A SIMPLIFIED KEY TO IDENTIFYING ISOLATED FOSSIL TEETH FROM LATE TRIASSIC ROCKS IN PETRIFIED FOREST NATIONAL PARK

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ABSTRACT

Isolated teeth and jaw fragments are some of the most common fossils found in Upper Triassic rocks at Petrified Forest National Park. All these specimens can be identified to at least the family level using an identification key.

INTRODUCTION

Isolated teeth or jaw fragments are among the most common remains of fossil vertebrates found at Petrified Forest National Park. These fossils occur in the Petrified Forest and Owl Rock Formations of the Chinle Group that are Late Triassic (about 210-230 million years old) in age. All well-preserved teeth can be identified to at least the generic level, and the purpose of this key is to provide a nontechnical means by which National Park Service personnel can identify them. We hope that this key will also be of use to students and amateur paleontologist working with Late Triassic vertebrates in other areas.

A FEW BASICS

Why so many teeth? Isolated teeth (teeth not associated with jaws) are common in Late Triassic rocks for several reasons:

1. Most Late Triassic teeth are from reptiles that replace their teeth continuously. Reptiles do not have a limited number of teeth (two sets) like mammals. Therefore, one reptile will produce hundreds of teeth in its lifetime.

2. Most reptiles have teeth that are simple, cone-shaped elements that fit in cylindrical sockets in the jaw. Reptile teeth do not have complicated roots as do most mammal teeth,

so when a reptile dies after a relatively brief interval of decay its teeth often fall out of the sockets.

3. Because reptile teeth are not well rooted these teeth are often lost when the animal feeds.

Most lower vertebrate (reptile, amphibian, fish) teeth consist of an upper part, the crown and a lower part, root. The crown is covered by enameloid, similar to the enamel of human teeth, and the enameloid shiny if it is well preserved. The crown is often cone-shaped and has serrations on its edges. The crown is the "working part" of the tooth that is exposed in the mouth.

The root is the part of the tooth that fits in the jaw and it is usually cylindrical and not shiny, because it lacks an enameloid covering. When a reptile is about to replace a tooth it resorbs (dissolves and absorbs) the root of the tooth. Therefore, if you find a tooth with a large root you know that it came from a dead animal and was not a tooth that was replaced during life.

The teeth of carnivorous reptiles have small square serrations that are at right angles to the edge of the tooth (Fig. 1A). In contrast, the teeth of herbivorous reptiles have larger serrations that are blunt and point towards the top of the tooth (Fig. 1B).

THE CAST OF CHARACTERS

More than 90% of isolated teeth at Petrified Forest National Park represent 7 types of reptiles and amphibians. We have included here one type of tooth (prosauropod) which is not known from the park but which may be found in the future.

The most common Late Triassic vertebrates are phytosaurs, which are superficially crocodile-like reptiles with elongate snouts. Metoposaurs are one of the last of the groups of giant primitive amphibians that had large, flat heads shaped like shovels. The most common herbivores were aetosaurs which were large (up to 5 meters long) armadillo-like reptiles with heavy armor on their backs. The largest predators were rauisuchians which were quadrupedal animals with large heads. Rarer carnivores were the small and slightly built sphenosuchians, which were the ancestors of modern crocodiles.

Three groups of dinosaurs are found in the Late Triassic. All carnivorous dinosaurs were bipedal saurischians which were usually much shorter than a human in height. Similarly sized plant-eating dinosaurs are ornithischians, which were also bipedal. The largest Late Triassic dinosaurs were prosauropod which look like emaciated versions of their descendants, the sauropods (e.g., *Diplodocus*, *Camarasaurus*, *Apatosaurus* [*Brontosaurus*]).

Note that phytosaurs have several different kinds of teeth in the same jaw and so these appear at different places in the key. This condition is referred to as heterodonty.

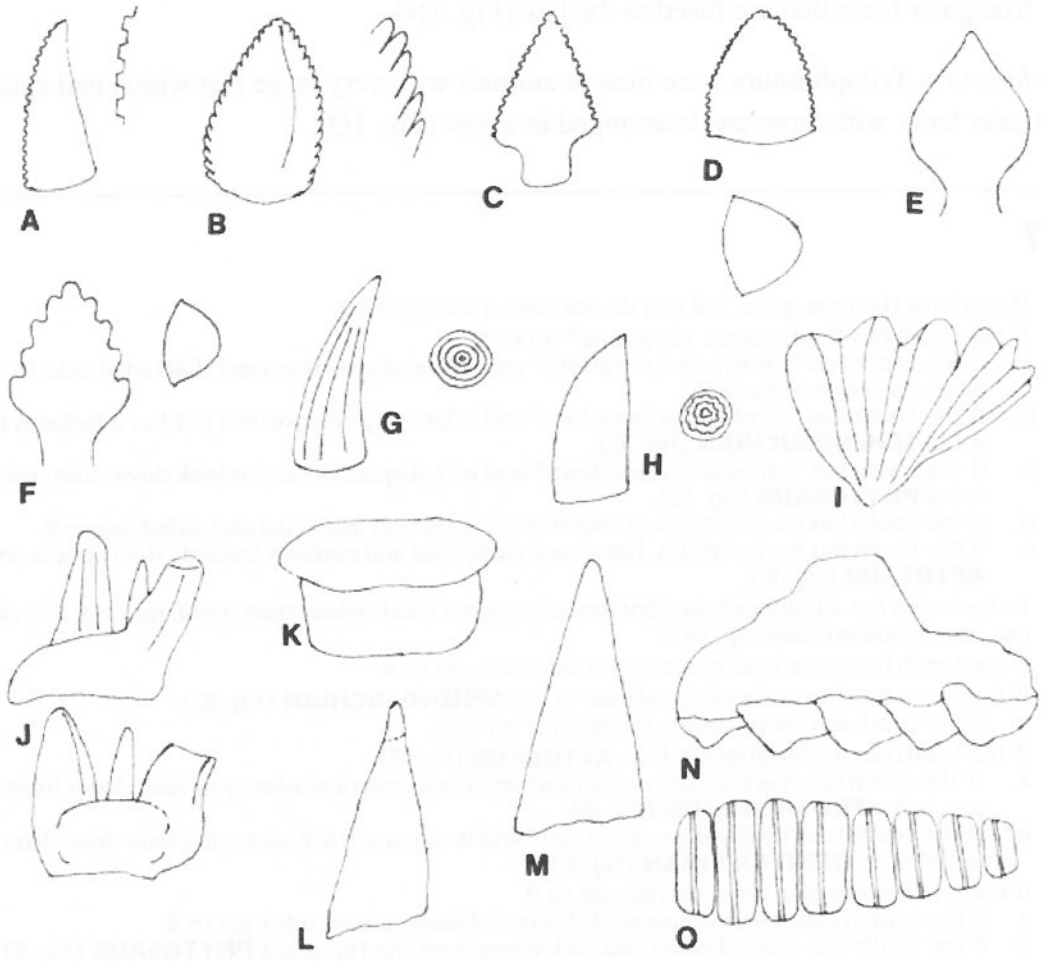


Figure 1. The main kinds of isolated teeth and jaw fragments found in Upper Triassic rocks at Petrified Forest National Park. A, Saurischian tooth in side view with a close-up of the "carnivorous serrations"; Prosauropod tooth in side view with close-up of "herbivorous serrations"; C, Sphenosuchian tooth (stylized) in side view; D, Phytosaur tooth in side and top views; E, Aetosaur tooth in side view; F, Ornithischian tooth (stylized) in side and top views; G, Phytosaur tooth in side and bottom views; Metoposaur tooth in side and top views; I, Lungfish toothplate in top view; J, Three-pronged shark teeth; K, Button-like shark tooth; L-M. Conical fish teeth; N, Sphenodont upper jaw in side view with five triangular teeth; O, Trilphosaur teeth in top view.

MISCELLANEOUS TEETH

Lungfish- Lungfish have fan-shaped teeth with sharp ridges radiating out from the center (Fig. 1I).

Sharks- Triassic sharks have very small teeth of several different shapes. Common shapes are a three-pronged form (Fig. 1J) and a flat button-shaped form (Fig. 1K).

Other fish- Other fish teeth are usually very small, conical, smooth and shiny, sometimes with an opaque base and a translucent top (1L-M).

Sphenodonts- Sphenodonts were lizard-sized animals with laterally compressed (flattened side to side), triangular teeth that are fused to the jaw (Fig. 1N).

Trilophosaurs- Trilophosaurs were bizarre animals with very large feet which had small rectangular teeth with three crests arranged in a row (Fig. 1O).

Key

1. If you have the root go to 3. If you do not have a root go to 2.
2. If the tooth has "herbivorous serrations," go to 6.
   a. If the tooth has "carnivorous serrations" and is laterally compressed (flattened side to side) all the way down, go to 8.
   b. If the tooth has "carnivorous serrations" and is laterally compressed but has a bulbous base it is a **SPHENOSUCHIAN** (fig. 1C).
   c. If the tooth has "carnivorous serrations" and is D-shaped when you look down from the top it is a **PHYTOSAUR** (fig. 1D).
   d. If the tooth has no serrations, is round in cross section and is parallel-sided, go to 9.
   e. If the tooth has no serrations, has a very wide base and narrows towards the top it is an **AETOSAUR** (fig. 1E).
3. If the crown has a bulbous base (bottom of crown is much wider than root), go to 4; if it does not have a bulbous base, go to 7.
4. If the tooth has serrations, go to 5; if it does not, go to 6.
5. If the tooth has "carnivorous serrations" it is a **SPHENOSUCHIAN** (fig. 1C).
   a. If the tooth has "herbivorous serrations," go to 6.
6. If the tooth has no serrations it is an **AETOSAUR** (fig. 1E).
   a. If the tooth has "herbivorous serrations" and is symmetrical when you look down from the top, it is a **PROSAUROPOD** (fig. 1B).
   b. If the tooth has "herbivorous serrations" and is asymmetrical when you look down from the top, it is an **ORNITHISCHIAN** (fig. 1F).
7. If the tooth is round in cross section, go to 9.
   a. If the tooth is laterally compressed (flattened from side to side), go to 8.
   b. If the tooth is D-shaped when you look down from the top it is a **PHYTOSAUR** (fig. 1D).
8. If one side (actually the back side) is concave it is a **SAURISCHIAN** (fig. 1A).
   a. If both sides are straight it is a **RAUISUCHIAN**.
9. If the height of the tooth is more than 5 times its maximum width and/or the inside of the tooth is composed of simple rings, it is a **PHYTOSAUR** (fig. 1G).
   a. If the inside of the tooth is composed of crinkly rings it is a **METOPOSAUR** (fig. 1H).

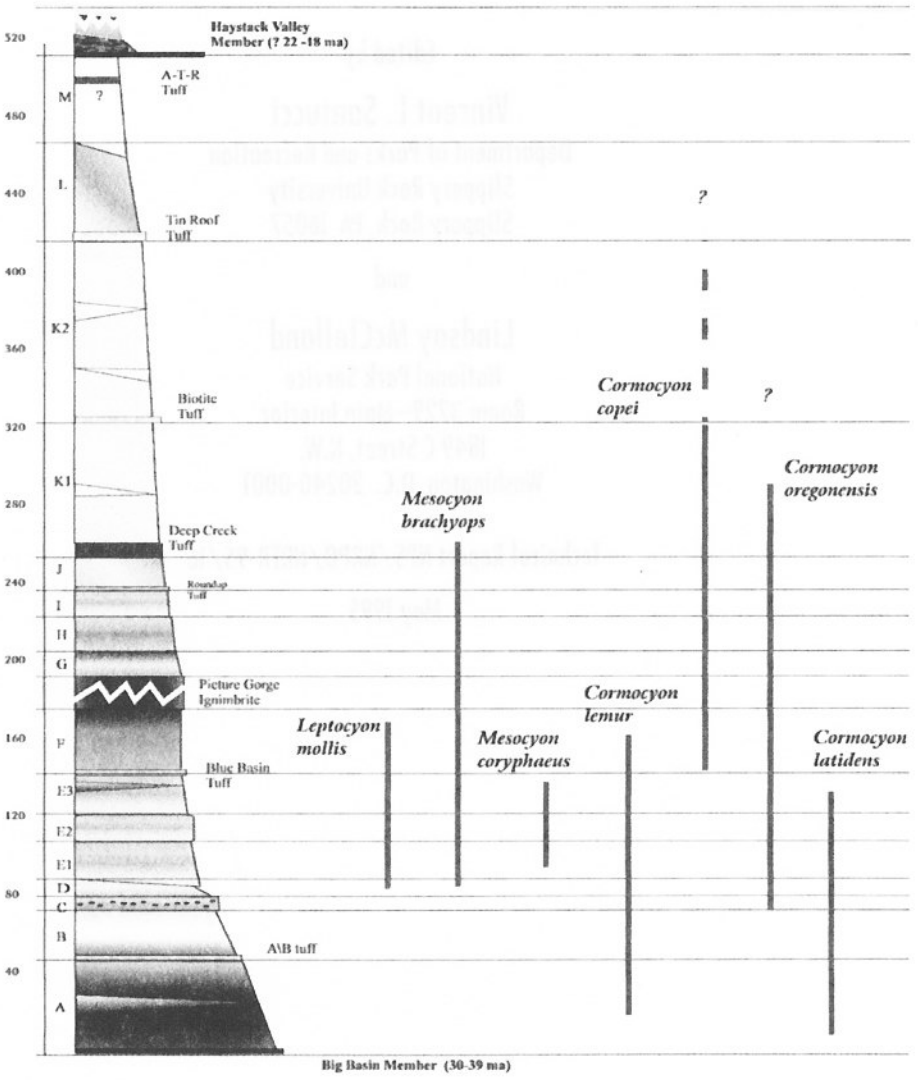
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