FIGURE 9.14.

The animal shown at the top is a representation of the small therapsid (mammal-like reptile) that survived the initial dinosaur onslaught. It was about a foot long. The therapsid is thought to have given rise to the first tiny rat-like mammal, shown in the lower sketch, which was about 6 inches long.

important for the mammals. Grasses concentrate their energy in seeds as do fruit and nut trees. Seed-eating animals are thus able to obtain and digest greater sources of energy from seed-producing grasses and trees.

Mammals typically have hairy coverings to aid them in maintaining their constant body temperature. Fur or hair is the typical mark of a mammal, as scales are the distinctive mark of a reptile. Mammals also have larger brains in proportion to body size, and thus more capacity for directing intelligent action.

It should be noted here that there is a growing line of thought that the dinosaurs may have been warm-blooded, or at least have had some means of maintaining a relatively constant body temperature. The dorsal, fin-like sail on the back of some forms may have been used as a temperature regulator or solar panel: sail up -- radiate or capture heat, sail down -- conserve body heat (see figure 9.13).

If the dinosaurs were warm-blooded, as analysis of fossil bones is beginning to hint, it would explain their long period of dominance on the land. On the other hand, environmental analysis tends to favor the cold-booded hypothesis. Vegetative analysis suggests that the Age of Reptiles was associated with a mild and rather constant climate. Further, the extinction of the dinosaurs was concurrent with a change in the Earth's climate to a drier, more variable one with greater extremes of heat and cold. Warm-blooded animals would be decidedly more suited to the climatic change that began to take place 70 million years ago.

The differences between mammals and reptiles -- warm blood, hair, and milk-producing glands -- do not lend themselves to fossilization. However, there are differences in the patterns of jaws and teeth which have left fossil records. The ability to maintain constant body temperature requires a great deal of food energy. Unlike the torpid reptiles, the more active mammals must eat amply and on a regular basis to maintain their high metabolic rate. Their jaws and teeth, therefore, must be more adapted to cutting, crushing, and grinding than those of reptiles. The analysis of jaws and teeth is therefore the basis of tracing the early evolution of the mammals.

THE ORIGIN OF THE MAMMALS

The fossil record of jaws and teeth has led scientists to the conclusion that mammals arose from the *therapsids* (see figure 9.16).