FOSSIL VERTEBRATE TRACKS IN NATIONAL PARK SERVICE AREAS

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ABSTRACT--Fossilized tracks of ancient vertebrates are widespread and are known from at least 19 National Park Service areas. The ichnostratigraphic record of vertebrates preserved in national parks ranges from the late Paleozoic through the Quaternary. The earliest tracks are known from the Pennsylvanian Wescogame Formation at Grand Canyon National Park, Arizona. The largest concentration of vertebrate ichnofossils occurs in the national parks on the Colorado Plateau. Glen Canyon National Recreation Area contains the greatest diversity and stratigraphic range of fossil tracks in any National Park Service unit. More than three dozen tracksites, representing eight different formations, have been identified at Glen Canyon. Dinosaur tracksites are most common, but tracks from non-dinosaurian reptiles, birds and mammals are also known from the national parks. The Copper Canyon tracksite at Death Valley National Park preserves one of the most abundant and diverse Tertiary track localities in North America. Nineteen fossil vertebrate track types have been identified including birds, artiodactyls, perissodactyls, carnivores, and rare proboscideans.

INTRODUCTION

Scientific and public interest in fossil vertebrate tracks has grown rapidly during the past decade. Large numbers of new tracksites have been discovered and numerous publications have been produced reporting on vertebrate ichnofossils (Gillette & Lockley, 1989; Thulborn, 1990; Lockley, 1991a; Lockley & Hunt, 1995). Fossil vertebrate tracks are widespread and are known from a number of National Park Service (NPS) units. Hundreds of fossil tracksites are known from parks on the Colorado Plateau.

Fossil vertebrate tracks preserved within National Park Service areas provide important opportunities for public education and interpretation of *in situ* fossils. Fossil tracks differ from fossil bones in that they provide different types of information about ancient organisms. Fossil bones preserve data on the environment in which the animal died or where it was buried, whereas fossil tracks provide data related to the environment in which the animal lived. Tracks represent an interface between the organism and its environment. Environments that promote good preservation of tracks and footprints do not typically promote the fossilization of bone.

Vertebrate ichnofossils have been reported from 19 National Park Service areas (Fig. 1). This record ranges from Pennsylvanian trackways in Grand Canyon National Park through Quaternary tracks at Zion National Park. Glen Canyon National Recreation Area contains the greatest diversity and stratrigraphic range of fossil tracks. Although tracks associated with dinosaurs are documented in the highest frequency, tracks from other reptiles, birds and mammals are known from National Park units.

PALEOZOIC TRACKSITES

Grand Canyon National Park, Arizona

The first discovery of vertebrate tracks in the Grand Canyon was made by Charles Schuchert in 1915. These tracks were collected from the Permian Coconino Sandstone on the South Rim (Schuchert, 1918). Richard Lull described the Paleozoic tracks collected by Schuchert, identified the trackmakers as an amphibian and named them *Laoporus* (Lull, 1918).

In 1924, the National Park Service invited Charles Gilmore to visit Schuchert's locality. Gilmore surveyed and discovered new track localities in the Grand Canyon. Between 1926 and 1928 Gilmore collected large numbers of fossil tracks from the Coconino Sandstone (Permian), Hermit Shale (Permian), and Wescogame Formation of the Supai Group (Pennsylvanian) for the Smithsonian Institution. He also developed an outdoor interpretive exhibit of Paleozoic tracks alongside Hermit Trail and published a series of classic papers about the late Paleozoic tracks from the Grand Canyon (Gilmore, 1926, 1927, 1928).

A reinterpretation of Permian vertebrate tracks occurred through the study of the extensive ichnofaunas from the redbeds of southern New Mexico (Haubold et al., 1995; Hunt et al., 1995; Haubold, 1996). A reexamination of the Grand Canyon tetrapod tracks based upon the revised ichnotaxonomy was undertaken by Hunt and Santucci (1998) (Fig. 2A).

Coconino Sandstone Tetrapod Ichnofauna:
- *Chelichnus duncani* (Owen, 1842) (=*Baropezia arizonae, B. eakini, Allopus? arizonae, Agostopus matheri, A. medius, Palaeopus regularis, Nanopus maximus, Barypodus metszeri, Laoporus noblei*)
- *Chelichnus gigas* (Jardine, 1850) (=*Barypodus palmatus, Amblypous pachypodus, Baropus coconinoensis*)
- *Chelichnus bucklandi* (Jardine, 1850) (=*Laoporus noblei, L. coloradensis, L. schucherti, Nanopus merriami, Dolichopodus tetradactylus*)

Hermit Shale Tetrapod Ichnofauna:
- *Batrachichnus delicatulus* (Lull, 1918) (=*Exocampe? delicatula, Batrachichnus delicatula, B. obscurus, Dromillopus parvus*)
- *Parabaropus coloradensis* (Lull, 1918) (=*Megapezia? coloradensis*) *Hyloidichnus bifurcatus* (Gilmore, 1927) (=*Hyloidichnus whitei*)
- *Gilmoreichnus hermitanus* (Gilmore, 1927) (=*Cursipes* sp., *Palaeosauropus hermitanus, Hylopus hermitanus, Collettosaurus pentadactylus*)
- *Limnopus* sp. (Gilmore, 1927) (=*Parabaropus coloradensis*) *Ichniotherium* sp. (Gilmore, 1928) (=*Parabaropus coloradensis*)

Wescogame Formation Tetrapod Ichnofauna:
- *Batrachichnus delicatulus* (Lull, 1918) (=*Stenichnus yakiensis*)
- *Limnopus* sp. (Gilmore, 1927) (=*Ammobatrachus turbatans, Tridentichnus supaiensis, Anomalopus sturdevanti*)

Glen Canyon National Recreation Area, Utah

Three Permian tracksites are known from the Cedar Mesa Sandstone in Glen Canyon National Recreation Area. One of the tracksites apparently preserves evidence of a predator attacking a prey. However, only photographs and replicas of this trackway are available for study since the original site is now underwater after the construction of the Glen Canyon Dam in 1963. The Glen Canyon Permian tracksites include:
- "Dirty Devil Tracksite" contains *Anomalopus*-like tracks converging with a small *Stenichus*-like trackway (Lockley and Madsen, 1993). The point of convergence for the tracks shows the small tracks ending abruptly and may represent evidence of a predation event. Hunt and Lucas (1998) have recently reevaluated the converging tracks interpretation and have concluded that the evidence does not

unequivocally support the predation scenario.

- "Steer Gulch Tracksite" contains tracks resembling those of *Anomalopus*.
- "Grand Gulch Tracksite" has 6 track-bearing slabs.

MESOZOIC TRACKSITES

Arches National Park, Utah

A high-density, dinosaur megatracksite exists in the lowest member of the Jurassic Morrison Formation in and around Arches National Park. The track-bearing sediments represent a vast basin where the water table was at or near the land surface level (Duffy, 1993). This highly dinoturbated surface yields *Allosaurus*-like tracks. The portion of the megatracksite within the boundary of Arches National Park represents a coastal plain environment (Lockley, 1986, 1991b; Lockley and Hunt, 1995).

Several iguanodontid tracks are known from the Cedar Mountain Formation near Thompson Ranch just north of Arches National Park. Three specimens of these tracks are in the collections of the College of Eastern Utah.

Big Bend National Park, Texas

Anthony Fiorillo (in press) reported possible large vertebrate footprints observed in cross-section within the Upper Cretaceous Javelina Formation at Big Bend National Park. Based upon the size and morphology of the sedimentary structures, these were interpreted as possible sauropod impressions.

Canyonlands National Park, Utah

A single tracksite of a well-preserved impression of a tridactyl dinosaur was found in the Rock Point Formation of the Chinle Group near Upheaval Dome in Canyonlands National Park. This specimen was identified as the ichnogenus *Grallator* (Hunt et al., 1993; Lucas et al., 1995).

A Chinle Group tracksite in Canyonlands National Park contains tracks of a tetrapod with a four-toed manus and five-toed pes identified as *Brachychirotherium*. The toes are blunt and lack well developed claw impressions. These tracks likely represent prints of an aetosaur-like reptile. The tracks of a large five-toed herbivore are also reported from Canyonlands. These have been identified as *Pentasauropus* and are probably attributed to a dicynodont reptile.

Fossil vertebrate tracks are also known from the upper part of the Kayenta Formation just below the overlying Navajo Sandstone in Canyonlands. There may also be some tracks from the Permian Cedar Mesa Formation in Canyonlands that are accessible by river trip. Loope (1984) reported four tracksites within Canyonlands National Park. Stokes (1986) reported a tracksite in Labyrinth Canyon just outside the park boundary. An additional tracksite is known from the Kayenta-Navajo transition from the Horseshoe Canyon area of Canyonlands.

Capitol Reef National Park, Utah

Fossil tracks were first reported from Capitol Reef National Park by Peabody (1956) and Lammers (1964). Numerous fossil vertebrate trackways are preserved in the Triassic Moenkopi Formation. The tracks include footprints and swimming traces of *Chirotherium*. Invertebrate

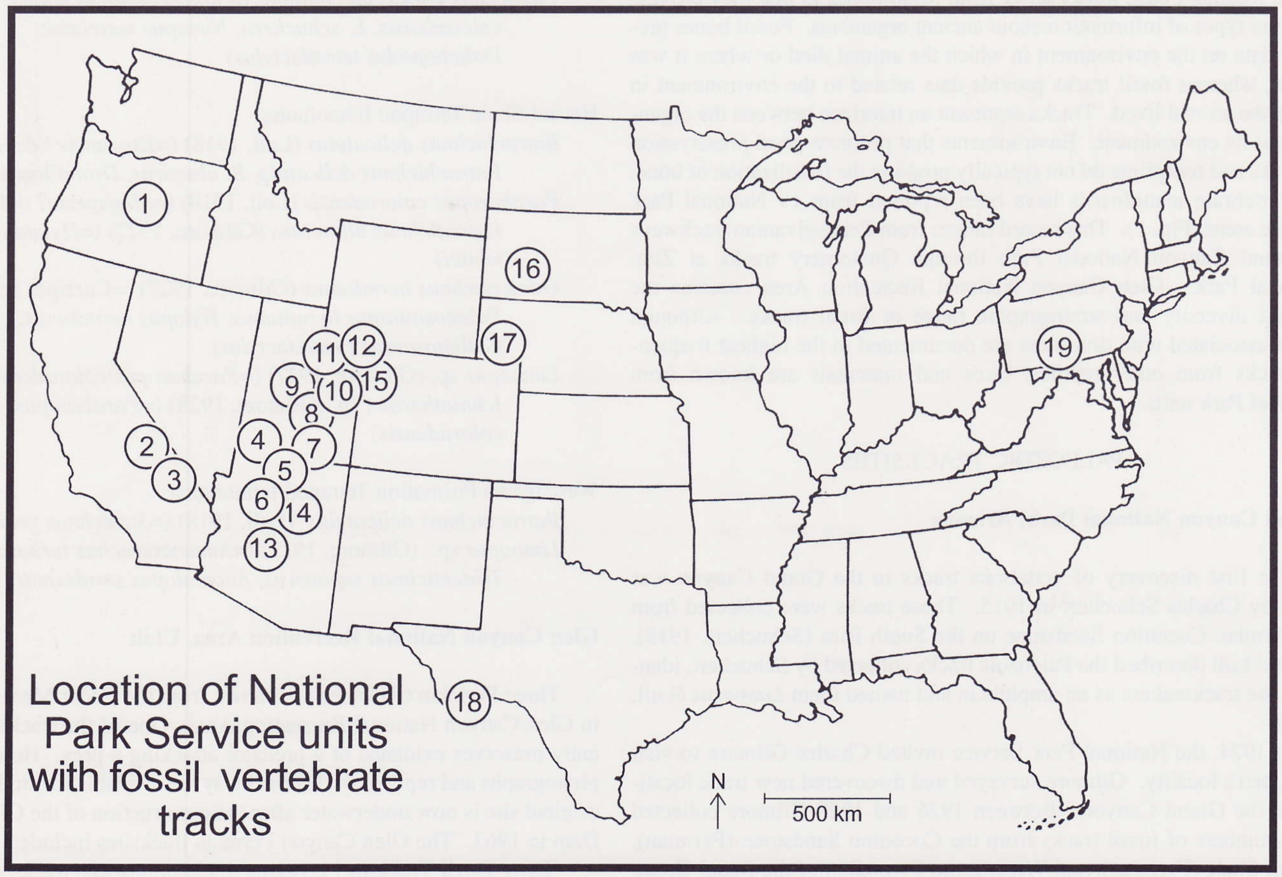

FIGURE 1 - Distribution of fossil vertebrate tracks in National Park Service areas. 1, John Day Fossil Beds National Monument, Oregon; 2, Death Valley National Park, California; 3, Mojave National Preserve, California; 4, Zion National Park, Utah; 5, Pipe Spring National Monument, Arizona; 6, Grand Canyon National Park, Arizona; 7, Rainbow Bridge National Monument, Utah; 8, Glen Canyon National Recreation Area; 9, Capitol Reef National Park, Utah; 10, Canyonlands National Park, Utah; 11, Arches National Park, Utah; 12, Dinosaur National Monument, Colorado and Utah; 13, Montezuma's Castle National Monument, Arizona; 14, Petrified Forest National Park, Arizona; 15, Colorado National Monument; 16, Badlands National Park, South Dakota; 17, Scott's Bluff National Monument; 18, Big Bend National Park, Texas; 19, Gettysburg National Military Park, Pennsylvania.

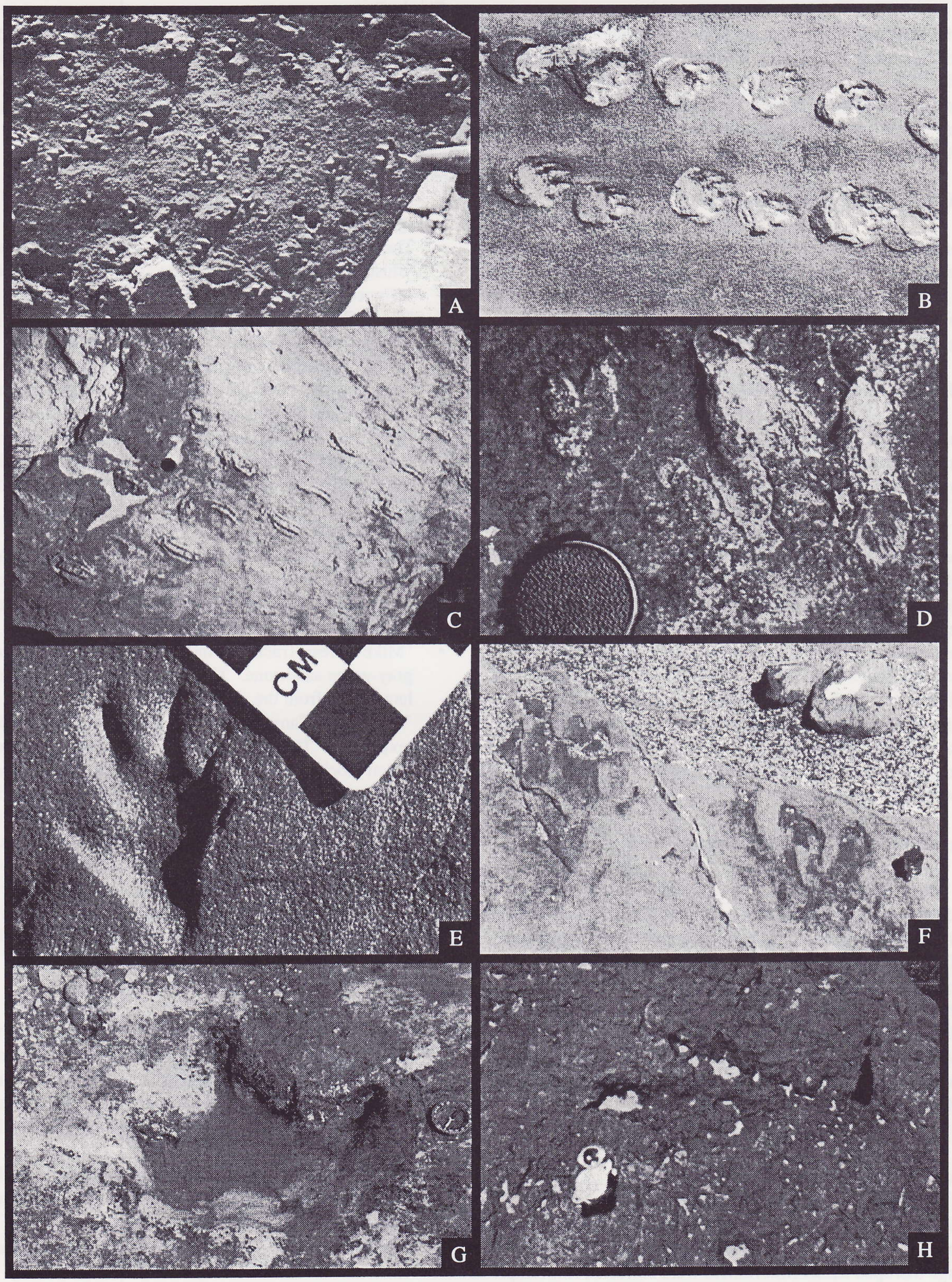

FIGURE 2 - A, *Chelichnus* tracks in Permian Coconino Sandstone at Grand Canyon National Park; B, *Chelichnus* tracks in Permian Coconino Sandstone at Grand Canyon National Park; C, Tetrapod swimming traces in Triassic Moenkopi at Capitol Reef National Park; D, *Atreipus milfordensis* tracks in Triassic Newark Supergroup at Gettysburg National Military park; E, *Rhynchosauroides* track in Triassic Chinle Group at Petrified Forest National Park; F, *Eubrontes* tracks in Jurassic Navajo Sandstone at Pipe Spring National Monument; G, Ornithopod-like tridactyl track in the Jurassic Moenave Formation at Zion National Park; H, *Grallator* track in Jurassic Kayenta Formation at Zion National Park.

traces including *Palaeophycus* and *Diplidnites* are reported from the Torrey Member of the Moenkopi.

Recent work by McAllister and Kirby (in press) indicated that the tracks show paddling activity in shallow water and movement onto emergent, subaerial surfaces. There appears to be some impressions that preserve evidence of tetrapods fighting a lateral current that carried them sideways (Fig. 2C).

A few tridactyl tracks are reportedly preserved in the Chinle Group and dinosaur and tritylodont tracks in the Kayenta Formation from Capitol Reef National Park.

Colorado National Monument, Colorado

A tracksite found near the top of the Chinle in "transitional" beds below the overlying Wingate Sandstone is not far from the east entrance of Colorado National Monument. The tracks consist of a number of subcircular to oval depressions, some of which show partial impressions of a tridactyl foot of a theropod dinosaur (Hunt et al., 1993).

Dinosaur National Monument, Colorado and Utah

Dinosaur National Monument area contains many important fossil vertebrate track localities. Frank Peabody found unusual Triassic Moenkopi tracks in the vicinity of the monument. This material includes some swim tracks that are in the collection of the Utah Field House Museum of Natural History in Vernal, Utah.

About two dozen tracksites occur within the boundaries of Dinosaur National Monument. Among these is a swimming trackway of *Gwyneddichnium* that shows webbing between the toes. There are specimens preserving both walking and swimming behavior for this track type (Lockley et al., 1992A, B, C; Lockley and Hunt, 1993).

Numerous tracksites have been discovered in the Upper Triassic Popo Agie Formation of the Chinle Group. Fossil tracks recorded from the monument are diverse and include track types assigned to dinosaurs, mammal-like reptiles, phytosaurs, aetosaurs, lepidosaurs, trilophosaurs, and tanystropheids. An *Otozoum* tracksite is known from the Navajo Formation within the monument.

Gettysburg National Military Park, Pennsylvania

A Late Triassic dinosaur track was reported within a building stone used in the construction of a stone bridge at Gettysburg National Military Park. Dinosaur tracks are preserved in mudstones that were quarried during the 1930s in an area outside of the park. The track-bearing deposits were laid down in a gradually deepening trough of sediments.

The Gettysburg track has been identified as *Atreipus milfordensis* and is preserved with manus and pes impressions (Santucci and Hunt, 1995). *Atreipus milfordensis* represents, as of yet, an undescribed dinosaur that exhibits a theropod-like pes in combination with a short-clawed and functionally tridactyl manus. The tracks are preserved in a block of the Gettysburg Shale, which is part of the Newark Supergroup (Fig. 2D).

Glen Canyon National Recreation Area, Utah

More than three dozen tracksites from eight formations have been reported from Glen Canyon National Recreation Area (Lockley et al., 1992d). Large theropod tracks (*Eubrontes*) were collected from Explorer Canyon and are on display at the Page Visitor Center (Fig. 3A, B). The stratigraphic breakdown of Glen Canyon tracksites was reported by Lockley et al. (in press).

Moenkopi Formation:

- "Trachyte Point Tracksite" contains irregular traces of several different size tetrapod swim traces. Horseshoe-shaped xiphosurid traces are also preserved at the site.
- "Mouth of Farley Canyon Tracksite" includes three track types (Schultz et al., 1995). The limulids are the most abundant. There are also elongate vertebrate swim tracks and lacertilian traces similar to *Rhynchosauroides*.

Chinle Group:

- "Four Mile Canyon Tracksite" preserves the first reported occurrence of *Atreipus* tracks from the western United States (Lockley et al., 1992d). There are also numerous well preserved lizard-like tracks of morphotypes assigned to be *Rhynchosauroides*. Collections of tracks were made in 1992.

Wingate Sandstone:

- "Lee's Ferry Tracksite" was first reported by Riggs (1904), and specimens were collected for the Field Museum of Natural History. These specimens represent the first fossil tracks collected and illustrated from this geographic area. The specimens are best assigned to *Grallator*.
- "North Wash Tracksite" was reported by Hunt et.al. (1953). The site includes two sets of reptilian footprints in the North Wash below the mouth of Marinas Canyon. The site is just outside the recreation area boundary. All specimens are identified as grallatoroid.
- "Rincon Tracksite" is also referred to as the "Secor" site in the NPS files. This is one of the best known fossil tracksites within Glen Canyon and is illustrated in a popular boaters' guide. The tracks rep resent a bipedal trackmaker producing tridactyl prints.

Kayenta Formation:

- "Explorer's Canyon Tracksite" is now submerged. A number of spec imens were collected in the 1960s, and one is on display at the visitor center that was featured in a *National Geographic* article (Edwards, 1967). These tracks are best assigned to *Eubrontes*.
- "Mike's Mesa Tracksite" includes large fallen blocks of bioturbated gray-green sandstone. The blocks with *Eubrontes* tracks appear to have come from the overlying Kayenta.
- "Slick Rock Canyon Tracksite" consists of two track-bearing exposures. There is a single *in situ Eubrontes* track and a large fallen block with more than 30 medium-sized *Grallator* tracks.
- "Cedar Canyon Tracksite" consists of a series of trail-bearing slabs from the Kayenta/Navajo transition. These include *Grallator* and broad-toed tridactyl tracks that resemble *Moyenisauropus*. These tracks resemble *Anomoepus*, which has traditionally been attributed to an ornithopod dinosaur.
- "Long Canyon Tracksite" preserves 20 consecutive, deeply impressed, elongate tracks of a bipedal theropod, which reveal toe impressions.

Navajo Sandstone:

- "Dam Tracksite" is the first tracksite reported from within Glen Canyon (Stokes, 1978). These tracks are best assigned to *Eubrontes*.
- "Crossing of the Fathers Tracksite" is the largest mapped *in situ* exposure in the Navajo Sandstone. Tracks include at least 28 trackways of prosauropods (*Otozoum*) and the small tridactyl *Grallator*.
- "West Canyon Tracksite" was submerged for years below lake level. Four *Otozoum* and a *Grallator* trackway were visible on emerged strata in 1991.
- "Last Chance Bay Tracksite" has *Eubrontes* trackways preserved as casts on the underside of an inaccessible overhang.
- "Driftwood Canyon Tracksite" contains *Eubrontes* tracks within an interdunal deposit.
- "Hole in the Rock Tracksite" preserves *Grallator* footprints.
- "Slick Rock Canyon Tracksite" includes a *Grallator*-dominated track assemblage. *Eubrontes*, *Brasilichnium* and an *Anomeopus*-like tridactyl biped track are also preserved at the site.
- "Annie's Canyon Tracksite" preserves *Eubrontes*, *Grallator* and *Otozoum* tracks on the eastern shore of Lake Powell.
- "Tapestry Wall Tracksite" contains at least 14 large theropod tracks

FIGURE 3 - A, *Eubrontes* track in Kayenta Formation at Glen Canyon National Recreation Area; B, *Eubrontes* track slab outside of visitor center at Glen Canyon National Recreation Area; C, Camelid tracks in Miocene Copper Canyon Formation at Death Valley National Park; D, Equid tracks in Miocene Copper Canyon Formation at Death Valley National Park; E, Carnivore track in Miocene Copper Canyon Formation at Death Valley National Park; F, Proboscidean tracks in Miocene Copper Canyon Formation at Death Valley National Park; G, Proboscidean track in Mio-Pliocene Verde Formation at Montezuma Castle National Monument; H, Large bird track in Pleistocene Coalpits sediments at Zion National Park.

(*Eubrontes*) on the underside of a long overhang.

- "Orange Cliff Tracksite" is a tracksite located at the northernmost portion of Glen Canyon National Recreation Area. Tracks are preserved near the base of the Navajo Sandstone.

Summerville Formation: A number of tracksites from this unit occur on the north side of Lake Powell. One site outside the boundaries of Glen Canyon contains possible pterosaur tracks.

- "Bullfrog Sauropod Tracksite" preserves several sauropod footprint casts showing skin impressions. They occur near the contact between the Tidwell Member of the Summerville Formation and the Salt Wash Member of the Morrison Formation. This tracksite is located near Bullfrog, on the northern side of Lake Powell.

Morrison Formation: The only known Morrison tracksite within Glen Canyon is just outside the boundary of national recreation area. The tracksite is in the Lost Spring Wash area and yields sauropod tracks.

Petrified Forest National Park, Arizona

The first fossil vertebrate tracks were discovered at Petrified Forest National Park in 1993. Two different track types were identified in channel sandstone unit within the Upper Triassic Chinle Group. Tiny, five-toed tracks called *Rhynchosauroides*, produced by a small, lizard-like animal, were the first vertebrate tracks discovered (Fig. 2E). A swimming trace of a larger reptile, possibly a phytosaur, was located during a secondary survey. This trace preserves scrape marks where the reptile claws scratched the substrate (Santucci and Hunt, 1993; Santucci et al., 1995).

Most of the Late Triassic tracksites in the western part of the United States are in the uppermost (youngest) strata of this age (i.e., Dinosaur National Monument, Canyonlands National Park). The vertebrate tracks at Petrified Forest National Park are several million years older than the other known sites.

Pipe Spring National Monument, Arizona

Three tridactyl dinosaur footprints, tentatively identified as *Eubrontes*, have been reported from Pipe Spring National Monument (Fig. 2F). The tracks occur in an orange-red cross-bedded sandstone that may lie stratigraphically within the base of the Early Jurassic Navajo Sandstone. These tracks were first reported by Stokes (1988) and have been recently studied by Cuffey (Cuffey et al., 1997; Cuffey et al., in press).

Rainbow Bridge National Monument, Utah

A small number of typical *Eubrontes* tracks are preserved in the Kayenta Formation at Rainbow Bridge National Monument. The badly weathered tracks have been known to exist at Rainbow Bridge for many years. Hall (1934) identified some tracks in the area in his University of California Rainbow Bridge Expedition Report.

Zion National Park, Utah

At least two fossil dinosaur tracksites occur in the early Jurassic Kayenta Formation at Zion National Park (Stokes and Bruhn, 1960). These sites were recently mapped as part of the Zion Paleontological Survey and were located near the Kayenta - Navajo transition (Santucci, et al., 1998). The tracks are principally tridactyl theropod footprints including one set identified as *Grallator* (Fig. 2H).

A tracksite in the Springdale Member of the Moenave Formation was discovered in 1992. This site preserves at least 18 ornithopod-like tridactyl tracks (Fig. 2G). These tracks have not yet been identified and may represent a new ichnotaxon.

CENOZOIC TRACKSITES

Badlands National Park, South Dakota

A trackway of four camelid tracks were reported from the Poleslide Member of the Brule Formation from the south unit of Badlands National Park (Bjork, 1976). Two poorly preserved carnivore tracks were also found in association with the camelid tracks. The carnivore tracks preserve claw marks. These tracks were preserved in a fluvial sandstone unit above the *Leptauchenia* clays.

Death Valley National Park, California

The earliest report of fossil vertebrate tracks from Death Valley was published by Donald Curry (1941). Curry recognized the importance and rarity of the fossil tracks in Copper Canyon. He collected a number of track specimens and assigned names to specific sites (e.g., Carnivore Ridge, Barnyard). During the 1950s and early 1960s, Raymond Alf collected fossil cat, camel and bird tracks from unknown locations in Death Valley (Alf, 1959).

The Copper Canyon fossil track locality in Death Valley National Park contains a rich and diverse assemblage of fossil vertebrate tracks from the Late Miocene Copper Canyon Formation. Tracks from this locality include impressions of birds, camels, horses, cats, bear-dogs, and proboscidians. Scrivner and Bottjer (1986) interpreted the Copper Canyon sediments to represent a thick sequence of lake deposits (Figs. 3C, D, E, F). The geochemistry of the sediments exhibits a "freshening-upward" trend. The geologic evidence indicates the lake was originally a shallow saline playa that slowly became more freshwater over time. The diversity and abundance of fossil tracks in Copper Canyon support this interpretation. Fewer numbers and types of tracks are associated with the more saline lake conditions, whereas many more groups and track types are found in the freshwater sequences.

The significance of the Copper Canyon tracksite includes: 1) the fossil tracks and trackways, including both impressions and casts, exhibit excellent morphological detail due to their preservation in fine-grained sediments; 2) the site represents one of the most diverse and abundant Tertiary vertebrate tracksites in North America; 3) 19 fossil vertebrate track types have been identified, including birds, artiodactyls, perissodactyls, carnivores and proboscideans; and, 4) rare proboscidean tracks (*Proboscipeda*) record one of the earliest occurrences of proboscideans in North America (Santucci, 1998).

John Day Fossil Beds National Monument, Oregon

Fossil vertebrate tracks were discovered in the Eocene Clarno Formation within the boundaries of John Day Fossil Beds National Monument. The four-toed tracks were discovered by Bruce Hansen and probably represent a small cat-like carnivore (Theodore Fremd, personal communication, 1998).

Mojave National Preserve, California

Pliocene tracks are known from the Tecopa Formation in Mojave National Preserve. Camel and carnivore tracks from this unit are on display at the Raymond Alf Museum. At one locality in this formation, the remains of camel limbs were found preserved in an upright position. The area is nicknamed "Standing Camel Basin" (Lockley and Hunt, 1995).

Montezuma Castle National Monument, Arizona

"Elephant Hill" is a mammoth tracksite at Montezuma Castle National Monument (Fig. 3G). The tracks occur in a limestone unit of the Mio-Pliocene Verde Formation. There are also tracks of camels and carnivores from this unit. At least two track localities are known in the area around the National Monument. A few of the tracks from these sites are in the collections at the American Museum of Natural History. The mammoth tracks are 40-45 cm in diameter with a single stride of about 2 meters. The tracks appear to be bipedal, but actually represent a quadruped that overstepped its front footprints with its hind feet (Brady and Seff, 1959).

Scotts Bluff National Monument, Nebraska

Fossil vertebrate tracks are reported from the late Oligocene Gering Formation at Scott's Bluff National Monument (Swinehart and Loope, 1987). These alleged tracks are located along the Saddle Rock Trail in horizontally stratified fine-grained volcanic clastic sands and ash deposits. The tracks appear in cross-section as concave-up deformation structures. These have been interpreted as vertebrate tracks. The size and bilobed morphology of some of these structures suggest that the track-makers were possibly large ungulates such as entelodonts.

Zion National Park, Utah

The Coalpits Lake deposits preserve Quaternary tracks. The lacustrine mudstones preserve camel, bird and insect tracks. The unit has not been formally mapped or described (Fig. 3H).

CONCLUSION

The increased scientific interest in vertebrate inchnofossils has a parallel trend in new tracksite discoveries within national parks. The number of tracksites recognized within national parks is likely to expand in the future. Likewise, the demands of park staff in management and protection of these non-renewable resources will also increase. Park management should seek to understand the significance of fossil tracksites and identify the variety of human and non-human threats that may adversely impact these paleontological resources.

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