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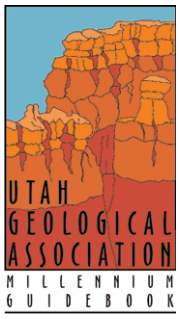

Ancient Animal Footprints and Traces in the Grand Staircase-Escalante National Monument, South-Central Utah

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ABSTRACT

The Grand Staircase-Escalante National Monument contains exposures of geologic formations ranging from Permian to Cretaceous in age. Several sites with fossil footprints were known prior to monument designation in 1996. There are now 56 known footprint sites occurring in eleven and possibly as many as thirteen of the twenty formations found in the monument. Early and Late Triassic footprints sites in the Moenkopi and Chinle Formations are well represented, as are Early Jurassic footprints in the Moenave, Kayenta, and Navajo Formations. One site is known in the Early Jurassic Wingate Sandstone. New discoveries from the Middle Jurassic include several sites in the upper Entrada Sandstone and a possible small theropod print in the Page Sandstone. Late Cretaceous natural footprint casts have been found associated with coalbeds in the John Henry Member of the Straight Cliffs Formation. Footprint casts have also been found in the Wahweap and Kaiparowits Formations. One possible footprint cast has been found in the Dakota Formation. The footprint localities vary from small sites, with only one or two prints or casts, to large sites with hundreds of footprints. The footprints represent both bipedal and quadrupedal locomotion of animals ranging from very small dinosaurs (*Grallator* and other unnamed footprints), small lizard-like reptiles (*?Gwyneddichnium and Rhynchosauroides*), cat-sized mammal-like reptiles *(Brasilichnium*) and Komodo dragon-sized reptiles, to fairly large carnivorous (*Eubrontes*) and herbivorous dinosaurs. Numerous traces of horseshoe crabs were also found in the Moenkopi Formation within the monument. Most Late Cretaceous footprints represent ornithopod dinosaurs with one possible theropod footprint.

INTRODUCTION

The Grand Staircase-Escalante National Monument (GS-ENM) in southern Utah (figure 1) contains extensive sedimentary rocks of Mesozoic age, most of which are of terrestrial origin with a potential for prehistoric animal footprints. Dinosaur and other reptile footprints had been discovered at several locations prior to designation of the monument in 1996 (Peabody, 1956; Stokes and Bruhn, 1960; Stokes, 1978). Investigations following establishment of the monument have resulted in identifications of more than 50 new footprint localities (appendix). These range in age from Early Triassic to Late Cretaceous. Fossil

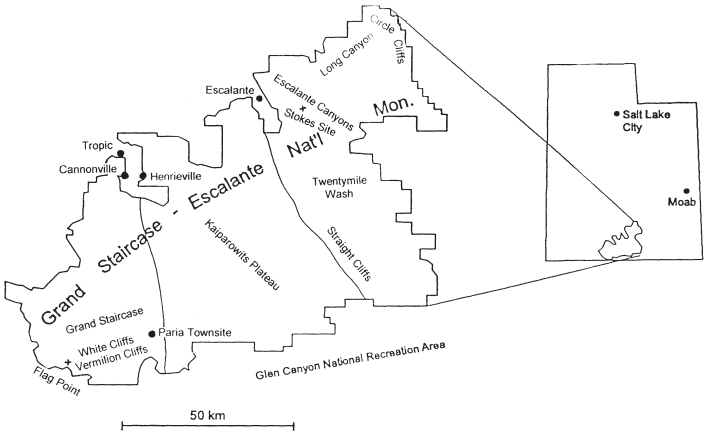

Figure 1. Location map. Grand Staircase-Escalante National Monument is divided into three geographic regions: Grand Staircase, Kaiparowits Plateau, and Escalante Canyons.

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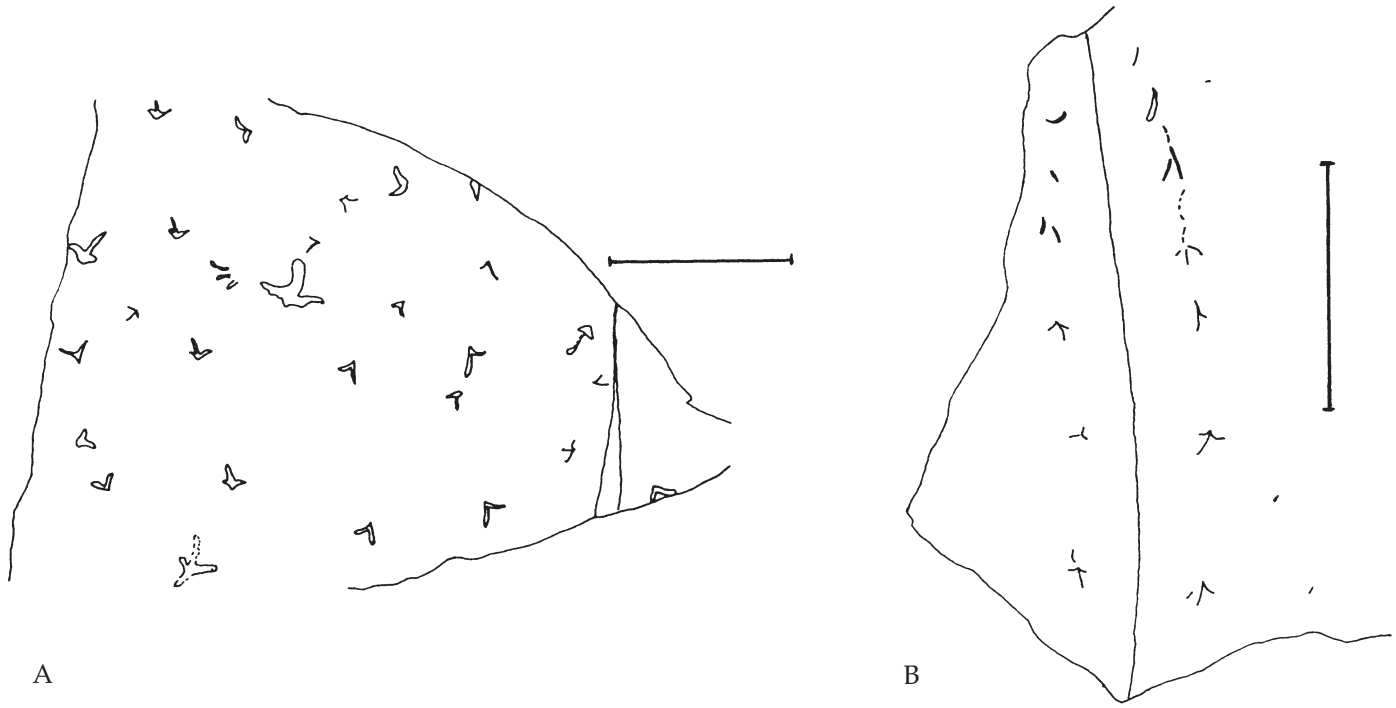


Figure 2. A) Sketch of a slab from the lower Moenkopi Formation of the Circle Cliffs uplift, containing trackways of two limulids (horseshoe crab) and a total of approximately 25 prints. B) Another slab from the same locality containing the trackway of one individual limulid, with telson drag impression. The animal was traveling from bottom to top in this figure. Both scale bars are 10 cm.

animal footprints provide an indication of the fauna present during these times and are particularly valuable in formations that are sparse or lacking in skeletal material. Not all known footprint sites in the monument are discussed here, but examples are given for the formations having sites. While invertebrate trace fossils are fairly common in various formations in the monument, only the more important invertebrate sites will be discussed in this paper. This paper will not address detailed stratigraphy or other aspects of paleontology in the monument. For that information the reader is referred to Doelling and others, this volume.

MOENKOPI FORMATION

The Moenkopi Formation is Early Triassic in age and is exposed in the southern part of the Grand Staircase and in the center of the Circle Cliffs uplift.

Several sites in the Moenkopi Formation in the Circle Cliffs uplift area of GS-ENM contain animal trace fossils, including those of limulids (horseshoe crabs), small reptiles (ichnogenus *Akropus?*), and some scrape marks made by unidentified vertebrates, possibly in shallow water. Footprints assigned to *Akropus* have also been found in the Moenkopi near Paria in the Vermilion Cliffs area, and vertebrate "swim" or scrape marks have been reported from east of GS-ENM in Capitol Reef National Park (Peabody, 1956). One site in the lower Moenkopi Formation of the Circle Cliffs contains hundreds of limulid (horseshoe crab) tracks, and numerous limulid trackways, in a thin unit of thin-bedded, platy siltstone (figure 2). Most of these tracks are probably undertracks made by the limulid pusher organs (as is common among post-Paleozoic limulid trackways [Goldring and Seilacher, 1971]), though pincer tracks and telson (spike-like posterior end of horseshoe crab) drags are also present in some specimens. The tracks indicate an abundance of horseshoe crab activity on the tidal flats of the seaway in this part of southern Utah during the Early Triassic.

CHINLE FORMATION

The Chinle Formation is Late Triassic in age and is exposed mainly along the Vermilion Cliffs and around the Circle Cliffs uplift.

Trace fossils known from the Chinle Formation within GS-ENM include *Pseudotetrasauropus*, *Grallator, Apatopus*, *Rhynchosauroides*, and *Gwyneddichnium?* (figure 3). These reptilian footprints are known from two sites in the Circle Cliffs area. *Pseudotetrasauropus* is believed to represent the footprints of small prosauropod dinosaurs (Ellenberger, 1972: Lockley and others, 1992), and *Grallator* footprints were likely made by small theropod dinosaurs such as *Coelophysis*. The footprints of *Apatopus*, which are pentadactyl in both the manus and pes, and which may include tail drag impressions, probably represent phytosaurs (Baird, 1957; Foster and others, in press). *Rhynchosauroides* and *Gwyneddichnium* are print types representing small, lizard-sized reptiles. Both localities containing these vertebrate print types occur in the Owl Rock Member of the Chinle Formation.

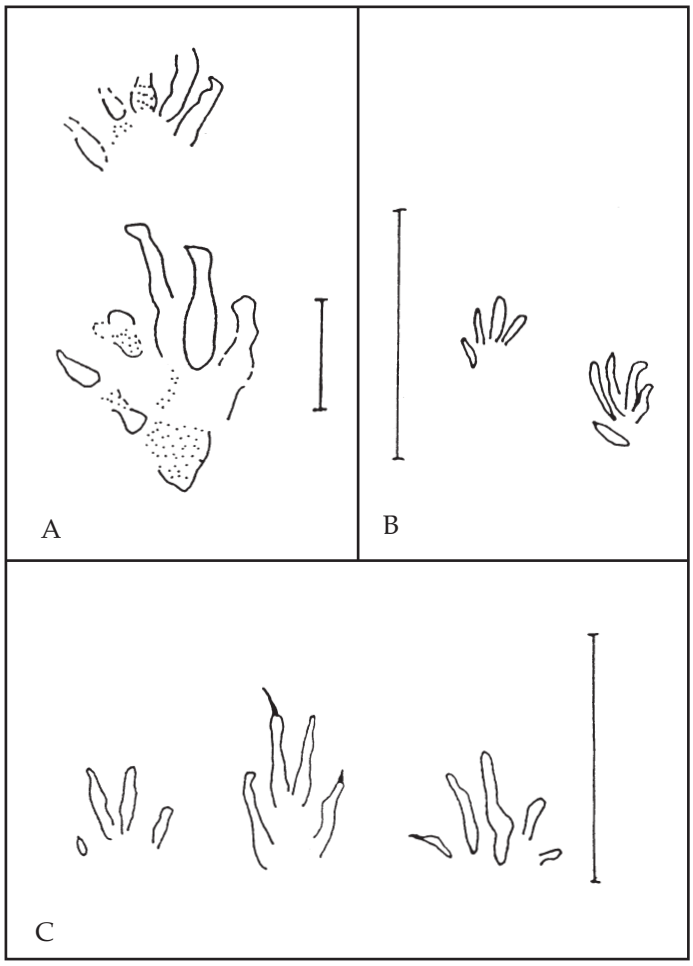


Figure 3. A) Left manus and pes of a trackway assigned to Apatopus *(probably a phytosaur). Scale bar is 10 cm. B) Two individual footprints assigned to* Rhynchosauroides*. Scale bar is 5 cm. C) Three footprints assigned to* Gwyneddichnium? *Scale bar is 5 cm. All from a site in the upper Owl Rock Member of the Chinle Formation in the northeastern Circle Cliffs. Based on Foster and others (in press).*

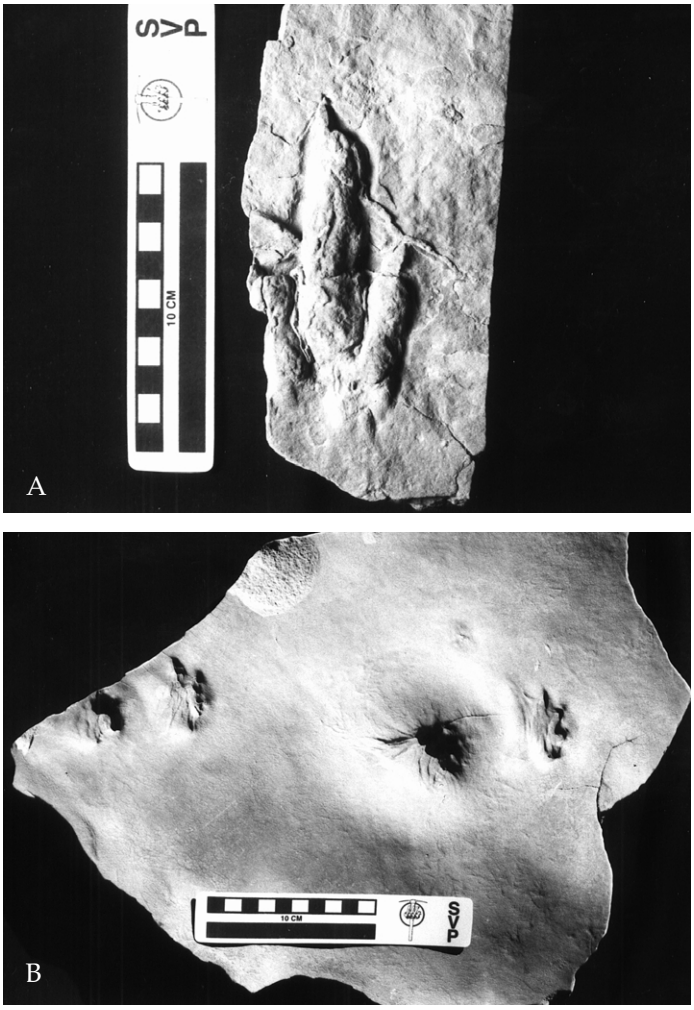


Figure 4. A) Natural cast of small theropod dinosaur footprint, assigned to Grallator*, from the lower Moenave Formation, Vermilion Cliffs. Note claw and pad impressions. Scale bar is 10 cm. B) Two left manus-pes sets of a small crocodylomorph trackway assigned to* Batrachopus*, from the lower Moenave Formation, Vermilion Cliffs. Scale bar is 10 cm.*

MOENAVE FORMATION

The Moenave Formation is Early Jurassic in age and occurs within the monument mainly in the western areas, along the Vermilion Cliffs. To the east it grades laterally into the Wingate Sandstone, which overlies the Chinle Formation around the Circle Cliffs.

The Moenave Formation contains footprints identified as *Grallator, Batrachopus*, and *Anomoepus?* within GS-ENM. Grallator represents the footprints of a small theropod dinosaur and *Anomoepus* may be the tracks of small, bipedal ornithischian dinosaurs. The ichnogenus *Batrachopus* probably represents a crocodylomorph (Olsen and Padian, 1986), possibly *Protosuchus*. However, *Batrachopus* footprints might be confused with synapsid footprints in some cases (Schultz-Pittman and others, 1996). Most of the sites in the Moenave Formation within GS-ENM occur along the Vermilion Cliffs. Here, at a particular stratigraphic level low in the formation, sandstone layers interbedded with thin mudstone layers has yielded numerous footprints as both impressions and natural casts. One site in particular (Park Wash I) has produced a very well preserved *Grallator* footprint cast (figure 4-A) and an impression of two manus-pes sets of *Batrachopus* (figure 4-B). *Grallator* casts have also been found higher up in the Moenave formation in the Springdale Sandstone Member. As few vertebrate fossils are known from the Moenave Formation in GS-ENM, these reptilian footprints furnish most of our current knowledge of the fauna for this area.

WINGATE SANDSTONE

The Wingate Sandstone is best exposed in the northeast part of the GS-ENM, where it forms the massive cliffs that make up the Circle Cliffs.

The Long Canyon site is the only site found so far in the Wingate within GS-ENM. Twelve *Grallator*-type footprints occur on the top side of a 3 m x 3 m sandstone block that is displaced slightly from its original position at the

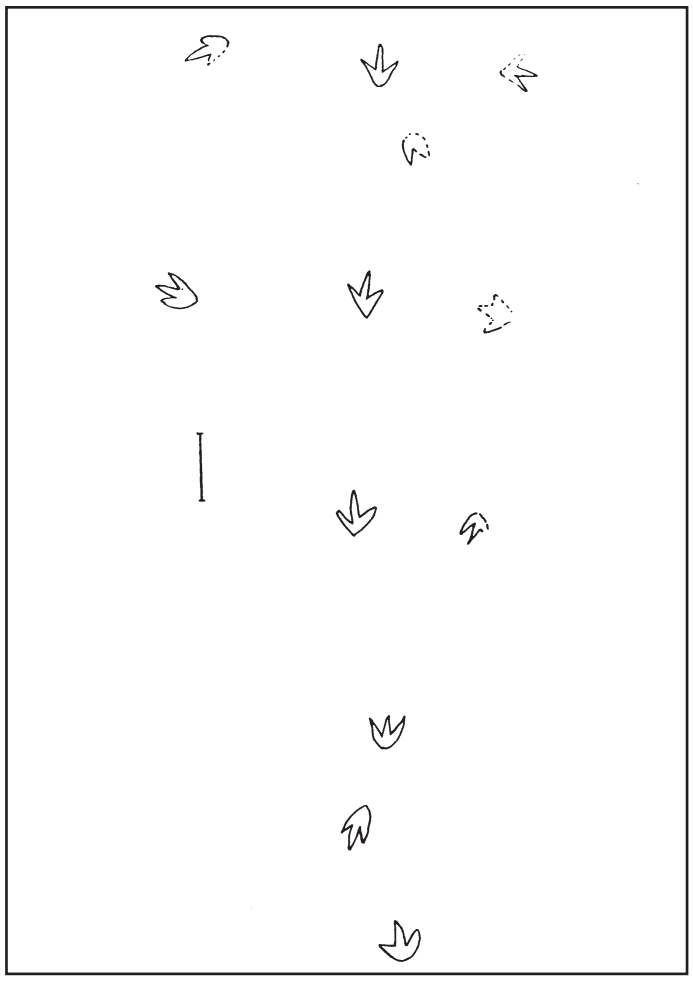


Figure 5. Sketch of Grallator *footprints on large block of Wingate Sandstone in Long Canyon (Circle Cliffs area) with 5 step trackway and 7 other footprints. Scale bar is 20 cm.*

base of the Wingate Sandstone cliffs. Five of these footprints form a trackway (figure 5). The prints measure 13 cm long and 10.5 cm wide, and the distance of the step from right foot heel to left foot heel is 65 cm. These are the only known Wingate fossils in the monument (Hamblin, 1998; Foster and others, 1999).

KAYENTA FORMATION

The Kayenta Formation is exposed in the Vermilion Cliffs of the Grand Staircase and in the Escalante Canyons and Circle Cliffs areas of the monument. The Kayenta is Early Jurassic in age.

Vertebrate footprints are the most common fossils found in the Kayenta. Nine Kayenta sites are known in the monument. These include several types of dinosaur prints (*Eubrontes, Grallator, Kayentapus and ?Anomoepus*), footprints of mammal-like reptiles (*Brasilichium*) and possible lizard footprints. It has been suggested that the maker of the *Eubrontes* footprints was the dinosaur *Dilophosaurus* and that the *Grallator* footprints were made by the dinosaur *Syntarsus* (DeCourten, 1998). The bones of both

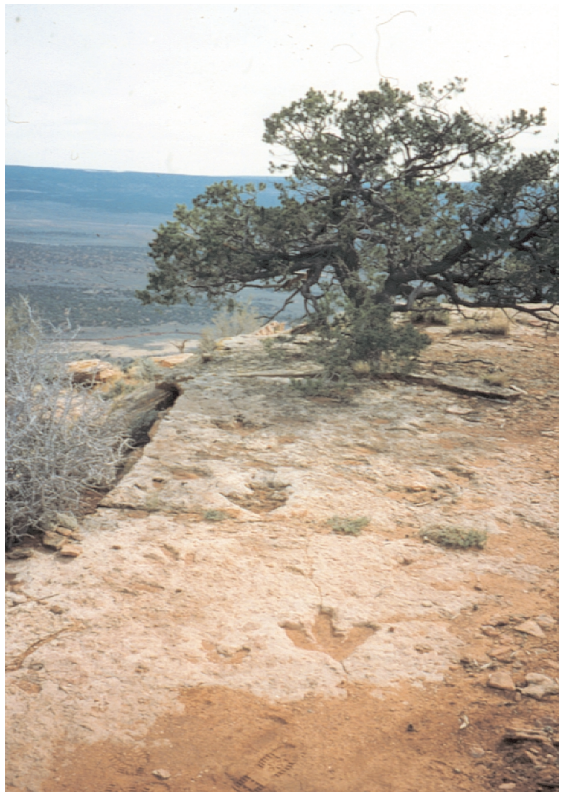


Figure 6. Flag Point tracksite with 3 Eubrontes *footprints and other scattered imprints. The footprint in the foreground measures 46 cm long and 41 cm wide. View is to the south.*

these dinosaurs have been found else-where in the Kayenta Formation.

Several footprint sites have been found northeast of Flag Point. The largest site has over 100 footprints, mostly *Eubrontes*, but with a few *Grallator* (figure 6). Another site near Flag Point has over 50 footprints, most of which are of *Grallator* type plus a *Kayentapus* footprint. One Kayenta site in the Escalante Canyons area exhibits *Brasilichnium*-type tracks which are probably made by small, cat-size mammal-like reptiles (figure 7-A). Another site, in the Grand Staircase area of the monument, has *Grallator* and *Eubrontes* footprints.

NAVAJO SANDSTONE

The Navajo Sandstone is Early Jurassic in age; it forms the White Cliffs of the Grand Staircase and is also exposed throughout much of the Escalante Canyons area.

There are four known footprint sites in the Navajo Sandstone in the monument. All four sites appear to be tracks of animals walking up dune faces. Some of the prints exhibit small mounds at the rear of the foot where the sand bunched up on the down-hill side. The Stokes site (Stokes, 1978), along Highway 12, has a 9 -print trackway of a small bipedal, 3-toed dinosaur walking up the dune face; it has a stride of 38 cm and each imprint measures roughly 9 cm long. Several feet to the right of this is

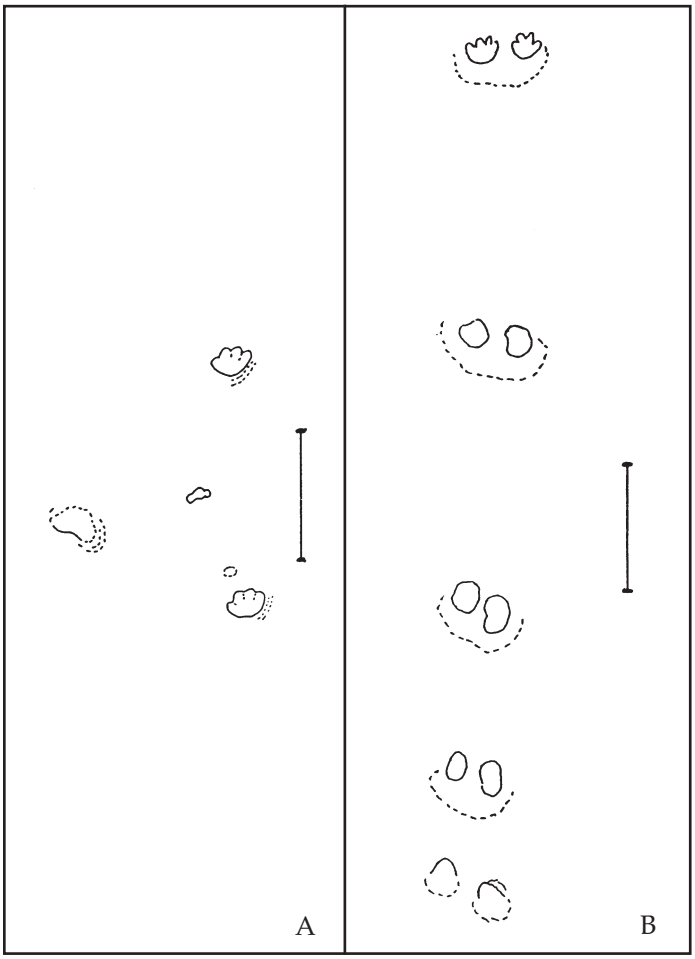


Figure 7. Sketches. A) Brasilichnium *footprints in Kayenta Formation in Park Wash area. Scale bar is 10 cm. B) Five sets of paired footprints of hopping mammal or mammal-like reptile in the Navajo Sandstone. Footprints are like* Brasilichnium*. Scale bar is 10 cm.*

another trackway composed of 27 small round to oval imprints referable to the ichnogenus *Brasilichnium*. (*Brasilichnium* footprints resemble modern mammal prints and are thought to have been made by a mammal-like reptile (?therapsid)). Other smaller vertebrate footprints are also known from this site and invertebrate trails have been found several hundred yards northwest of this site.

The Escalante Canyon site is in a small overhang, along with a small prehistoric pictograph. It has 42 footprints in three tracksways made by three different animals. Footprints in two trackways vary slightly in size, forming 2.5 cm and 4 cm circular patterns with indentations showing sand rims or crescents behind the feet as the animals moved up a dune. They also have different gaits. The smaller footprints form a trackway of 28 prints evenly space about 7.5 cm apart (right side of figure 8). The other trackway has sets of two prints, spaced 13 cm apart; these sets are in turn, spaced about 26 cm apart (left side of figure 8). These two trackways start on top of one another at the back of the overhang and after two feet they diverge. The third trackway with three circular imprints, several

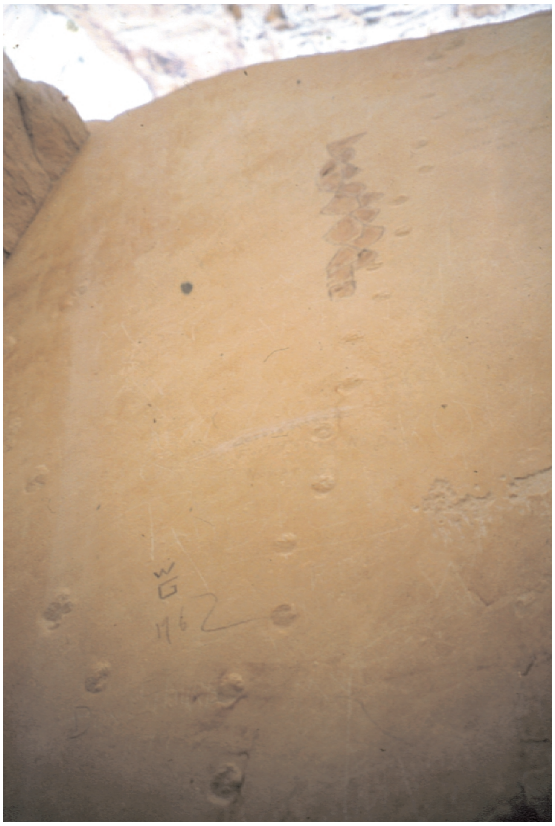


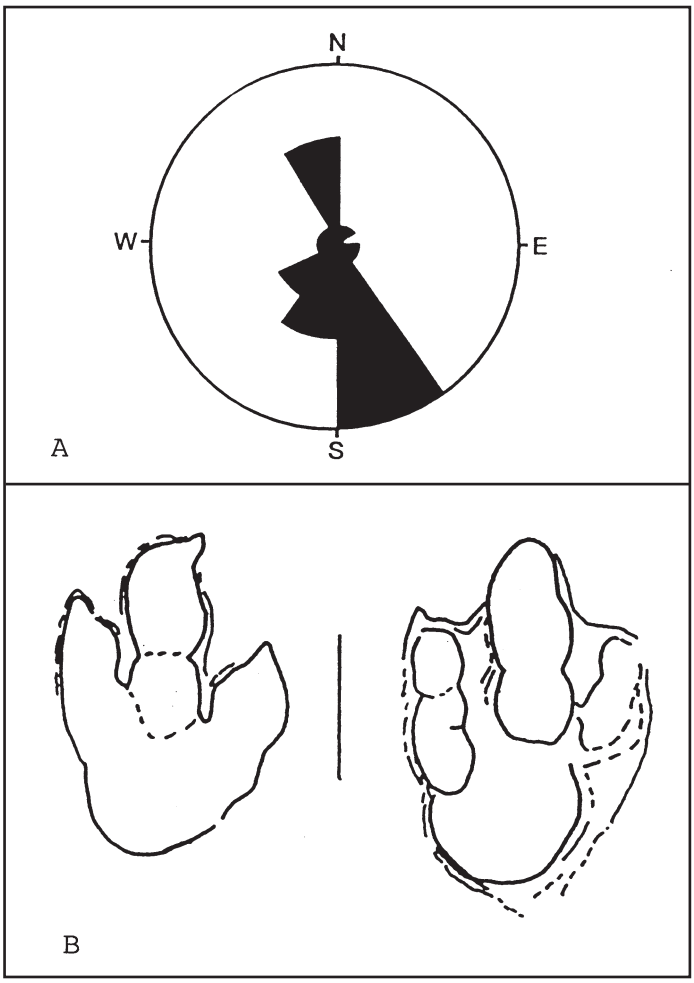
Figure 8. Brasilichnium *footprints on underside of an overhang in the Navajo Sandstone in Escalante Canyon. Footprints of right trackway measure 2.5 cm across and are spaced 13 cm apart.*

times larger than those of the first two trackways, occurs at the back of the overhang. These all appear to be referable to *Brasilichnium*.

The third site has several dune faces with small footprints of *Brasilichnium* type. One particular track is made up of 5 sets of parallel or nearly parallel footprints moving up a dune face. These appear to be in a hopping stride, which increases in length up the dune from 8 cm to 13 cm to 21 cm and 23 cm. The top set of prints are most distinct and measure about 2 x 2 cm, with 4 toes of about equal length (figure 7-B). This is possibly the first example of footprints of hopping vertebrates from the Navajo Sandstone. Similar footprints have been reported from late Triassic to Jurassic rocks in South America by Leonardi (1994), being attributed to a small hopping dinosaur; these were later interpreted as footprints of small hopping mammals or mammal-like reptiles by Rainforth and Lockley (1996). The last pair of prints illustrated in figure 7-B appear to have the morphology of typical *Brasilichnium* footprints.

PAGE SANDSTONE

The Page Sandstone is Middle Jurassic in age and is exposed only in the southern part of the monument, where it lies above the Navajo Sandstone and interfingers with the Carmel Formation. The paleoenvironment represent-



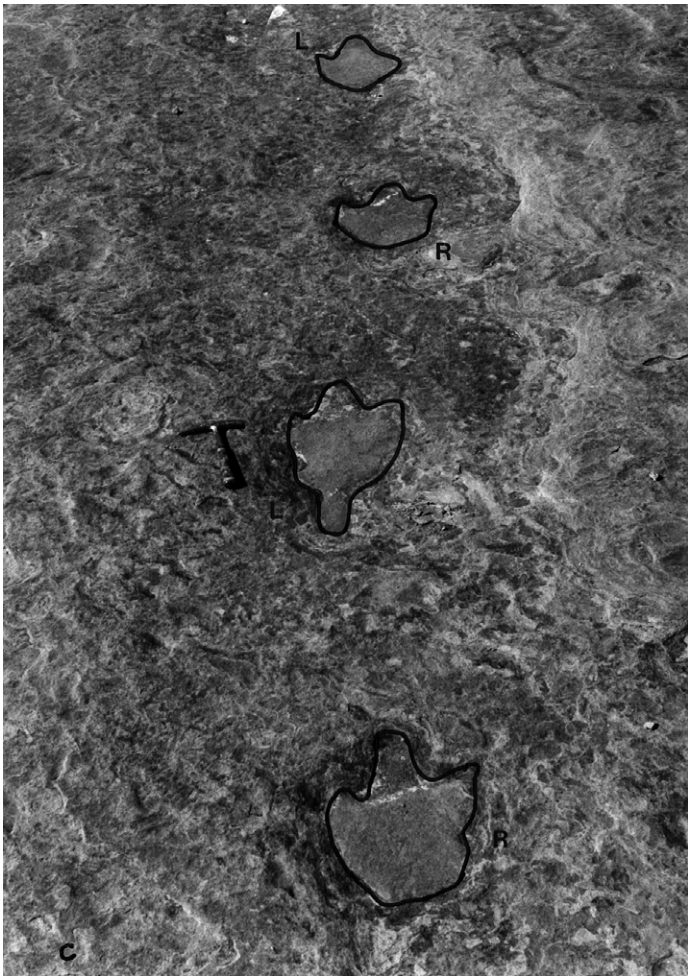


Figure 9. A) Rose diagram of theropod track orientations from the upper Entrada Sandstone near Twentymile Wash along the Straight Cliffs. N=35. B) Outlines of two of the better-preserved theropod dinosaur footprints from the upper Entrada Sandstone, both left feet. Scale bar is 20 cm. Based on Foster and others (in press). C) One of the theropod trackways from the upper Entrada Sandstone near Twentymile Wash, with left and right steps labeled and footprints outlined for clarity. Note metatarsal impression on second footprint. Rock hammer for scale.

ed by the Page Sandstone may be similar to the eolian dunes of the underlying Navajo Sandstone, but no fossil material has been reported previously from the Page. One site near West Clark Bench, at the southern end of the monument, contains what may be a small (~5 cm) tridactyl dinosaur footprint, and this, along with the lithologic similarities of the Page to the Navajo, suggests that further footprints may be found in the Page Sandstone.

CARMEL FORMATION

The Carmel Formation is Middle Jurassic in age; it is exposed along the Straight Cliffs south of Escalante and in the Grand Staircase, south of the town of Tropic. Fossils from the Carmel Formation are relatively rare within the monument and invertebrate trace fossils are more common than body fossils. The paucity of fossil material within the monument, compared to some areas further west, may be a result of high salinity in this part of the seaway during deposition of the Carmel (Fred Peterson, personal communication, 1998). Invertebrate traces found in the Carmel Formation include grazing trails and burrows, and some larger traces that are similar to the ichnogenus Planolites.

ENTRADA SANDSTONE

The Entrada Sandstone is Middle Jurassic in age; it is exposed along the Straight Cliffs and east of Cannonville. Few fossils are known from the Entrada Sandstone anywhere, but near Moab, Utah, abundant large theropod footprints have been found (Lockley and Hunt, 1995).

Prior to 1998, no fossils were known from the Entrada Sandstone within GS-ENM, but several footprint localities have now been identified near the top of the formation along the Straight Cliffs. These sites reveal nearly 300 footprints of perhaps 50 individual theropod dinosaurs and a trackway with footprints and tail drag of a sauropod dinosaur, which is the lowest stratigraphic evidence of a sauropod in the United States (Foster and others, in press).

Figure 10. Possible natural sandstone cast manus-pes set of a small sauropod dinosaur from the Morrison Formation. For scale, walking stick is approximately one meter.

The theropod trackways show a north-south bimodal orientation, with most of the trackways trending approximately south (figure 9-A). The footprints are in several levels within the top sixteen meters of the upper member of the Entrada Sandstone and are in horizontally bedded sandstones, up to two meters thick, that lie between thick units of cross-bedded sandstone. Cross-bed sets within the sandstones are up to approximately 4-5 m thick and probably represent eolian deposition. The horizontally bedded units containing the footprints may represent wet interdune areas perhaps near a tidal flat, as some of the Entrada may have been deposited by reworking of eolian dunes in shallow marine and beach environments (Doelling and Davis, 1989).

The theropod dinosaur footprints in the Entrada Sandstone at Twentymile Wash are mostly large, about 25-50 cm, with most prints approximately 45 cm long (figure 9B). These foot lengths suggest hip heights for the animals in the range of 2 m. The trackways range from short sets of two or three footprints up to 30-print trackways about 30 m long. Calculations on one trackway with an estimated modal stride length (figure 9-C) indicated a walking speed of 5.3 km/hr. There are also numerous isolated footprints in some layers. Most of the footprints have been identified as *?Megalosauripus* by Foster and others (in press), though some smaller, less well preserved prints about 15-20 cm long may belong to *?Therangopodus*. These same types of theropod footprints have also been found at many sites near to the top of the Entrada Sandstone around Moab, Utah, but the occurrence of a sauropod trackway is unusual in that sauropods have not previously been found anywhere in the Entrada.

MORRISON FORMATION

The Morrison Formation is Late Jurassic in age and is exposed along the Straight Cliffs, east of the Kaiparowits Plateau, and in the southeastern part of the monument, north of Lake Powell. The formation is not present in the western part of the monument, as it was removed by erosion prior to deposition of Cretaceous rocks. Despite the abundance and diversity of fossil collections from the Morrison Formation elsewhere, vertebrate material is rather rare in the Morrison of GS-ENM.

The Morrison Formation contains a number of trace fossil types at many localities, and a few traces are known also from GS-ENM. One site along the Straight Cliffs contains possible traces of a termite nest (Hasiotis and Demko, 1998) in sandstone of the Salt Wash Member. A nearby site consists of a possible natural sandstone cast manus-pes set of a small sauropod dinosaur (figure 10). A site in the Salt Wash Member near the southern boundary of the monument, north of Lake Powell, includes several possible sauropod pes natural casts. The structures found in GS-ENM are not as well preserved as tracks from some other Morrison sites, but their overall shape suggests they probably are tracks of sauropods.

DAKOTA FORMATION

The age of the Dakota Formation has been considered early Late Cretaceous in age (Davidson, 1967), but there is evidence that the lower member is late Early Cretaceous (Doelling and Davis, 1989). The Dakota Formation is exposed north of Cannonville and Henrieville, along the Cockscomb, across the south end of GS-ENM below the Kaiparowits Plateau, and along the base of the Fiftymile Mountain.

The Dakota Formation has not been explored to any extent for tracks within GS-ENM, although dinosaur footprints are quite plentiful in the Dakota Formation in other areas (Lockley and Hunt, 1995). To date, only one possible 3-toed small dinosaur footprint has been found in the monument. This measures 9.5 x 9.5 cm and is possibly that of a very small ornithopod dinosaur. It was found on the bottom of a sandstone block, along with impressions of several leaves and other plant debris (figure 11-A). Further exploration for footprints has a potential for finding new sites in the Dakota Formation.

STRAIGHT CLIFFS FORMATION

The Straight Cliffs Formation is exposed around the edges of the Kaiparowits Plateau, particularly along the Straight Cliffs for which it was named. It is Late Cretaceous in age.

The John Henry Member is the only member of the 4 members so far to produce dinosaur footprints, six sites being known as of this writing. Although the Smoky Hollow Member has a high potential for footprints, it has not been explored to any extent yet. Several sites in the John Henry Member have been found associated with coalbeds just above the Calico bed. Footprints in coalbeds are fairly common in other areas of the Colorado Plateau (Lockley and Hunt, 1995). Footprint have also been found in mud-

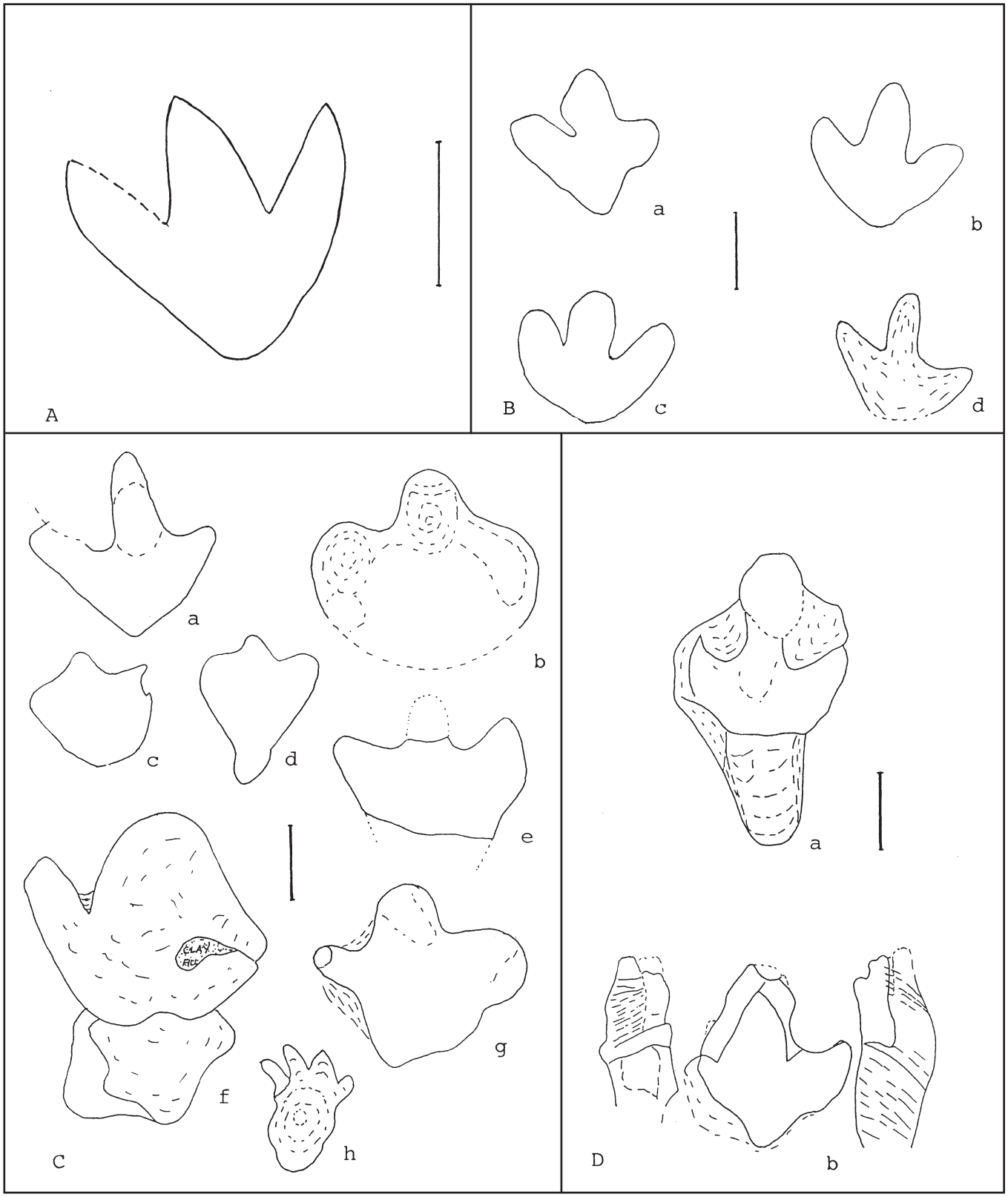


Figure 11. Sketches of Cretaceous footprints. A) Outline of possible small ornithopod footprint in the Dakota Formation in the Henrieville area. Scale bar is 5 cm. B) Outlines of footprint casts from John Henry Member of the Straight Cliffs Formation. Drawing made with bottom side up. B-d) has long slender toes compared to others and may be theropod. Others are probably ornithopod footprints. Scale bar is 20 cm. C) Outlines and drawings of casts from Wahweap Formation, thought to be ornithopod footprints. Drawings made with bottom side up. C-b) is on the bottom of a large sandstone block. The others are loose casts. C-f) appears to be multiple footprints. C-h) is the only 4 toed footprint found, possible ceratopsian. Scale bar is 20 cm. D) Two ornithopod casts from the Kaiparowits Formation. Drawing made with bottom side up. D-a) appears to have a heel skid. D-b) is figured with sides of footprint showing striations on sides of cast where the foot went into the mud. Scale bar is 20 cm.

stone-sandstone layers. Most occur as 3-toed casts of ornithopod dinosaurs (figure 11-B-a,b,c). One possible exception is a footprint with narrow toes, which could be that of a theropod dinosaur (figure 11-B-d).

WAHWEAP FORMATION

The Wahweap Formation is Late Cretaceous in age. It is found on the Kaiparowits Plateau from the north central part of the monument, running south to the center of the plateau and hooking to the west in a "j" shaped exposure.

Only recently have fossil footprints been recorded in the Wahweap Formation. Five sites were found in the lower unit in several brief days of exploration, attesting to a high potential for footprints in this formation. Four of these sites occur in interbedded sandstone and mudstone along roads, where the footprints are either eroding out of road cuts or have been graded up by road equipment and deposited with other rocks and debris along the side of the road. They are comprised of 3-toed casts of ornithopods and vary in size from 31 x 31cm to 63 x 57 cm (width x length) (figure11-C). One large cast is 63 cm wide and 82 cm long may represent several footprints (figure11-C-f). A 4-toed footprint cast at one site appears to be that of a quadruped, possibly a ceratopsian (figure 11-C-h).

KAIPAROWITS FORMATION

The Kaiparowits Formation is the youngest Cretaceous formations in the monument. It occurs mainly east of the Cockscomb and in the northwest part of the Kaiparowits Plateau.

The Kaiparowits Formation has not been properly explored for footprints, but several sites have recently been found. One site consists of one 3-toed footprint cast 41 cm wide and 50 cm long which preserves striations on the sides of the center toe where the foot went into the mud (figure 11-D-b). The other site has one large 3-toed footprint cast on the bottom of a large rock. It has a long heel skid and measures 44 cm wide and 78 cm long (figure 11-D-a). These footprints also appear to have been made by ornithopod dinosaurs.

CONCLUSIONS

The identification of 56 sites with fossil footprints in eleven, possibly thirteen, formations of the Grand Staircase-Escalante National Monument is a great illustration of the potential for ichnological research in the monument. These footprint site discoveries give a better indication of the paleofauna present in the monument through the Mesozoic than would be apparent relying solely on body fossils, adding another important dimension to the study of paleontology in this new national monument.

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APPENDIX, GRAND STAIRCASE-ESCALANTE NATIONAL MONUMENT FOOTPRINT SITES.

	SITE #	FORMATION	DESCRIPTION OF SITES / FOOTPRINTS	SITE NAME / INFORMATION
1	Ga325	Moenkopi	Possible swim marks	The Flats
2	Ga326	Moenkopi	3-toed footprint mold	Lamp Stand
3	Ga464	Moenkopi	Limulid tracks (horseshoe crab)	Canyon View
4	Ga466	Moenkopi	Vertebrate footprints	White Canyon
5	Ga467	Moenkopi	?*Akropus*, small manus/pes, tetradactyl pes, tetra or tridactyl manus footprints	Stud Horse East
6	Ga468	Moenkopi	Possible vertebrate track: swim mark, scrape mark	Northeast Horse Canyon
7	Ga610	Moenkopi	Swim? marks	Moody Creek II
8	Ga612	Moenkopi	Swim? marks and other tracks	Silver Falls Creek
9	Ka004/ Ka667	Moenkopi	Lacertoid footprints resembling *Akopus*	Old Paria Road I /Camp's 1951 site (Peabody, 1956)
10	Ka615	Moenkopi	3 sets of 3-toed marks, also arthropod? tracks	Old Paria Road II
11	Ka689	Moenkopi	Swim marks	Paria South
12	Ga324	Chinle	Vertebrate footprints; *Apatopus, Rhynchosauroides* and *?Gwyneddichnium*	Brinkerhof Spring (Foster, et.al., in press)
13	Ga475	Chinle	Small theropod footprint: *Pseudotetrasauropus,* invert tracks	Long Canyon Pass
14	Ka300/ Ka509	Moenave	Footprint cast of 3-toed dinosaur, *Grallator*	Watson Cabin III
15	Ka299/ Ka510	Moenave	Footprints, ? *Grallator*	Watson Cabin II
16	Ka562	Moenave	2 *Grallator* footprints, invert traces, 2 reptile manus/pes sets	Park Wash I
17	Ka563	Moenave	4 *Grallator* footprints, possible tetradactyl footprints	Fin Little Overlook
18	Ka564	Moenave	dinosaur footprints *?Anomoepus*; invertebrate traces	Fin Little II
19	Ka565	Moenave	Small theropod footprints (*?Grallator*)	Park Wash III
20	Ka566	Moenave	Theropod footprints	Paria Movie Set IV
21	Ka690	Moenave	Small 3-toed footprint casts (*?Grallator)*	Park Wash IV
22	Ga323	Wingate	Dinosaur footprints, *Grallator*	Long Canyon
23	Ga322/ Ga477	Kayenta	3-toed dinosaur footprints (*Grallator?, Eubrontes?*), mammal-like reptile footprints *Brasilichnium*	Kiva Koffee House
24	Ga478	Kayenta	Theropod footprints, medium size, 2-4 step tracks	Calf Creek Trail
25	Ka002	Kayenta	3-toed dinosaur footprints, *Eubrontes?* and *Grallator?*	Flag Point Track Site (Stokes & Bruhn, 1960)
26	Ka298	Kayenta	Dinosaur footprints?	Watson Cabin I
27	Ka567	Kayenta	50+ *Grallator* footprints, 1 *Kayentapus* & 1 theropod footprint	Flag Point III
28	Ka568	Kayenta	*Eubrontes* (2), *?Anomoepus* dinosaur footprints	Flag Point II

Appendix continued.

29	Ka569	Kayenta	2 small theropod footprints	Lower Long Canyon
30	Ka570	Kayenta	4 large & 3 small theropod footprints (*Eubrontes, ?Anomoepus*); lacertoid? track	West Swag
31	Ka621	Kayenta	Dinosaur footprints, possibly *Eubrontes*	Flag Point IV
32	Ka571	Navajo	non-dinosaurian vertebrate footprints, *Brasilichnium*	Park Wash II
33	Ga001/ Ga479	Navajo	Vertebrate footprints, *Grallator?, Brasilichnium*, invertebrate trails	Stokes Site (Stokes, 1978)
34	Ga319	Navajo	Vertebrate footrpints, *Brasilichium*	Escalante Canyon
35	Ga609	Navajo	Vertebrate footprints, *Brasilichium*, footprints of small hopping animal	Big Spencer Flat
36	Ka579	Page Sandstone	Possible small theropods footprints	Power Lines
37	Ga480	Entrada	Theropod footprints, 25+	20 Mile Wash West
38	Ga481	Entrada	Track site with 250+ footprints, 3-toed and quadruped tracks, cf. *Brontopodus, ?Megalosauripus, ?Therangospodus*	Twentymile Wash Track Site (Foster, et al., in press)
39	Ga482	Entrada	Theropod footprints	Right Hand Bowl
40	Ga483	Entrada	5 Theropod footprints	Cattle Tank Tracks
41	Ga608	Morrison	2 sauropod(?) footprint casts or other quadruped	Right Hand Collet Canyon
42	Ka580	Morrison	3 probable sauropod footprints, worm borrows	Croton Bench
43	Ga523	Dakota	Possible 3-toed dinosaur footprint cast	South Middle Bench
44	Ka293	Straight Cliffs	3-toed dinosaur footprint	Roger Canyon
45	Ka301/ Ka518/Ka605	Straight Cliffs, John Henry Member	3- toed dinosaur footprint casts, and possible 4-toed footprint cast	The Scorpion
46	Ka682	Straight Cliffs, John Henry Member	3-toed dinosaur footprint casts, mostly ornithopod?, but one possible theropod	Tibbet Canyon I
47	Ka684	Straight Cliffs, John Henry Member	3-toed dinosaur footprint casts above 6" coal bed	Tibbet Canyon II
48	Ka686	Straight Cliffs, John Henry Member	3-toed dinosaur footprints on coal bed	Smokey Hollow Coal
49	Ka691	Straight Cliffs, John Henry Member	2 3-toed ornithopod? dinosaur footprint casts	Lower Trail Canyon
50	Ka687	Wahweap	Several dinosaur footprint casts, 3-toed and one possible 4-toed	Nipple Butte
51	Ka688	Wahweap	1 3-toed ornithopod? dinosaur footprint cast	Tibbet Bench
52	Ga624	Wahweap	3 3-toed dinosaur footprint casts, one also has the mold on opposite side	Star Seep I
53	Ga625	Wahweap	1 large rock with 3-toed dinosaur footprint cast, possibly more than one print	Star Seep II
54	Ga626	Wahweap	2 3-toed dinosaur footprint casts	Star Seep III
55	Ga621	Kaiparowits	1 3-toed ornithopod? Footprint cast, 1 toe broken off, striations on center toe	Shurtz Bush Creek I
56	Ga622	Kaiparowits	1 large 3-toed ornithopod? dinosaur footprint cast with long heel drag, one other possible cast.	Shurtz Bush Creek II