Report on the Assessment of Vertebrate Paleontological Collections, Burke Museum of Natural History, University of Washington

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Compiled and submitted by Laurie J. Bryant, Ph.D.

Introduction

At the request of Dr. David C. Hodge, Dean of the College of Arts and Sciences, University of Washington, a team of vertebrate paleontologists examined the collections stored at the Burke Museum of Natural History and Culture, in early November, 2005. Members of the team were Mr. Patrick Leiggi (Museum of the Rockies, Bozeman, MT), Mr. Ted Fremd (John Day Fossil Beds National Monument, OR), and Dr. Laurie J. Bryant, Bureau of Land Management (BLM), UT (retired). The Museum's collections include not only fossil specimens but reproductions of specimens, catalogs of both specimen and locality data, and a limited number of maps. This report is a compilation of our work.

Specimens in the Museum's vertebrate paleontology collection had been obtained over a period of some 35 years, principally by Dr. John Rensberger. Although the collection appears to be appropriately stored and neatly labeled, Museum staff had become concerned about the scientific integrity of some data and the legality of collections made from federal and other lands.

Scope of Work

The team of investigators was contacted and charged with determining a) the dates and places of specimen collection, b) the existence of records and specimens, c) the

integrity and completeness of the data recorded, d) the physical condition of the collection, and e) the legality of the collection. With the help of Dr. Elizabeth Nesbitt, Dr. Christian Sidor, Ms. Bev Witte, and Mr. Bruce Cowley, the team had access to all known records, maps, and specimens; anecdotal information about field and laboratory work was also graciously given.

Procedures

Most vertebrate fossil specimens, as well as the accompanying data, in the Burke Museum are housed in a single basement room. Investigators began by surveying the contents of each storage cabinet, drawer, specimen tray and file cabinet to become generally familiar with the collection as a whole. The collection is arranged in stratigraphic order; that is, with the oldest specimens at one end of the room and the youngest specimens at the other end on the opposite wall. Within this system, specimens are stored in geographic order, then grouped by locality, and ultimately, arranged by specimen number. On first inspection, the collection appeared to be extraordinarily well curated.

Dr. Rensberger recorded specimen and locality data in two different formats. At one time, both specimen and locality data had been hand-written on index cards and stored in steel drawers. Beginning in the middle 1960's, Dr. Rensberger began entering these data both on cards or ledgers and on computers, ultimately on an Apple Mac G4. Investigators searched both written and electronic databases to determine the sources, accuracy, and integrity of what had been recorded.

When possible, data from sources outside the Museum were used to verify catalog entries. For example, Dr. Rensberger submitted a report to Wyoming BLM in July, 1998. It included limited specimen data and fairly complete locality information; much more detailed information was recorded in the Museum's catalogs, although the accuracy of the data is still undetermined.

Investigators also tried to establish a timeline showing the dates and places where Museum collections were made (see below).

Timeline

Some parts of the collection – those from the Eocene of Wyoming, from Montana, and from the middle Tertiary of Oregon – were examined very carefully to create a rough timeline for at least some of the field trips led by Dr. Rensberger with his students and volunteers. Although more study would add detail, the following table indicates roughly when collecting in these areas took place over some 35 years. During the same period of time, Dr. Rensberger and/or his students also conducted field trips to collect in Nevada, Idaho, South Dakota, North Dakota, New Mexico, and California.

Year	Wyoming	Montana	Oregon
1968	Bridget Fm.	Hell Creek, Deep River Fms.	John Day Fm.
1969	Bridget & Washakie Fms.	Deep River, Renova Fms.	John Day Fm.
1970		Hell Creek, Deep River, Renova Fms.	John Day, Shutler, Dalles
1971		Deep River Fm.	John Day, Astoria
1972		Two Medicine, Hell Creek, Deep River Fms.	John Day, Ellensburg, Dalles

1973			John Day
1974		Two Medicine, Deep River Fms.	
1975		Hell Creek, Deep River Fms.	Dalles, Fossil Lake, Drewsey
1976		Deep River Fm.	John Day, Dalles, Juntura
1977	Bridger Fm.	Deep River Fm.	John Day, Dalles, Fossil Lake
1978		Deep River Fm.	John Day, Dalles
1979		Deep River Fm.	John Day Fm.
1980	Uintan faunas, Bridger Fm.		Rattlesnake Fm.
1981		Renova, Deep River Fms.	Dalles
1982	Indian Meadows Fm.	Renova Fm.	
1983	Wasatch Fm.	Hell Creek, Deep River Fms.	John Day
1984		Deep River Fm.	
1985	Washakie, Bridger Fms.		
1986	Bridger Fm.	Hell Creek Fm.	
1987	Bridger Fm.	Hell Creek Fm.	
1988		Hell Creek Fm.	John Day
1989			
1990			
1991	Bridger Fm.		
1992	Bridger Fm.		
1993			

1994			
1995			
1996	Bridger Fm.		
1997	Bridger Fm.		
1998			
1999			
2000			
2001		Hell Creek Fm.	
2002		Hell Creek Fm.	John Day
2003		Hell Creek Fm.	

Collecting Permits

Federal departments and agencies such as the Department of the Interior, the National Park Service and the Bureau of Land Management first realized early in the 20th century that the lands they owned and administered contained not only valuable commodities - minerals, timber, forage - but also objects that had national significance outside the commercial realm. Collection of these objects, including artifacts and fossils, was regulated as early as 1906 through the issuance of permits to qualified individuals and institutions, initially under the authority of the Act for American Antiquities (although removal of any object from federal lands had long been subject to theft and degradation statutes). Vertebrate paleontologists have routinely applied for and obtained

such permits since the 1970's; requirements and procedures are discussed at meetings and in the literature of professional societies, principally the Society of Vertebrate Paleontology (SVP), founded in 1941.

Permits serve two basic purposes. While the process of application, approval, and subsequent reporting is time-consuming for agency staff and paleontologists alike, it protects important specimens from amateurs and commercial dealers, who cannot get permits. The permit process also provides a means of informing federal agencies about the kinds and numbers of these relatively rare fossils on lands they administer. Since the early 1990s, the SVP statement of ethics has required members such as Dr. Rensberger to obtain all necessary permits before collecting fossil vertebrates from federal, state or other lands, and to record detailed contextual data associated with the specimens.

Vertebrate fossils collected under a permit remain the property of the federal government in perpetuity. They cannot be traded, bartered or sold, and the museums that act as repositories are chosen for their suitability to preserve these irreplaceable remnants of America's national natural history.

Permits Issued to Dr. Rensberger

Dr. Rensberger's history of applying for and obtaining permits is sparse. It would be fair to say that permits for the collection of vertebrate fossils were rarely issued by federal agencies before the 1970's, but by the 1980's permitting was routine. Because Dr. Rensberger regularly attended SVP meetings from the 1960's onward, and indeed was still attending in 2005, he could not have avoided learning that the expectations of federal agencies were rising as regarded qualifications of applicants, reporting standards, and

care of the resulting collections and data. So far as investigators could discover, Dr. Rensberger obtained only two permits for Wyoming and two for Montana, No permit for federal, state, tribal or other lands was ever issued to Dr. Rensberger for Oregon.

State-By-State Summaries

WYOMING

Although Dr. Rensberger collected during at least 13 years in the Eocene of Wyoming where the lands are in large part administered by the Bureau of Land Management, he applied for permits only twice. He was issued a BLM permit in 1992, but did not submit any reports. Then in 1997, Dr. Rensberger faxed an outdated permit application to the Rock Springs BLM office only days before he wished to begin work; no permit was issued because the BLM paleontologist in Cheyenne was unavailable and because BLM permit processing takes at least 30 days. Dr. Rensberger took the application to Rock Springs, had it initialed by the office geologist, and proceeded to collect fossils as if he had received a permit

After repeated letters, telephone calls, personal conversations, and e-mails, Dr. Rensberger finally submitted an incomplete report to the Wyoming BLM in July, 1998. That report was carefully compared in November, 2005, with catalog data and specimen labels in the Burke Museum, and proved to reference specimens collected in 1992, 1996, and 1997; Dr. Rensberger had not even applied for a permit in 1996.

Dr. Rensberger collected fossils from many regions and stratigraphic units in Wyoming where land ownership may be federal, tribal, state, or private, but the greater part of the Museum's collections are from the middle Eocene Bridger Formation.

Outcrops of the Bridger Fm. occur primarily on lands administered by the BLM, and so Dr. Bryant focused on these specimens and contextual data. Locality data for most of this collection appears to be precise; it may also be accurate, but there are no known maps of appropriate scale that show these localities, and no field notes. Without these, locality accuracy will remain unknown.

Despite Dr. Rensberger's denials, evidence in the Museum's records shows that he did in fact record information in field notes, which are typically written as collections are being made. For example, Wyoming localities A5911, A6596, C0196, C0202 through C0204, C0206, C0255, C0258 and 0259, C0273 and C0275 all refer to Dr. Rensberger's field notes for additional locality and stratigraphic information.

OREGON

Collections from the John Day area of Oregon were given particular attention by Mr. Fremd, and many irregularities in the recorded data were discovered. For example, at Burke Museum locality A9966 (Picture Gorge 36), the *computer database* indicates that certain specimens collected at this site were collected in 1972, but on the labels with *the specimens themselves*, the collection date shown is 1988. This site is "on north side of Sheep Rock pinnacle," which is on National Park Service (NPS) lands. A collecting permit would have been required but was not applied for.

One of Dr. Rensberger's collectors - Glen Gieselink (sp?) – was working on BLM-administered land in 2002. Specimen # 87698, a *Promerycochoerus* dentary, was collected "at base of west side of Sutton Mountain," but there is no record of a collecting permit for this work.

A note found in a drawer from Blue Basin locality A4459 states that several boxes (?) were exchanged with a European museum. These NPS specimens could not legally be exchanged without permission, and there is no record of which specimens or how many were exchanged, if any exchange forms were generated, or if any material was received for these specimens. No permit was issued for their collection.

All of the approximately 500 specimens in the Burke Museum collection from the Foree area are "orphaned" - that is, there is no stratigraphic information associated with them. Ms. Bev Witte, who sometimes accompanied Dr. Rensberger in the field, stated that he kept field notes which should contain this information, but no field notes have been located. Ms. Witte also kept field notes, but all of hers were turned over to Dr. Rensberger at his request.

There appear to be repeated collecting visits to some localities over a period of years - i.e, A4498 (Haystack, Reed Ranch, OR) - but there is no record of any permits having been issued. At two BLM localities (Bone Creek and Logan Butte), unauthorized collecting certainly occurred in the late 1980s and possibly in the early 1990s. Dr. Rensberger hand-wrote the specimen labels for the material collected and thus knew of its existence, but there is no record of permits.

MONTANA

Most specimens from Montana were collected from the Hell Creek Formation (Upper Cretaceous Maastrichian) near the Fort Peck Reservoir, the Two Medicine Formation (Upper Cretaceous, Late Campanian) near Choteau, or the Deep River Formation (Miocene) from several areas.

It appears that fossil specimens were collected from federal, state, tribal and private lands in Montana during Dr. Rensberger's tenure at the Burke Museum. Ms. Bev Witte related to Mr. Leiggi that part of the Two Medicine Fm. collection almost certainly came from private lands, as she was present at the time of discovery and collection. According to Ms. Witte, the landowner(s), the Peebles family, granted permission, but it not clear which family members did so, or for which lands. Some of the Two Medicine Fm. collection came from the Browning and Lake Frances areas, which are within or near the boundaries of the Blackfeet Indian Reservation.

The BLM issued permits to Dr. Rensberger in 2001 and in 2003 for surface collecting in the Maloney Hill area near Ft. Peck Reservoir; curiously, the specimen list Dr. Rensberger submitted to the BLM in his 2003 report is the same as that for 2001.

Lands adjacent to BLM-administered lands surrounding Ft. Peck Reservoir are administered by the U.S. Fish & Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (USACE), and there are many known fossil localities. Maloney Hill is only one mile south of the Charles M. Russell National Wildlife Refuge (USFWS) boundary; no permits from these agencies were found in the Museum's files, although Dr. Rensberger has been collecting in this area for over 30 years, according to specimen labels in the collections. A recent inquiry to the Charles M. Russell National Wildlife Refuge office revealed that neither Dr. Rensberger, the Burke Museum, nor the University of Washington had ever applied for permits.

Specimens Missing From the Collection

A number of specimens from the John Day area, OR, area are not in their boxes in the collection. Hand written notes state "... on loan to J. Rensberger," and apparently he checked them out to himself. There is no record of any loans to Dr. Rensberger in the Museum's "in-house loans" file.

Holotype and Notable Specimens

Mr. Fremd visited Dr. Rensberger in 1987 and was allowed to see some parts of the collection. At that time, a number of especially notable specimens were kept in Dr. Rensberger's office. A sample survey done in November, 2005, suggests that at least some of these specimens had been returned to the main collections.

Holotypes are specimens selected for description and publication as being diagnostic of a new taxon, such as a species. They are particularly important and should be carefully secured to ensure their continued availability for study. The Burke Museum's computer database lists 12 to 14 holotypes. Careful inspection showed that some of these "holotypes" were reproductions of holotype specimens, but others were in fact fossils. All were located in the main collections, although they were poorly marked and had no special protection.

Of particular interest was the holotype skull of a small peccary, not a Burke Museum specimen but one belonging to the University of California Museum of Paleontology (UCMP). This particular specimen was last officially borrowed from the UCMP in 1967 by another paleontologist, but it must have been in the Burke Museum for many years. The UCMP has been notified of its existence, and the other holotypes have been re-labeled and moved to secure storage.

Paleontological Localities - Recording and Reporting

Fossil specimens are at the heart of the discipline of paleontology, but continued refinement of the science means an increased need for detailed contextual data that accurately places specimens in geologic time and in space. A century ago, the lack of suitable maps made it acceptable to identify a locality as "3 miles east of Ft. Bridger," but that is no longer the case.

Localities are 3-dimensional; that is, they exist in geographic (N-S, E-W) and stratigraphic (temporal) space. The stratigraphic position of a locality within a geological formation is as important as its latitude and longitude.

Locality data in a museum catalog may appear to be very accurate, when in fact it may only be very precise, and the difference here is enormous. A locality recorded at 41° 15.4' N, 110° 12.7'W could indeed be very accurately placed, or the data could simply be precise, inaccurate, and therefore entirely misleading. Geographic Positioning Systems (GPS) technology now makes both great accuracy and great precision possible, but even a skilled individual with a large-scale topographic map may approach this standard. An unskilled, lazy, or deceptive individual can create serious damage to the integrity of locality data.

Vertebrate paleontologists, like other field scientists, record information about the geology, geography, topography, and fossil associations as they collect during the day. While published maps and/or GPS data are extremely important, a collector's field notes, sketches and photographs are crucial for providing details that other media cannot supply. No field notes for Dr. Rensberger, or for his students and volunteers, were found,

although some notes were found on torn pieces of brown paper bags; these may be useful if they can be definitely associated with specimens. Failure to keep field notes, retaining them as the collector's personal property, or simply discarding them is extremely poor practice, if not worse. Topographic maps should also be associated with the locality records, but with few exceptions, the only maps found in the Burke Museum files were either of unusable scale, outdated or unrelated to any known collecting areas.

Improprieties and Sources of Error

The investigative team examined locality records at the Burke Museum and found them to be both confusing and in some cases misleading. Many very precisely-identified locality records referenced only small-scale maps (1:250000 or even 1:500000); these maps represent such large areas that even a pencil dot would be hundreds of feet in diameter on the ground and could encompass tens or hundreds of feet of vertical relief. Some very precise Museum locality records referenced suitably large-scale (1:24000) maps, but those maps were not found in the Museum's records and accuracy of the data cannot be established.

A careful review of specimens from the Bridger Fm. of Wyoming suggests another source of imprecision in locality data. In some cases, dozens of specimens, collected by several individuals in a single day, have been given the same locality number. This suggests that students or volunteers covered a large area in order to find so many fossils, and the day's collection was given a single locality designation that may have included an area 1/4 mile or more in diameter at an unknow number of stratigraphic levels.

A few maps in the collection room showed penciled locality names in the White Sulphur Springs - Smith River drainage of Montana, but there were no corresponding locality numbers that would indicate any relationship between the maps and specimens in the collection. The maps may have been used by Dr. Tony Barnosky when he was a student. A random check of locality records revealed that many latitude/longitude coordinates did not even correspond to those printed on the quadrangle map that was referenced.

The only map data with corresponding locality numbers and contextual data appears on two maps submitted to Montana BLM in 2001 and 2003. However, when the BLM hired a consultant to review its locality data, discrepancies were found. The consultant inquired about the discrepancies but received no reply from Dr. Rensberger.

Several locality cards were examined in detail to assess the accuracy of the recorded data. For example, the latitude and longitude for locality A4459 show it to be at the top of Middle Mtn, OR, which is incorrect for this locality known to Mr. Fremd. Public Land Survey System (PLSS) data for the same locality places it somewhere else entirely, suggesting an attempt to conceal the true location of this site. For locality A5835, the recorded latitude and longitude would place it about 1.5 miles east of its known position, and PLSS data for the same locality places it on adjacent private land. Museum localities A4556, A4772, and A4893 contain similar errors. The card for locality A5930 - Rudio Creek 4 - is missing. The computer database includes latitude and longitude for this locality (which place it in a very unlikely statigraphic position), but lacks PLSS data. This locality is important because it was at this site that a specimen of *Ekgmowechashala sp*. was recovered - the only one known from the Northwest and, if its

presumed stratigraphic occurrence is correct, the last fossil primate known from North America. PLSS data for locality A7913- Warm Springs - place this locality on a highway near Shateki Creek, proximal to or within the Confederated Tribes of the Warm Springs Reservation.

For this small sample of important John Day, OR, localities that are known to Mr. Fremd, latitude and longitude were consistently incorrect in random directions and by as much as 1 to 2 miles from the correct site. These errors were not within a reasonable margin of error. PLSS data was more accurate, but at least occasionally incorrect.

Even a cursory survey of locality records indicates that, for a variety of reasons, locality data for the vertebrate fossil collection in the Burke Museum cannot be relied upon for its accuracy or its precision.

Use and Availability of the Collection

It was well known in the vertebrate paleontology community that access to collections and data in the Burke Museum was strictly controlled by Dr. Rensberger. Many paleontologists and their students who requested access were denied, and the few who did receive permission were allowed to see only selected specimens under certain conditions. Dr. Rensberger may have wished to reserve the use of the collections for himself and certain colleagues or students, but because many of the specimens were collected from federal lands, access to them cannot be denied to any qualified investigator. Although the specimens are in the possession of the Burke Museum, they remain the property of the federal government and hence all Americans.

Conclusions and Recommendations

For whatever reason(s), recording and reporting locality data apparently was conducted with a disregard for completeness and accuracy, either through carelessness or deliberate falsification. Many specimens in the Burke Museum are beautifully preserved and skillfully prepared, but their significance to modern paleontology may have been drastically and perhaps irretrievably reduced. We refer you to the attached appendices on "Guideline for the Care of Natural History Collections" from the Society for the Preservation of Natural History Collections (SPNHC) guidelines, and to the U.S. Department of Agriculture, Forest Service Minimum Standards for Curation of Paleontological Resources. Some corrective actions may be taken to improve data quality, and we list these below.

1. Continue to insist that Dr. Rensberger provide his original field notes and detailed maps.
2. Contact relevant federal and state agencies and provide them with a list of specimens that may have come from lands they administer.
3. Contact former students for locality data and field notes.
4. Consider deaccessioning some unidentifiable material, but not before contacting former students and colleagues about the collection. Most federal agencies have their own policies regarding the disposition of specimens from lands they administer.
5. Inform the scientific community of the contents and availability of the collection for study, as initiated by the current curator.

6. Consider hiring a temporary assistant to the curator to assess the options for improving and correcting Museum data.

The willingness of Burke Museum staff and its Director, and University department and division leadership, to face the Museum's problems and work toward solutions is surely the most important element in making this excellent collection truly valuable to the science of paleontology. All three members of the investigative team are grateful for the opportunity to have assessed such an important resource, and very hopeful for its future.