

INVENTORY OF U.S. GEOLOGICAL SURVEY PALEONTOLOGY COLLECTIONS TO IDENTIFY FOSSIL LOCALITIES IN NATIONAL PARK SERVICE AREAS

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INTRODUCTION

Between the last quarter of the nineteenth century to nearly the end of the twentieth century, the United States Geological Survey assembled an extensive collection of fossils from the continental United States and Alaska. Collectively these collections represent the foundation for American biostratigraphy and paleontological taxonomy. The U.S. Geological Survey paleontological collections also represent many significant historical collections associated with early reconnaissance and mapping of the western United States. Fossils associated with the Hayden Survey exploration into Yellowstone are maintained in museum cabinets at the U.S. Geological Survey facilities at the Denver Federal Center in Denver, Colorado. The USGS also maintains the important Mesozoic ammonite reference collection of Bill Cobban (Cobban et al., 2006).

Paleontological resources were addressed in the act which established the U.S. Geological Survey (USGS) in 1879. Generations of USGS geologists and paleontologists acquired collections of fossils to support their research, mapping, and other work for the federal government. In 1900, a Division of Paleontology was created within the organization of the USGS, which later changed names several times throughout the following 90 years. USGS fossil collections were directed to facilities in Menlo Park, California; Denver, Colorado; and the Smithsonian National Museum of Natural History in Washington, D.C.

Beginning in 1889, the USGS documented paleontological specimens and locality information in informal reports known as Examination and Report on Referred Fossils or E&R Reports. These reports enabled field geologists and mappers to record detailed information about fossils which were discovered during field work. Often the E&R reports contain geologic and geographic information regarding fossil occurrences and collections which were obtained contemporaneous with field work. In some cases the locality data reported in the E&Rs are extremely limited. A near complete set of paper E&R reports are maintained at the USGS Headquarters in Reston, Virginia. USGS staff have scanned and organized the E&Rs into a searchable database.

During the early 1990s, the USGS Paleontology and Stratigraphy Branch was eliminated and the professional paleontology expertise for the bureau was greatly diminished. In 1997 the paleontological collections at Menlo Park were transferred to the Museum of Paleontology, at

the University of California at Berkeley. The USGS paleontology collections in Denver have continued to be maintained at the Denver Federal Center. Estimates suggest that the USGS at one point maintained over 1.5 million fossils in the various collections. These collections were accompanied by extensive records including the E&R reports, field notes, sketches, maps, locality and taxonomic reference cards, photographs and other information.

USGS PALEONTOLOGY COLLECTIONS—DENVER

In an effort for the National Park Service (NPS) to obtain information about fossil and fossil localities maintained in USGS collections, a pilot project was initiated in 2009 to inventory all fossil collections and associated records for the state of Oklahoma held by the USGS at the Federal Center in Denver. Although the principle interest for the NPS was to obtain paleontological resource data for Chickasaw National Recreation Area, the statewide approach to the project was determined to be the most efficient inventory method based on the organization of the USGS collections in Denver. A drawer-by-drawer inventory was conducted for each of the sixty museum cabinets with Oklahoma fossil collections. This work identified over 13,500 specimens assigned to 1,250 paleontological localities throughout the state of Oklahoma. Information was incorporated initially into spreadsheets and then into a database. Locality data was entered into ArcGIS so the distribution of paleontological data could be mapped and evaluated (McKinney et al., 2009).

Between 2002 and 2012 the National Park Service conducted a servicewide inventory to establish baseline paleontological resource data for parks throughout the agency (Santucci et al., 2012). Through this inventory effort and subsequent work, 244 units of the National Park System have been identified with documented fossils. The ten-year inventory effort significantly increased awareness regarding the scope, significance, distribution and management issues associated with NPS paleontological resources. This information enhances the ability for NPS staff to manage, protect, interpret and research fossils from park lands. The servicewide paleontological resource inventory found that the USGS has collected fossils and maintains fossil locality records from nearly 50 NPS administered areas. Many of these fossil collections and locality data were not known until recently. This paleontological resource data maintained by the USGS is extremely valuable to the

NPS in developing plans for future resource management, site monitoring, research and other stewardship activities.

Starting in 2011, the NPS and USGS began to inventory fossil collections and compile associated records and E&R reports from the state of Utah. Approximately 50 museum cases with fossils from Utah were identified by USGS Paleontology Collections Manager K. C. McKinney. The E&R reports associated with the Utah fossil collections were located in a number of file cabinets at the back of the collection area in the Denver Federal Center facility, arranged by the USGS group who worked on the material, not by the geographic location of the material worked on. Ninety-five E&R reports associated with fossils collected from areas administered by the NPS were scanned, portions of the text transcribed, and information (stratigraphy, taxonomy, geospatial) was incorporated into a project database.

NPS Guest Scientist John Ghist conducted the drawer-by-drawer inventory of the Utah fossil collections at the USGS facility in Denver. John systematically examined the fossil collections in each drawer contained within each cabinet. Photographs were taken of the entire drawer and secondary photos were taken with each specimen or groupings of fossil specimens. All associated cards, notes or other records were photographed and/or scanned, along with any corresponding field notes and E&R reports. All of the photos and information were entered into a searchable database.

Several important fossil collections from NPS areas in Utah were discovered during the inventory. In most cases these fossil collections were not known to current NPS staff and were not documented in park or servicewide paleontological archives. Notable fossil collections and corresponding records from Arches National Park and Dinosaur National Monument were photographed and scanned.

The collections from Arches National Park include the remains of mammoth and bison bones (Fig. 1) and clasts



FIGURE 1. USGS cabinet drawer (K-29-a-4) with miscellaneous vertebrate remains including mammoth and bison from Arches National Park. NPS photograph.



FIGURE 2. Planorbid gastropods from locality referred to as “snail rock” in Arches National Park, which Jack Oviatt (UGS) sent to John Hanley in 1984 from the base of ‘Tertiary deposits. NPS photograph.

with Tertiary planorbid gastropods (Fig. 2). Associated records and E&R reports provide detailed information regarding field localities, collector, date of collection and other information. Several letters, dated from the early 1980s, between C. G. “Jack” Oviatt (Utah Geological Survey) and John Hanley (USGS) discuss the interesting occurrence of the freshwater Tertiary gastropods from blocks within the Salt Valley Anticline in Arches National Park. Madsen et al. (2012) provides further discussion regarding Hanley’s archives and the implications for the occurrence of the gastropod fossils at Arches and the collapse of the Salt Valley Anticline.

Two collections of Carboniferous invertebrate fossils from Dinosaur National Monument were found in the USGS collections. One fossil collection was made by J. S. Williams in 1944. The other fossil collection was made by Barnum Brown and Gilbert Stucker (American Museum of Natural History) in 1953. The field collections from 1953 were supervised by Jess H. Lombard who was superintendent at Dinosaur National Monument between 1946 and 1960.

USGS PALEONTOLOGY COLLECTIONS—SMITHSONIAN

In 2011, the National Park Service requested assistance to evaluate the thick Silurian sequence preserved in Glacier Bay National Park and Preserve (GLBA), the thickest Silurian section known in North America. A team led by Robert B. Blodgett conducted field investigations of Silurian strata both within and in areas adjacent to GLBA. Paleontological specimens were collected and utilized to reconstruct the paleoenvironmental relationship of the Silurian geology. Part of this project involved the development of a comprehensive fossil locality database for GLBA and the surrounding area, which incorporated data from over 576 localities, most of which were documented by USGS field teams. The new information gained during

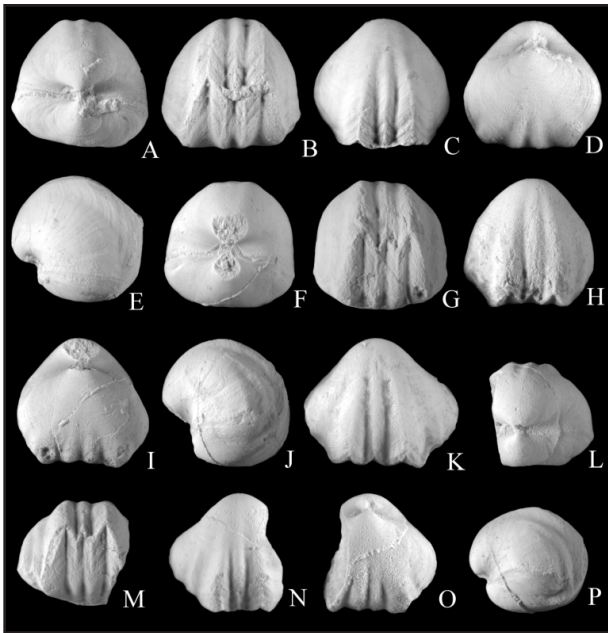


FIGURE 3. Holotypes and paratypes for *Sapelnikoviella santuccii* Blodgett et al. (2013), a Late Silurian gypidulinid brachiopod described from exposures of the Willoughby Limestone on the west side of Drake Island in at Glacier Bay National Park and Preserve, in southeast Alaska. Photography by Robert Blodgett.

field activities in 2011, along with the large number of unstudied USGS collections, enabled a new interpretation for the Silurian stratigraphy and paleoenvironment (including massive reef complexes) for GLBA and surrounding areas in southeast Alaska (Rohr et al., 2013). The historic collections made by USGS staff from GLBA, now at the Smithsonian, were also inventoried and studied as part of this project. Several major taxonomic papers have been published on the Silurian brachiopods (including a new genus and species *Sapelnikoviella santuccii*, Blodgett et al., 2013) (Fig. 3) and gastropods. A manuscript is also in preparation redescribing the original type specimens of the bivalve genus *Pycinodesma* (formerly thought to be the largest Paleozoic bivalve), which was originally described from Glacier Bay in 1927.

While examining the USGS fossil collections from GLBA and other parks in Alaska now maintained by the Smithsonian, a collection of extraordinarily large Middle Devonian brachiopods (Family Stringocephalidae) from the northern flank of the Brooks Range were discovered. This particular collection is from Noatak National Preserve and was collected in 1968 by Augustus Armstrong from a monospecific coquinoid shell bed. Study of this forgotten collection conducted during the past year shows that the brachiopods are examples of the large stringocephalid genus *Chascothyris*, and are the first specimens of this Eurasian genus to be found in North America. A manuscript is in the final stages of completion, and this material is being described as a new species of the genus

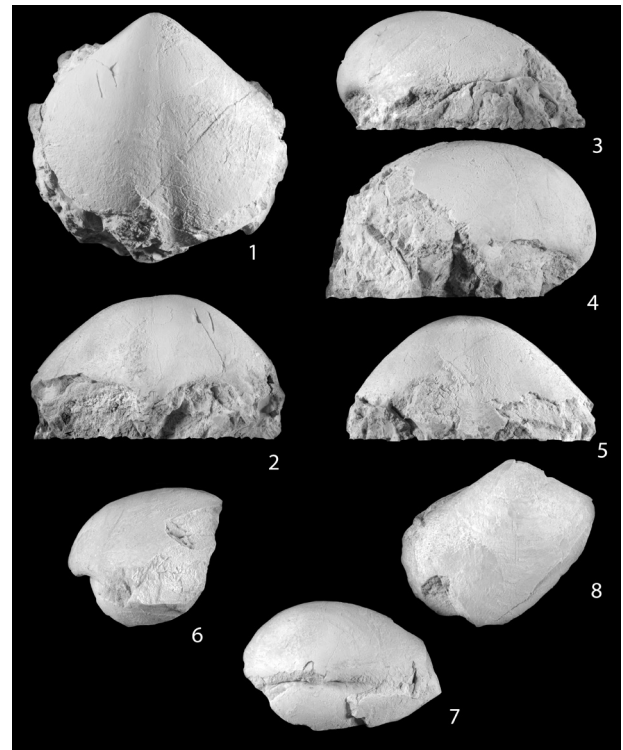


FIGURE 4. Various views of a new late Middle Devonian (Givetian) age stringocephalid brachiopod species being named in honor of Herbert Frost (NPS Alaska Regional Director). Specimens collected by A. K. “Gus” Armstrong (formerly USGS) in Noatak National Preserve (NOAT) in 1968, prior to the preserve being established as a unit of the NPS. Photography by Robert Blodgett.

(Fig. 4). The species will be named in honor of Herbert Frost, the new Regional Director for the Alaska Region of the National Park Service. The occurrence of this genus in northern Alaska is of great interest to paleobiogeographers as it helps constrain the possible tectonic origins of the allochthonous terranes which comprise most of the state.

USGS PALEONTOLOGY COLLECTIONS—UCMP (MENLO PARK)

A cooperative venture between the NPS and the University of California Museum of Paleontology (UCMP) was initiated in 2013 to inventory the USGS Invertebrate Collection from Menlo Park for specimens associated with NPS areas. The Menlo Park collections were donated to the UCMP in 1997. Museum Specialist (Invertebrate Collection) Erica Clites is coordinating the project and is developing an online fossil locality portal for collections identified from NPS areas. Fossil collections from over 20 national parks have already been incorporated into the fossil locality portal, most of which are parks in California and the Pacific West Region of the NPS.

CONCLUSIONS

The USGS paleontology collections are the result of over a hundred years of scientific field work by teams of

geologists, paleontologists and mappers. These collections held by the USGS in Denver, at the Smithsonian National Museum of Natural History, and at Menlo Park (now transferred to the Museum of Paleontology at the University of California), along with the associated data contained in the E&R reports, represent the foundation for North American stratigraphy and paleontology. It is difficult to imagine that such an extensive and representative fossil collection, dating back to the late 1800s, could ever be duplicated or replaced.

The paleontological collections of the USGS are a legacy and a reference collection (including thousands of holotype fossil specimens) that scientists today and in the future need to access for study and comparison. Through the authorities and mandates contained in the Paleontological Resources Preservation Act of 2009, the five federal agencies identified in this law will benefit from the century of work the USGS put forth to build the fossil collections. The care, maintenance, and continued access to the USGS fossil collections and associated data should be ensured in perpetuity in order to support the future work of the Bureau of Land Management, National Park Service, and U.S. Forest Service.

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