V. Definitions

The following definitions try to clarify certain relevant concepts about the ecology, morphology and locomotion of small mammals used in this study.

Small mammal: Mammalian species with a body length of 200 mm or less (maximum size that of a rat or a squirrel, with a maximal body mass of about 300 g).

The weight of a small mammal varies considerably intraspecifically and intraindividually, depending on season and food resources due to different amounts of fat reserves. Thus, the body mass is a less exact parameter than the body length.

Body length: Body length is defined as the total length of the vertebral column excluding the caudal vertebrae, i.e. from the rostral edge of the atlas to the caudal end of the sacrum.

The body length comprises the cervical, thoracic, lumbar and sacral region.

Head-body length: Length of an animal skeleton between the most rostral point of the skull and the caudal end of the sacrum.

Locomotory movements extending into the third dimension imply important differences depending on respective body masses. Small mammals have a much more favorable allometric ratio of body mass relative to muscle force than large mammals (Preuschoft et al. 1998). Consequently, small mammals spend less energy when moving “up and down” than large ones (Taylor el al. 1972). Therefore, I propose to differentiate clearly between large and small mammals in this respect. The term “climbing” is exclusively applied to large mammals whereas the typical mode of locomotion of small mammals in a three-dimensional network of supporting surfaces is called “scansorial locomotion”.

Climbing (large mammals): Climbing is locomotion on steeply inclined or even vertical substrates, or by making use of a series of hand- and footholds at various levels (Preuschoft et al. 1998). Climbing implies a gain or loss of height above ground. The gravity vector may be outside the area of support, which entails the need to transmit rotating moments; thus, the tension as well as compression has to be applied from the animal’s body to the substrate (Preuschoft et al. 1998).

Scansorial locomotion (small mammals): Agile locomotion along uneven, variably inclined (up to vertical), and spatially irregular substrates.

Due to their small body size, small mammals are continuously confronted with steeply inclined and uneven substrates (Jenkins 1974). The perception of their habitat is a three-dimensional discontinuity. Moving with agility along complex structured substrates is essential to survive and requires a flexible and versatile mode of locomotion. The advanced therian mode of locomotion, characteristic of most of the generalized Recent small mammals, was probably evolved in the course of the Jurassic by small mammalian taxa (e.g. *Henkelotherium*).

Generalized small mammals: Small mammalian species of which the postcranial skeletons are lacking profound specializations. The majority of extinct and Recent small mammals have similar corporal and limb proportions (e.g. the limbs are nearly equal in length).

The generalized small mammals are able to cope with an infinitely variable array of irregularly spaced substrates. Their versatile mode of locomotion implies displacing with agility within a three-dimensional discontinuous habitat. Thus, generalized small mammals are able of "scansorial locomotion" (e.g. *Monodelphis domestica, Mus musculus, Rattus norvegicus, Tupaia glis*).

Arborealism: Behaviour of certain large and small mammals living in wooded habitats and spending most of their time on trees. Large arboreal mammals often have evolved specific adaptations for arboreal life (e.g.: tactile pads, opposable first digit of hands and/or feet, hind-foot reversal mechanism, Jenkins and Mc Clean 1984). Small arboreal mammals apply scansorial locomotion within the complexe structured canopy of trees. Examples for small arboreal mammals are the primates *Galago demidovii* and *Microcebus murinus*.

Vegetation substrates: Trees are woody plants that reach 4.5 to 6 m or more in height at maturity, with a single stem of at least 10 cm in diameter, unbranched at some distance above the ground, and having a more or less definite crown (Harlow et. al., 1991). For the dimensions of a small mammal the shrubs and the thicket vegetation can be considered to have the same functionality as a tree.

Terrestrialism: Behaviour of certain large and small mammalian species that spend most of their time on the ground. Usually these species are no good climbers and their locomotion mode takes place on flat surfaces. With regard to

small mammals, the term “terrestrialism” should be confined to those few species uncapable of “scansorial locomotion” i.e. to species definitely restricted to locomotion on plane substrates (e.g. *Elephantulus brachyrhynchus*,*Talpa europaea*). Specific adaptations (e.g. the autopodium of the mole *Talpa europaea* is adapted to excavate subterranean tunnels) or modified limb proportions (the hind limb of *Elephantulus brachyrhynchus* is elongated) are found in the postcranial skeleton of certain small terrestrial species.

Steering tail: Elongated tail, often longer than the body, and composed of long and slender caudal vertebrae used as a balancing device during locomotion. A steering tail may occur in species with diverse modes of locomotion: i) terrestrial quadrupedal fast running, e.g. *Elephantulus brachyrhynchus*; ii) arboreal jumping e.g. *Galago demidovii*; iii) running and jumping along twigs and branches, e.g. *Ptilocercus lowi* (Nowak 1999).

Prehensile tail: A tail that is composed of short vertebrae with the ability to grasp around a support. Such a tail can be considered as a fifth extremity, used as a fixing organ, e.g. in *Micromys minutus, Microcebus murinus, Marmosa murina*.

“Krallenkletterer”: Terminus for a mammalian species making intense and frequent use of its claws as a device for clinging to strongly inclined or vertical substrates (Böker 1935, Krebs 1991), e.g. *Sciurus vulgaris, Saguinus oedipus*.