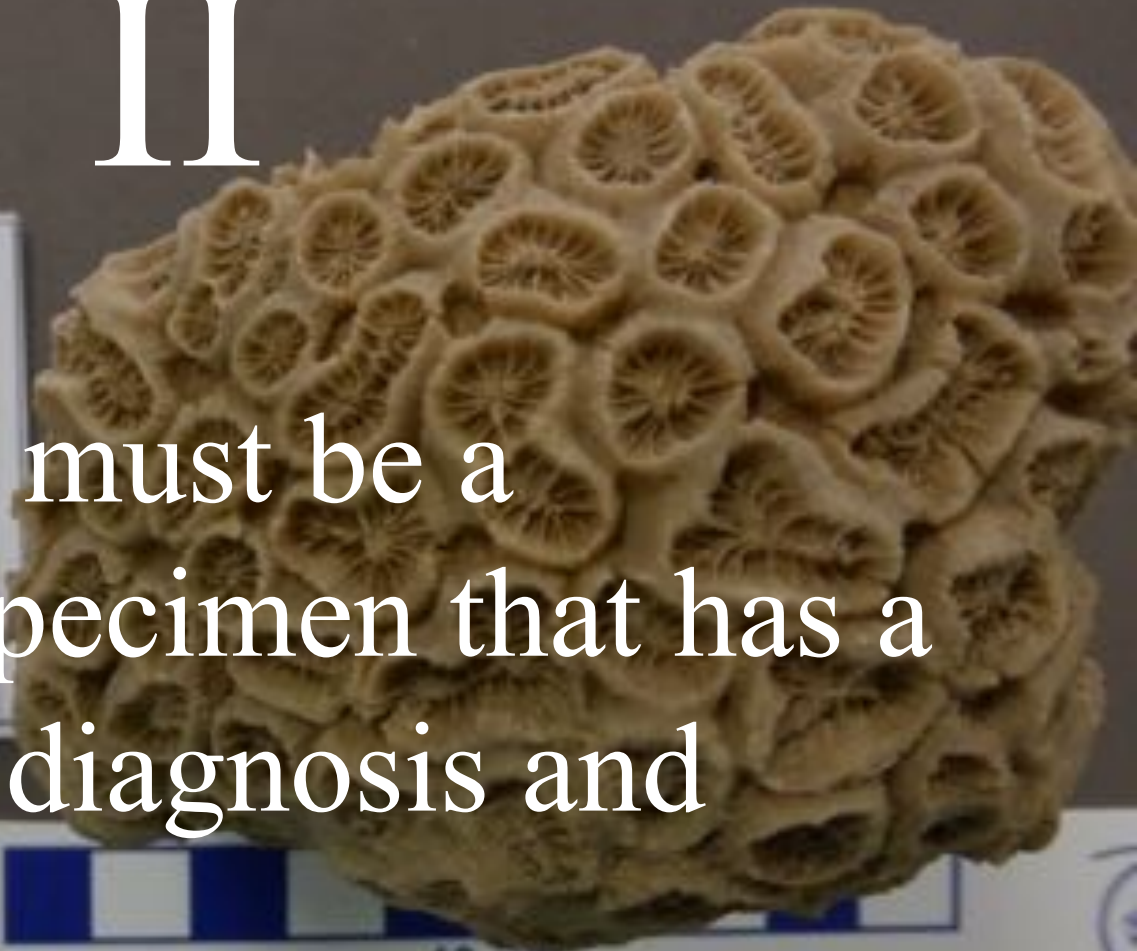
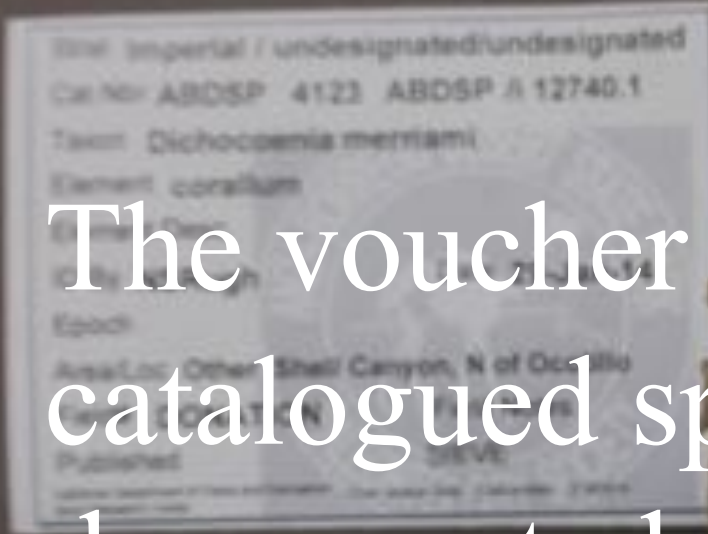
A group of people are standing in a desert landscape at sunset. The scene is dominated by sand dunes and a large, bare, branching tree in the center. The sky is filled with soft, golden light from the setting sun. In the foreground, a black bag and a green bag are lying on the sand. A large, white, serif letter 'I' is overlaid on the upper part of the image.

I

Every taxon must be anchored
by a voucher,

II

The voucher must be a catalogued specimen that has a documented diagnosis and authority,



III

Earliest and latest records of a taxon must be anchored by voucher specimens,



IV

The method used to establish the age of the voucher specimen must be described in detail,

V

When a faunal list is updated, all taxa to be removed from the active list must be retained with a retired classification, reason, and authority for the removal,

VI

Taxonomic identifications should be ranked according to the level of confidence.

VII

Ask the collection manager to review the list.



Data Quality

Locality Provenience

Taxonomic ID

Accuracy

correct position

correct ID

Resolution

size of map dot

group level

Data Quality

Taxonomic ID

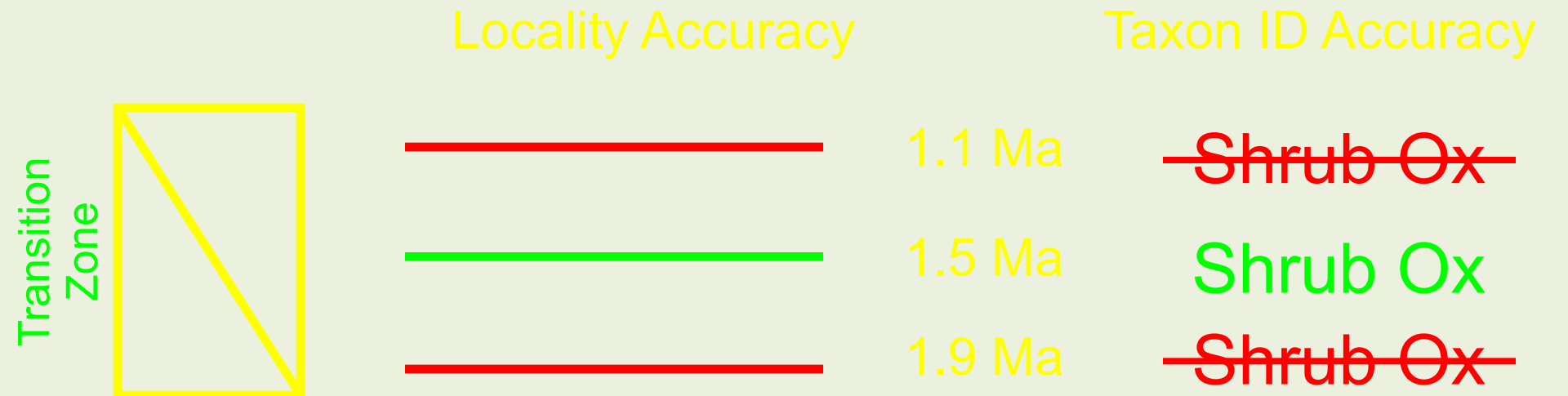
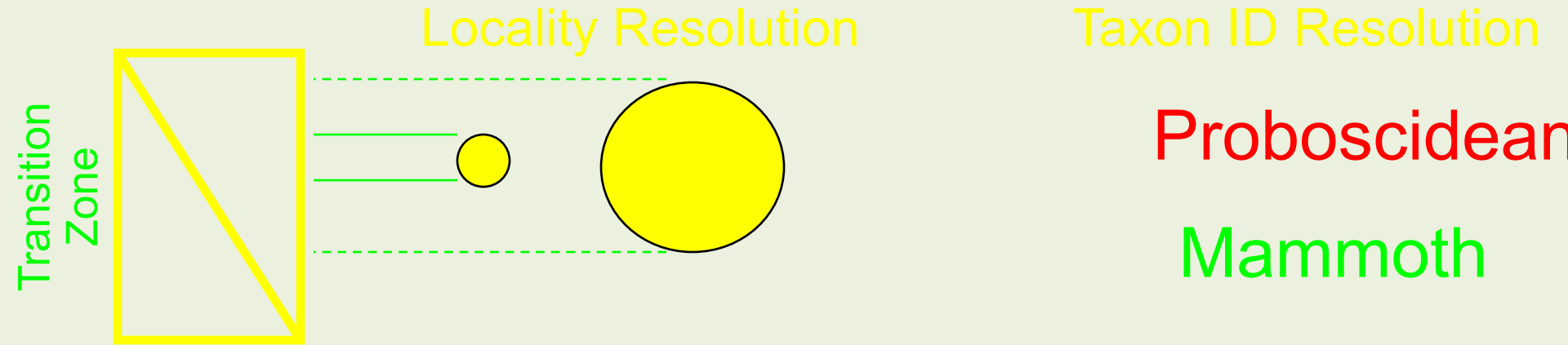
Accuracy

correct ID

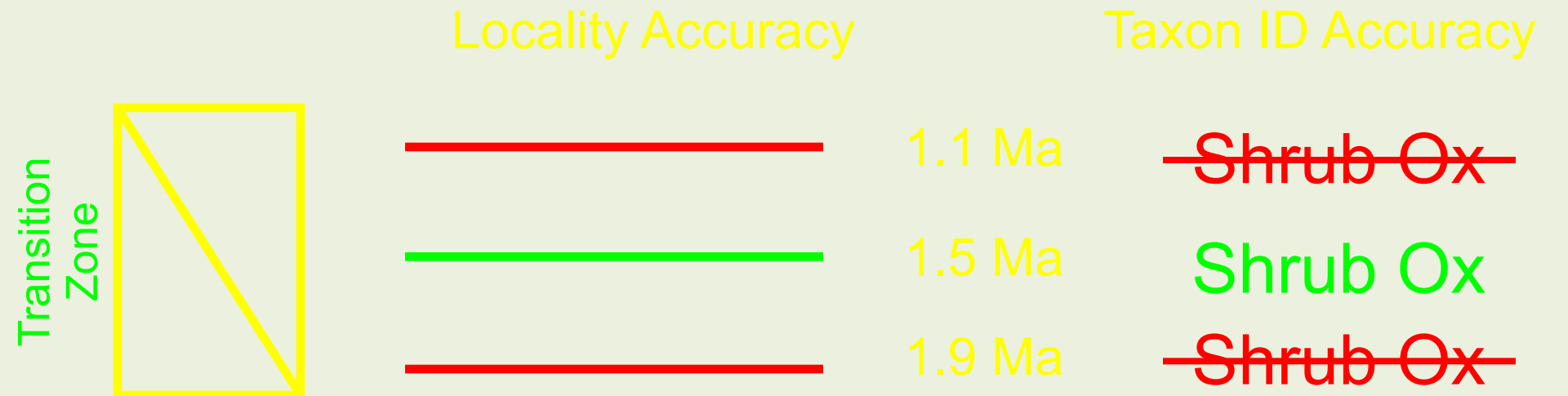
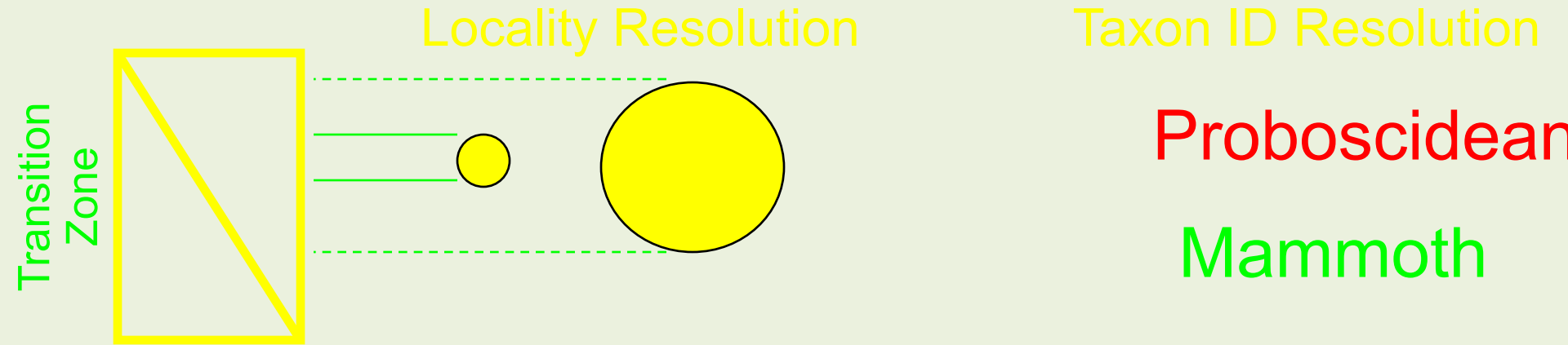
Resolution

group level

Application of Data Quality to Boundary Concepts



Application of Data Quality to Boundary Concepts



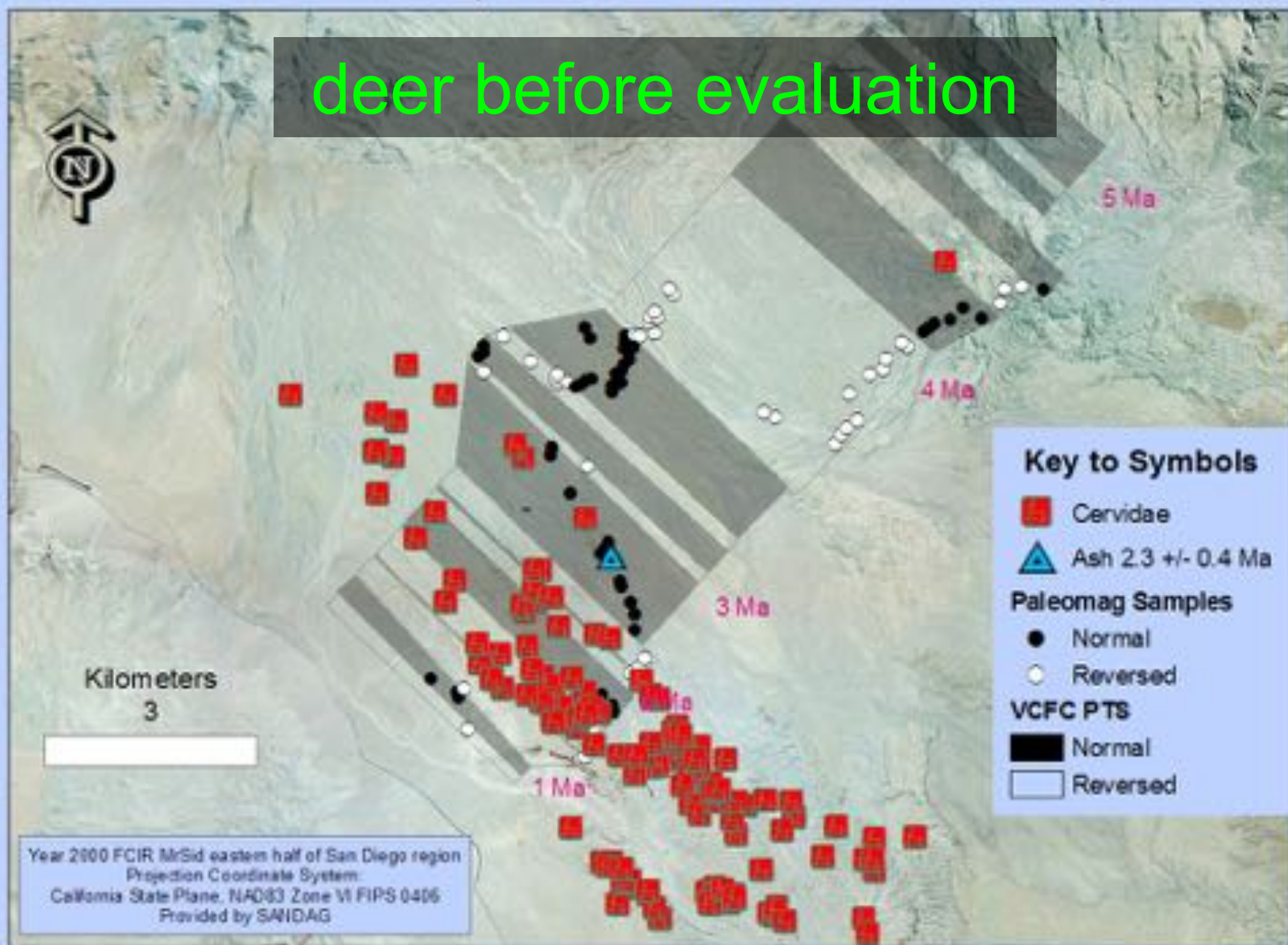
Locality before evaluation
best resolution = 10 m
accuracy low = 0%



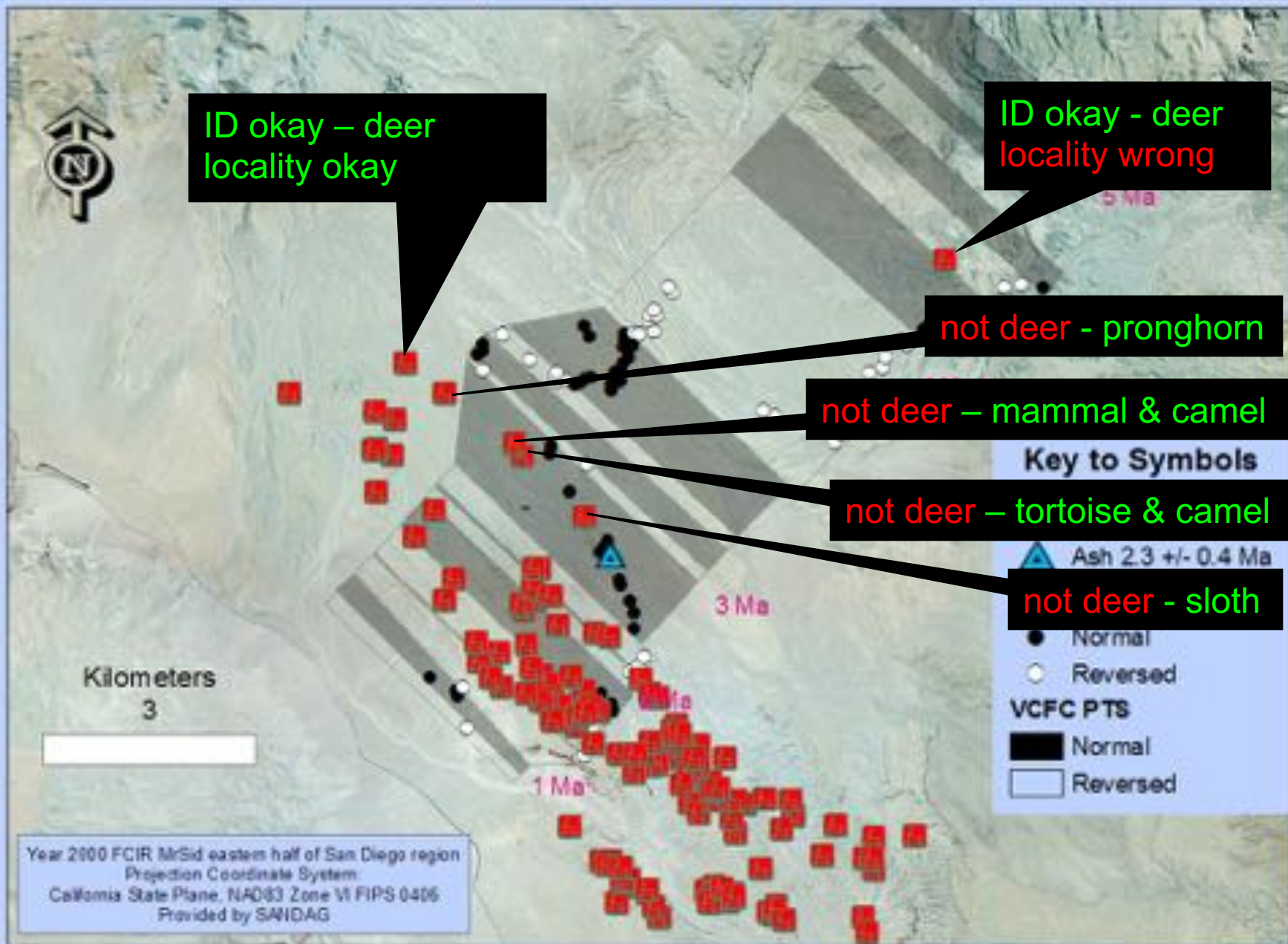
Locality after evaluation
best resolution = 2x3 km
accuracy high ≈ 100%

Cervidae (Deer & their Relatives)

deer before evaluation



Cervidae (Deer & their Relatives)



Accuracy and Resolution of Canid Identification

Resolution

Accuracy

before & after evaluation

LOW

Vertebrata

100%

100%

Carnivora

85%

~100%

Canidae

60%

<100%

Canis

<100%

HIGH

Accuracy and Resolution of Canid Identification

Resolution

Accuracy

before & after evaluation

LOW

Vertebrata

100%

100%

Carnivora

85%

~100%

Canidae

60%

<100%

Canis

<100%

HIGH

Accuracy and Resolution of Canid Identification

Resolution

Accuracy

before & after evaluation

LOW

Vertebrata

100%

100%

Carnivora

85%

~100%

Canidae

60%

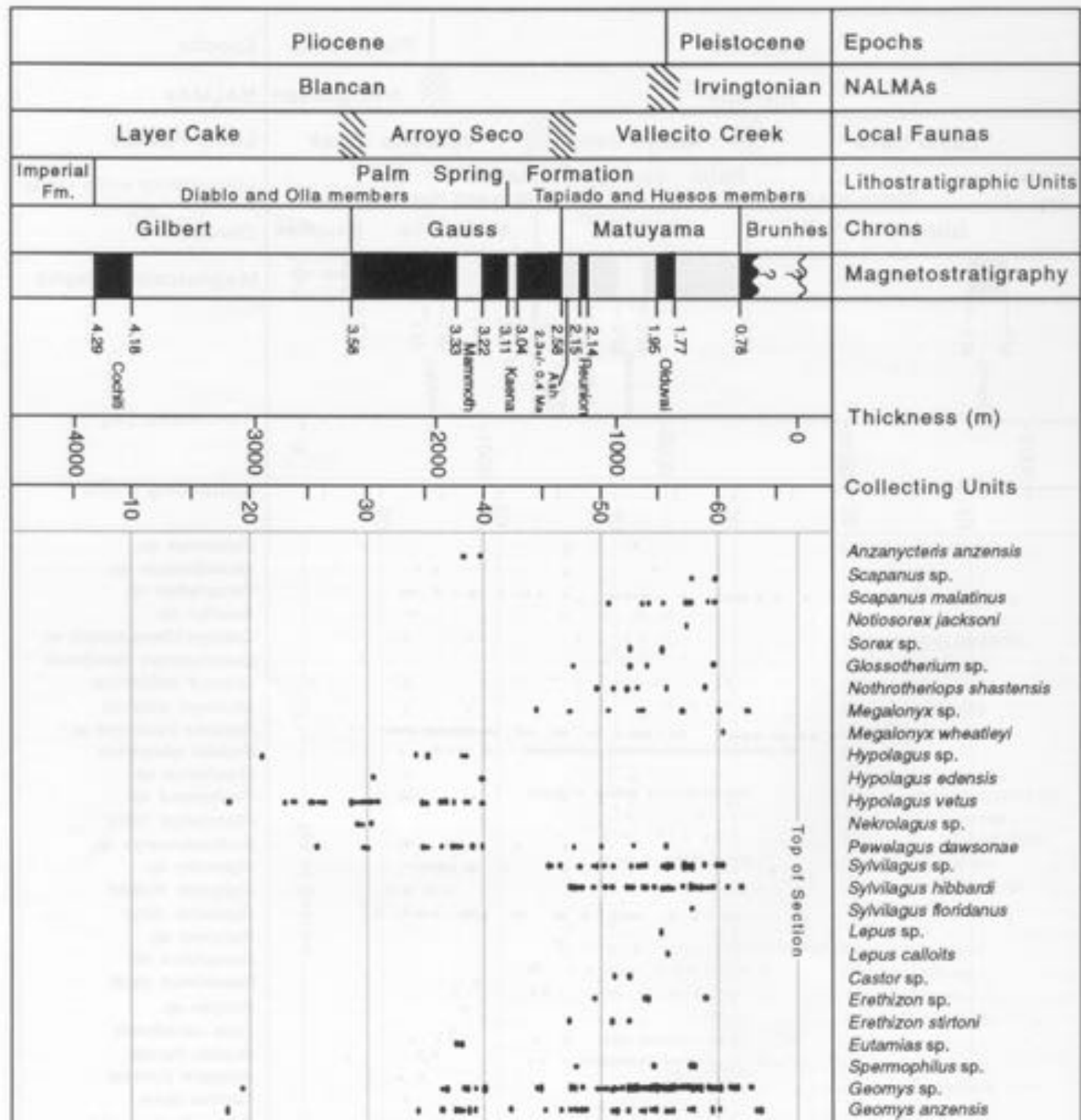
<100%

Canis

<100%

HIGH

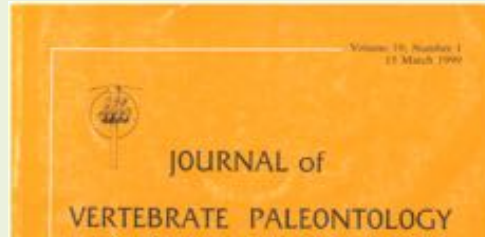
Taxon Locality Data Transposed to a Range Chart



Cassiliano, M. 1999. Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

Evolution of the ABDSP Faunal List

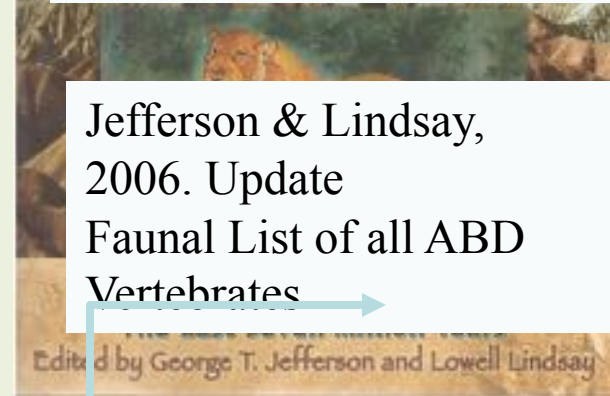
+Subsequent Publications
of Select Taxa
+Database Updates



Cassiliano, 1999.
Update Range Chart
of VCFC Mammals

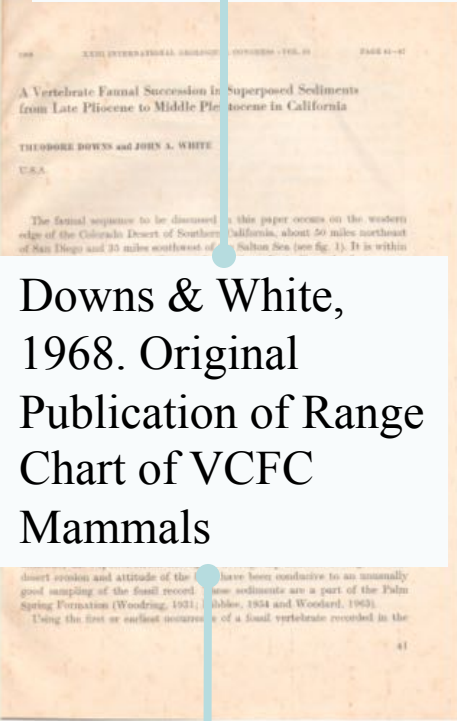


Cassiliano, 2006. Update
Range Chart of VCFC
Mammals

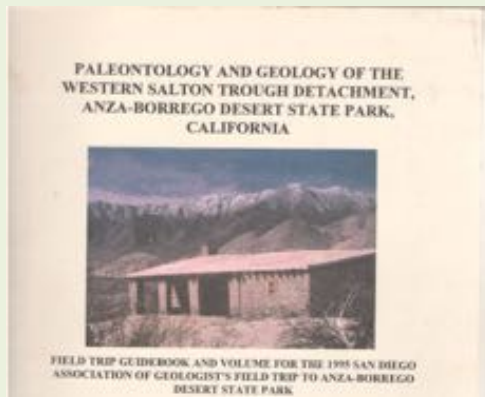


Jefferson & Lindsay,
2006. Update
Faunal List of all ABD
Vertebrates

Downs & White,
1968. Original
Publication of Range
Chart of VCFC
Mammals



+In-House Lists
+ Subsequent Publications
+Database Updates

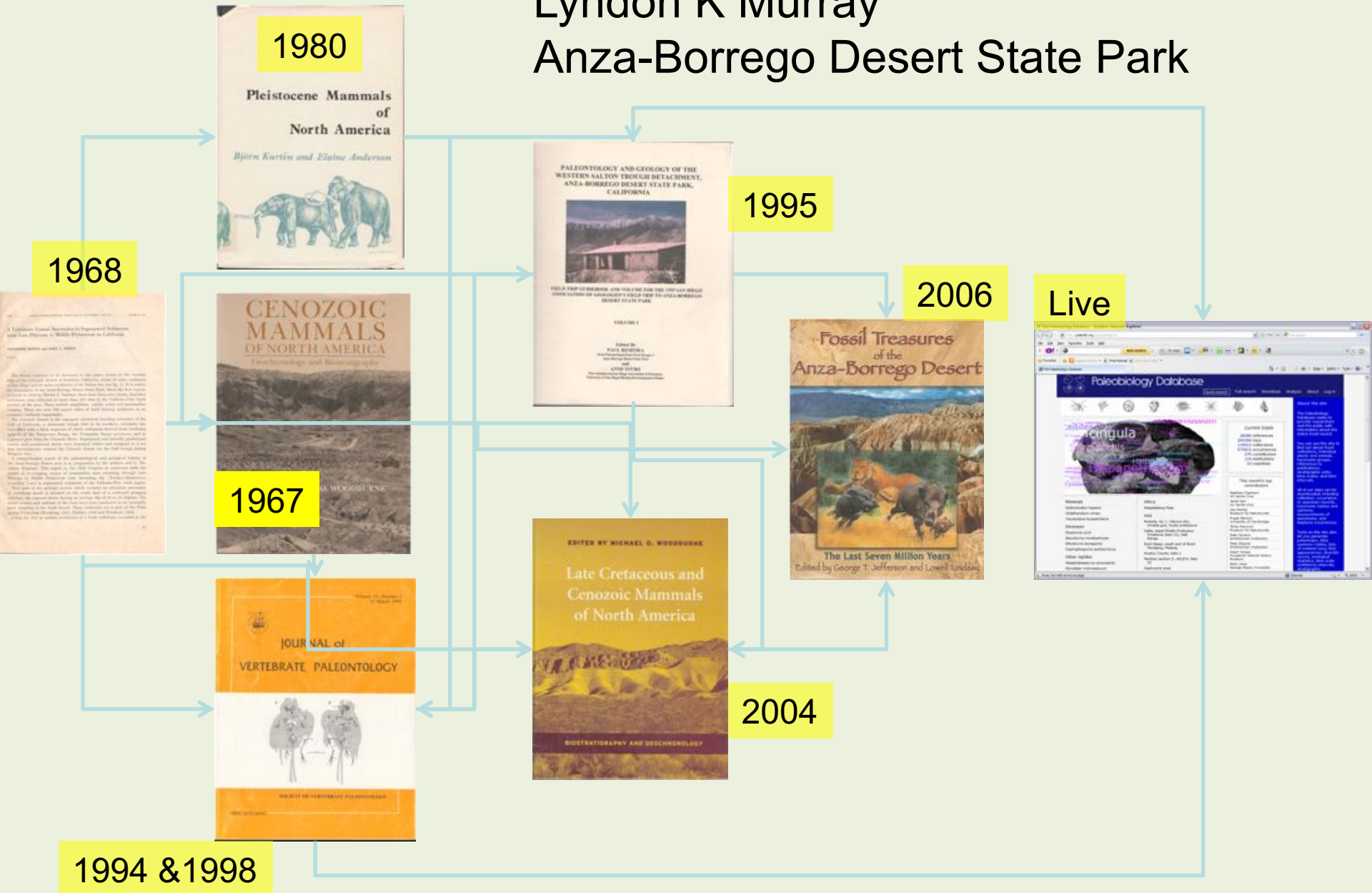


Remeika et al., 1995.
Original Publication of
Faunal List of all ABD
Vertebrates

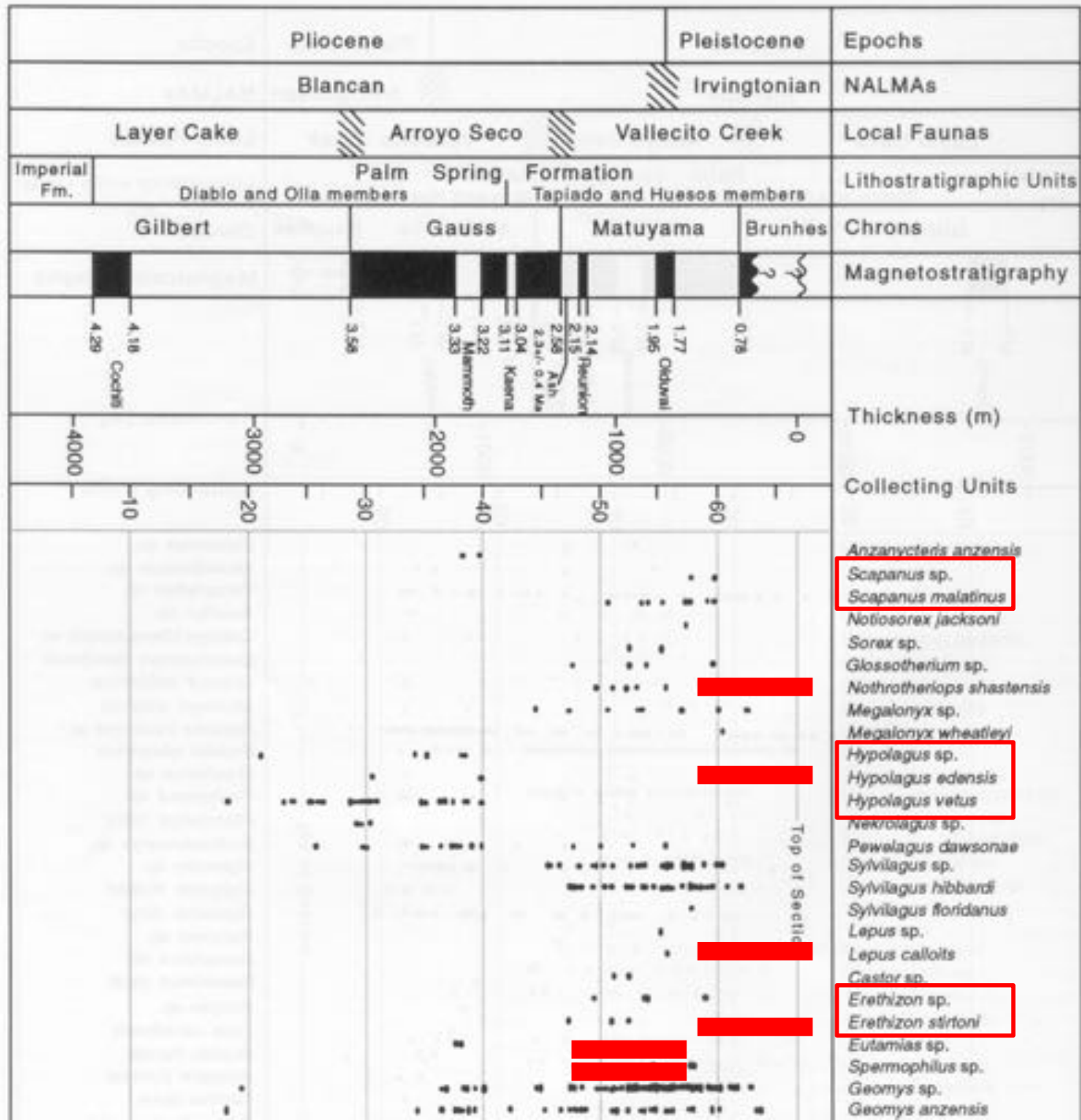
THE PROBLEM OF FAUNAL LISTS

Lyndon K Murray

Anza-Borrego Desert State Park



Taxon Locality Data Transposed to a Range Chart



Cassiliano, M. 1999. Biostratigraphy of Blancan and Irvingtonian mammals in the Fish Creek-Vallecito Creek section, southern California, and a review of the Blancan-Irvingtonian boundary. *Journal of Vertebrate Paleontology* 19:169-186.

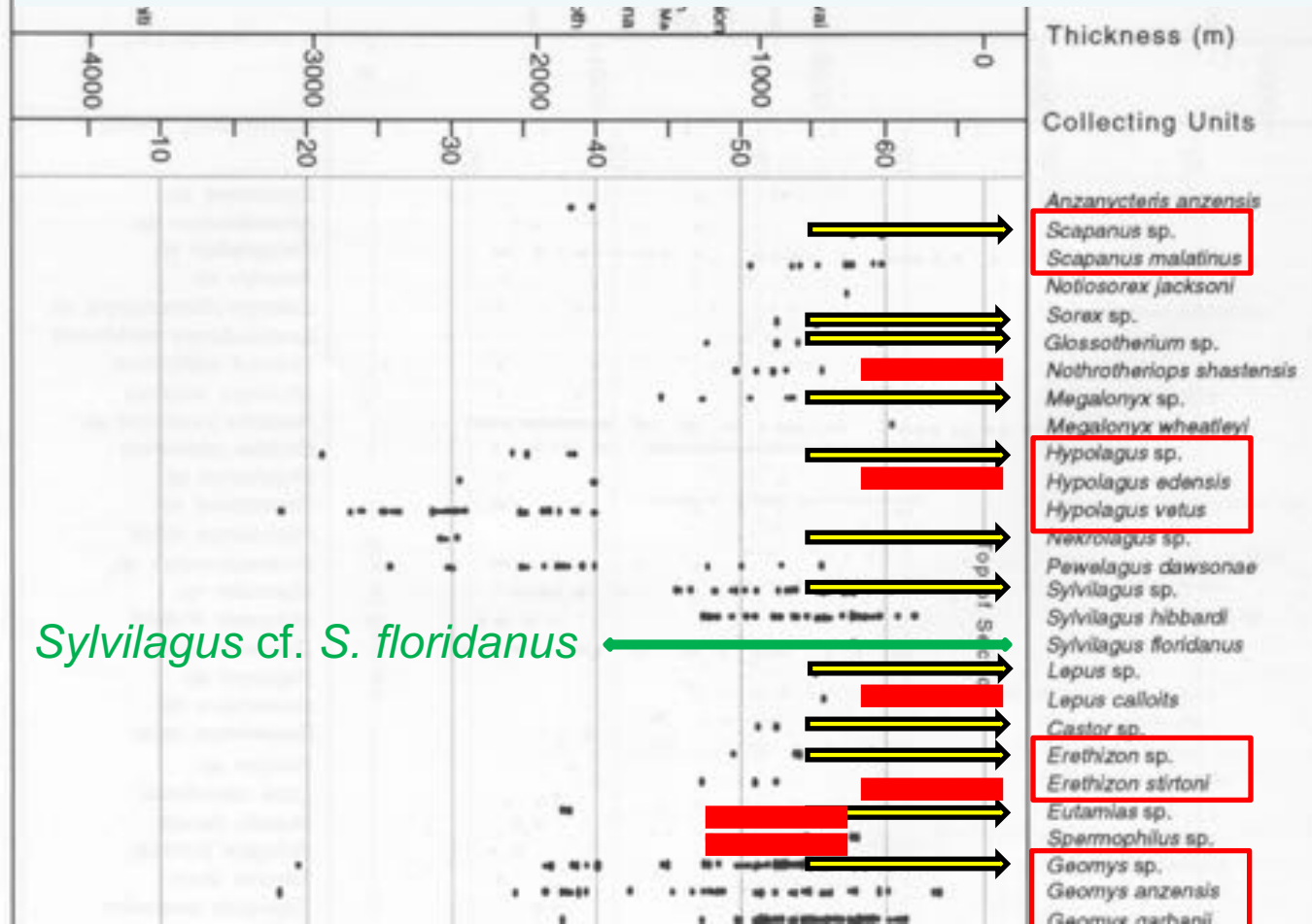
ID Evaluation of Canidae (Dogs) –

100+



Taxon Locality Data Transposed to a Range Chart

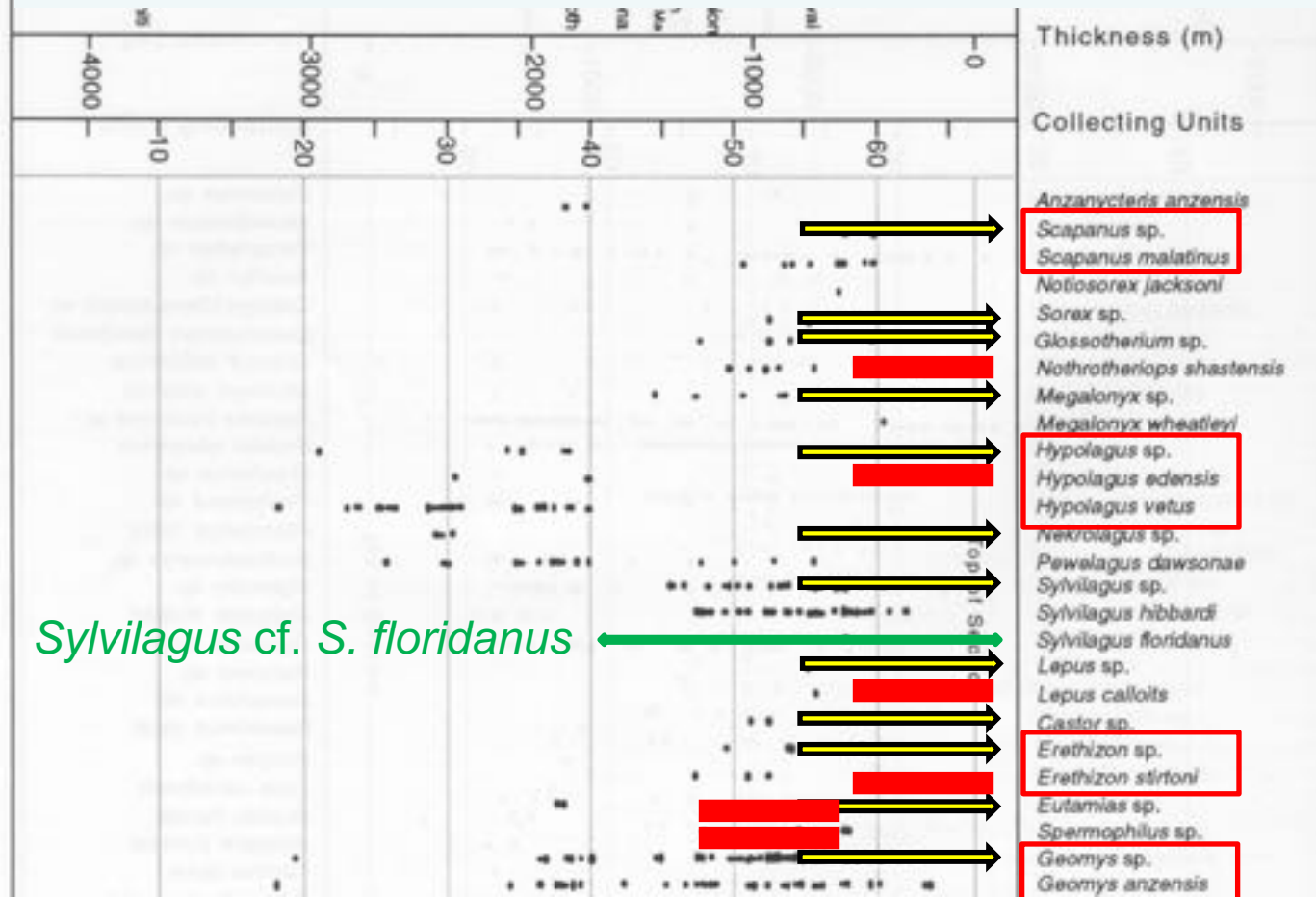
- Qualifiers in text stripped away in chart
- With the exception of 'sp.',
- Which creates the possibility of non-existent ghost species.
- Re-evaluation shows mis-identified, or invalid taxa.



Cassiliano, M. 1999.
Biostratigraphy of Blancan
and Irvingtonian mammals
in the Fish Creek-Vallecito
Creek section, southern
California, and a review of
the Blancan-Irvingtonian
boundary. Journal of
Vertebrate Paleontology
19:169-186.

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Cassiliano, M. 1999.
 Biostratigraphy of Blancan
 and Irvingtonian mammals
 in the Fish Creek-Vallecito
 Creek section, southern
 California, and a review of
 the Blancan-Irvingtonian
 boundary. Journal of
 Vertebrate Paleontology
 19:169-186.

TABLE 2.1. ABD Database Tables archived on the CDD ABDSP network server, as cited in text, are listed chronologically by date last modified.

Table as Cited in Text	Table Name	Description	Date Last Modified
LACM 1995 Localities	ABLOCS	earliest extant version of 1995 LACM localities table sent to ABDSP	09/06/1995
LACM 1995 Specimens	LACM Specimen Data	earliest extant version of 1995 LACM specimens table sent to ABDSP	02/26/1996
ABDSP 1997 Specimens & Localities	VERTEBRATES	earliest extant version of IVCN & ABDSP specimens & localities combined	05/14/1997
ABDSP-LACM 2003 pre-TMS Localities	Localities	last pre-TMS version of IVCN, ABDSP, & LACM localities combined	09/17/2003
LACM Sep 2003 Specimens	LACM Vertebrates	LACM Specimens table with field numbers scrambled, pre-dates TMS conversion	09/17/2003
LACM 2003 pre-TMS Specimens	LACM Vertebrates	last pre-TMS version of LACM specimens	11/06/2003
ABDSP 2003 pre-TMS Specimens	ABDSP Vertebrates	last pre-TMS version of IVCN & ABDSP specimens	11/11/2003
ABDSP-LACM 2004 TMS Specimens	Combined Vertebrates	early post-TMS version of IVCN, ABDSP, & LACM specimens	02/10/2004
ABDSP-LACM 2007 Specimens	Specimens Combined Active	Current version of 2007 IVCN, ABDSP, & LACM specimens	08/12/2007

TABLE 2.2. ABD in-house faunal lists (on file at SRC).

Institution Acronym	Date of List	Author	Fossil Area Covered
LACM	1965	T. Downs and J. White	VCFC
LACM	1966	T. Downs and J. White	VCFC
LACM	1968	T. Downs and J. White	VCFC
ABDSP	1972	B. Jones (park naturalist)	ABD
LACM	1977	T. Downs and J. White	VCFC
IVCM	1979	no author (possibly G. Miller)	ABD
ABDSP	no date (probably 1979)	no author (possibly G. Miller)	Coyote Canyon Badlands
IVCM	1981 (handwritten addenda to LACM 1977)	G. Miller (addenda to T. Downs and J. White)	ABD (addenda to VCFC)
LACM/IVCM	1981	T. Downs, J. White, and G. Miller	ABD
IVCM	no date (between 1984 and 1987)	no author (probably G. Miller)	ABD
IVCM	no date (between 1985 and 1988)	no author (probably G. Miller)	ABD
IVCM	no date (about 1987)	no author (probably G. Miller)	Boerego Badlands
ABDSP	no date (probably 1992)	no author (probably P. Remoika)	ABD
ABDSP	no date (about 1994)	no author	ABD

TAXONOMIC REVIEW

>150 publications and in-house faunal lists

>830 taxonomic variants

~100 taxonomic names

~65 genus names (w/o qualifier)

~45 species names (w/o qualifier)



**FOSSIL
FRANKENSTEINS:
Resurrecting Old Data**

Universal Pictures, 1931;
Image Credit: www.doctormacro.com

ID Evaluation - Canidae (Dogs)

wolf, coyote, & fox

cats

badger, raccoon, +

not carnivoran