Paleontological Survey of the Jurassic Morrison Formation in Dinosaur National Monument

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✦ Executive Summary

This project has undertaken to survey the surface exposures of the Jurassic Morrison Formation within Dinosaur National Monument (DINO) for fossil occurrences of any sort. The primary purpose of this survey is to provide an assessment of the extent and characteristics of the paleontological resource in this geologic formation within DINO. In so doing, the survey may also have the effect of discovering specimens of obvious and immediate scientific importance and providing observations that will contribute to an improved understanding of the stratigraphy of the Morrison Fm.

Dinosaur National Monument was originally established for, and takes its name form the unique occurrence of a quarry (the Carnegie Quarry (CQ) that has produced a diverse and abundant dinosaur fauna. The CQ occurs within the Morrison Fm., which is known worldwide as one of the most prolific dinosaur-bearing units in the paleontologic record (Colbert 1968). In addition to the dinosaurs, the Morrison Fm. has produced the best-represented fauna of early mammals from the Jurassic (Clemens et al. 1979) and fossils of other vertebrates (Chure & Engelmann 1989).

This suggests that the area beyond the CQ at DINO may contain important paleontological resources. This project will provide the first systematic survey of the Morrison Fm. within DINO. It will provide input for management of the paleontologic resource in the future and is likely to yield immediate results in the discovery of specimens that can be important to ongoing research projects.

✦ Methods

The methods employed have been standard paleontological field practice. A field assistant and I walk over the outcrop area in a systematic pattern that allows us to visually inspect the surface at close range. When fossil material is observed at the surface, the site is examined more closely to determine the nature of the occurrence, whether the specimens are in place, the quality of preservation, the identity of the specimen(s) and any other pertinent observations. All observations are recorded in field notes. Shallow excavations are sometimes made in order to assess the site more accurately, although the objective is not to completely expose the specimen nor to collect it, in most instances.

Occasionally specimens are collected if loss or destruction of a scientifically valuable specimen is imminent, or if the specimen can be used in a currently active research project. All specimens collected are catalogued into the collections at DINO.

In addition to field notes, all sites are documented in the field. A description of characteristics and location of the site is recorded, for later entry into the computerized locality file system at DINO. The location is plotted on enlarged sections of topographic maps and B&W print photographs are made.

Information pertinent to the stratigraphic research project being conducted in DINO is shared with the investigators of that project and our work is guided by their findings. This is especially true in the selection of samples for palynological analysis and radiometric dating which will be done cooperatively by both projects.

✦ Preliminary Results

In the first year of a 3-year project, we have inspected perhaps 40% of the total area to be covered. I anticipate that this rate of work will permit us to cover the entire area within the period of the project.

We have recorded more than 160 sites, of which only about 40 were previously known in DINO records. The majority of these sites are dinosaur bone localities. Most occurrences of dinosaur bone are of fragmentary material of little scientific value but many sites could prove to be of some value with further investigation. For example, articulated partial skeletal remains of part of a theropod dinosaur were found at one site.

Silicified logs were relatively common, particularly in some horizons. Some plant remains, including a cone-like structure, were found at a few sites. Invertebrate fossils and trace fossils were also documented. In addition,a few sites have the potential to yield microvertebrates. Many horizons that may contain palynomorphs have been located and sampled, as have many bentonite layers which may be suitable for radiometric dating.

Except at Deerlodge Park, where we observed evidence of systematic prospecting of the outcrops, we saw little evidence of illegal collecting. Only a short distance away from areas heavily used by visitors, specimens seemed to be relatively undisturbed.

✦ Interpretation

Our work so far leads me to conclude that fossils are indeed abundant in the Morrison Fm. within DINO. As we expected, dinosaurs are especially common, but many other types of fossils which could provide important environmental information occur as well.

Of particular interest is the fact that dinosaur remains are abundant in the Salt Wash Member; although elsewhere in the areal extent of this member this is not known to be the case. Silicified logs are also common in the Salt Wash. Furthermore, both dinosaurs and logs appear to be concentrated in the major sand bodies within the Salt Wash, especially in a persistent sand in the middle of the member. Important specimens of fossil vertebrates occur within this member, as well as, within the Brushy Basin Member in which the CQ is located. Also important, is the potential for the development of microvertebrate localities, which must await evaluation.

Although some evidence suggests that illegal collecting of fossils does occur, there is also reason to believe that it is not, at the present time, widespread nor severe, within DINO.

Further work will be needed to characterize and evaluate the resource as a whole, and specific sites and specimens in particular. The initial impression is that the Morrison Fm. within DINO is a paleontologically data-rich environment. It figures importantly in paleontologic and stratigraphic problems of regional and perhaps global scale.

✦ Literature Cited

Chure, D. J., and G. F. Engelmann. 1989. The fauna of the Morrison Formation in Dinosaur National Monument. p. 8-14 In: Flynn, J. J., ed., Mesozoic/ Cenozoic vertebrate paleontology: Classic localities, contemporary approaches. 28th International Geological Congress Field Trip Guidebook T322, AGU, Washington, D.C.

Clemens, W. A., J. A. Lillegraven, E. H. Lindsay and G. G. Simpson. 1979. Where, when and what - A survey of known Mesozoic mammal distribution. p 7-58 In: Lillegraven, J. A., Z. Kielan-Jaworowska and W. A. Clemens, (eds.), Mesozoic mammals: the first two-thirds of mammalian history. Univ. California Press, Berkeley.

Colbert, E. H. 1968. Men and dinosaurs. E. P. Dutton and Co., New York, 283 pp.