LIST OF FIGURES

Pages

Figure 1. Structure and hierarchical organization of skeletal muscle ….....4

Figure 2. Myofilaments, actin and myosin, that form the sarcomeres……5

Figure 3. The composition of a motor unit, which coordinates muscle contraction……....6

Figure 4. The neuromuscular junction……....7

Figure 5. A ventral view of *Bufo marinus*, the cane toad, highlighting the coracoradialis and deltoideus scapularis…….16

Figure 6. Images of the various kinematic phases of a) a vertical hop……20
b) a horizontal hop…….....20

Figure 7. An EMG recording from the *coracoradialis* muscle detailing the variables obtained from each hop……23

Figure 8. The phases of the jump labeled with the average durations identified for each type of hop in this study……..27

Figure 9. a) A representative EMG signal of a deltoideus scapularis during a vertical hop……..29
b) A representative EMG signal of a deltoideus scapularis during a horizontal hop……..29

Figure 10. a) A cumulative binning figure for all four animals for vertical hops for the deltoideus scapularis …….30

b) A cumulative binning figure for all four animals for horizontal hops for the deltoideus scapularis……30

Figure 11. a) A representative EMG signal of a coracoradialis during a vertical hop……...31

b) A representative EMG signal of a coracoradialis during a horizontal hop ……31

Figure 12. a) A cumulative binning figure for all four animals for vertical hops for the coracoradialis…….32

b) A cumulative binning figure for all four animals for horizontal hops for the coracoradialis…...…….32

Figure 13. Scatter plots of aerial duration versus pre-landing intensity for the deltoideus scapularis……....33

Figure 14. Scatter plots of aerial duration versus pre-landing intensity for the coracoradialis……..……34

Figure 15. Scatter plots of aerial duration versus onset latency deltoideus scapularis……35

Figure 16. Scatter plots of aerial duration versus onset latency for the coracoradialis…….36

Figure 17. A phylogenic tree highlighting Bufonidae (true toads), Hylidae (tree frogs), and Ranidae (true frogs)…..…….39

LIST OF TABLES

Table 1. Overview of the data collected in this study……..24

ABSTRACT

When landing from a jump or fall, humans and other mammals, such as cats and monkeys, modulate the timing and degree of activation of limb muscles in mid-air in response to fall height. Recent work revealed the presence of this behavior in Cane toads (Bufo marinus), the first non-mammalian animal in which it has been identified. These toads exhibited tuning of the timing and intensity of pre-landing recruitment in elbow antagonists in accordance with hop distance. Specifically, longer hops led to more intense and later activation of pre-landing muscle activity. To investigate the conservation of this behavior among other anurans, I studied landing in *Osteopilus septentrionalis*, commonly known as the Cuban tree frog. In particular, I addressed if these animals were capable of altering forelimb muscle activation patterns in preparation for landing in response to hop distance. I also examined if any differences exist between preparations for landing on horizontal versus vertical surfaces.

Using high-speed video, I tracked the limb positions during jumps onto surfaces of different orientation. I also implanted fine-wire electrodes into two forelimb muscles, the deltoideus scapularis, which acts at the shoulder, and the coracoradialis, which acts at the elbow, in four jumping tree frogs. Electromyographical recordings measuring the timing and intensity of the muscle activation were characterized from the onset of movement through landing.

These tree frogs demonstrated different forelimb kinematics and muscle activation patterns between jumps to vertical versus horizontal surfaces. Furthermore, when hopping onto a horizontal surface, these animals exhibited tuning in the intensity and timing of their pre-landing muscle recruitment in these two muscles. However, when jumping to a vertical surface tuning was not present.