**Section 8 – Cont.**

University of Toronto, Scarborough Animal Use and Care Committee Application

**“Pit-tagging of hummingbirds”**

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Description of Project and Procedures.

Hummingbird Capture –

A total of up to 100/year hummingbirds captured at the Koffler Scientific Reserve at Joker’s Hill (KSR) and 15 hummingbirds held in the UTSC vivarium and used in other protocols are proposed for use in this study. Please see associated umbrella bird capture protocol description for further details regarding bird capture, handling, and numbers.

Project – **Pit-tagging of hummingbirds**

Note: Every year, thousands of hummingbirds are captured throughout North America and marked with small metal bands fastened around their legs. These individual identifiers permit the tracking of hummingbirds whenever they are subsequently caught. Such captures result in the collection of data that informs our understanding of hummingbird dispersal patterns, breeding behavior, growth and development trajectories, etc. However, because licensed banders cannot operate an unlimited number of traps 24 hours a day/7 days a week, very few hummingbirds (< 1%) are ever recaptured. Pit tagging technology (relying on radio-frequency identification, RFID, technology) has advanced in recent years to the point where commercially available pit tags are now small enough so that they can conceivably be implanted in hummingbirds with little to no adverse effects. Additionally, commercially available tag-readers, designed for deployment in water for the automated detection of tagged fish, offer an ideal method of detecting tagged hummingbirds approaching commercial nectar feeders. The antennas used in these applications are formed as a ring through which fish would swim (Figure 1). For use with hummingbirds, this antenna would be placed immediately in front of a commercial feeder. The presence of hummingbirds visiting the feeder would be automatically recorded each time they visited. With some careful programming and inclusion of inexpensive auxiliary pieces of equipment, it will also be possible to generate additional data and stream these to web servers so that researchers from around the world, and interested members of the public, could view the collected data and hummingbirds in real-time. The inclusion of a digital balance with a perch mounted on top of it could be used to automate the collection of mass data. I have accomplished this with birds under both laboratory and field settings already. The addition of a web-cam and infrared detection circuit, could be used to capture live video of the visiting hummingbird and record a photograph of each visitation. Photographs could be used automatically obtain certain morphological data, such as molting status and gorget (colored throat feather patch) development. Via development of a public website connected to the associated database, web cam images of each hummingbird presently, or recently, at the feeder could be displayed while associated individual data is shown. These data could include, hummingbird sex, age (if known), date of first capture, date of birth (if known), current mass, minimum and maximum recorded mass, time since last visitation, number of visitations that day/week/year, etc. This information would be of use to fellow hummingbird researchers and to interested members of the public. School teachers could utilize the associated website as a tool to illustrate wildlife biology practices, educate students about hummingbird natural history, and generate significant interest and excitement in basic science research.

Successful, wide-scale deployment of this system could represent a hundred-fold increase in the amount of data available to hummingbird researchers worldwide. These stations would operate continuously and offer the additional advantage of not necessitating repeated handling by banders which may stress birds and likely leads to birds avoiding banding stations in the future.

1) Hummingbirds will be transported to the laboratory (including laboratory space at the Koffler Scientific Reserve – when birds are caught there - or at the University of Toronto Scaroborough campus – only when birds are caught at the investigator’s home or near campus). A 0.5% solution of lidocaine will be applied to the area of implantation via cotton swab to locally numb it. The implantation area will be cleaned by application of Betadine via a sterile cotton-tipped swab. Commercially produced pit-tag implanters, such as the unit pictured in figure 2a will be used to implant the smallest commercially available pit tag (such as that shown in figure 2b) under the skin on the back of the hummingbird, just to the right of the centerline. All instruments used are available pre-sterilized and are single-use only. The resulting wound will be closed with Vetbond, medical-grade cyanoacrylate. I have personally performed dozens of these survival surgeries on ruby-throated hummingbirds and not one bird has exhibited significant side-effects. The graduate student who will lead this project, has performed dozens of these implantations under my direct supervision.

2) Topically numbed birds are immediately flight capable and will be promptly released. For captive hummingbirds only: they will be allowed to recover for 20 minutes (though they typically demonstrate full flight and feeding ability immediately). At this point, they will be placed in a flight arena with a commercial nectar feeder and associated equipment and allowed to behave normally. This will permit testing of the responsiveness of the system and allow assessment of the effects, if any, of the implanted tag on hummingbird behavior and demeanor. This observation will be continued for approximately 4 hours. Notes of any unusual behaviors such as excessive preening, changes to flight patterns or abilities, panting, etc., will be noted. Following any period of acute monitoring, hummingbirds will be checked several times a day for the following week, and checked once daily, as is normal for their care, following this. Weight measurements will be taken prior to, and each day following, the implantation for one week. Food consumption of captive hummingbirds is currently monitored daily. Abrupt weight loss greater than 20% and sudden, significant changes in food consumption, not associated in either case with changes in migratory/seasonal status, will be noted and the bird will be recaptured and the pit tag will be removed if possible. Any hummingbird for which this is not feasible will be euthanized via overdose (>5% isoflurane) and tissues used in other studies in our lab (e.g. those described in “Blood sugar regulation in hummingbirds” protocol).

Figure 1. Raquet antenna for use in pit-tagging applications (Biomark, Inc., Boise, ID, USA). This, or a comparable custom-made antenna would be placed immediately in front of a commercial nectar feeder and thus automatically detect the passage of tagged hummingbirds as they visit the feeder.

1A

3) I have developed 5 additional custom-fabricated RFID readers and associated stations (at greatly reduced cost). These have now been deployed at KSR. Equipment troubleshooting is ongoing. None-the-less, it is clear that a significant proportion of tagged birds (~25%) routinely visit the available feeder stations. Those that have not regularly been recorded at feeder stations cannot be assumed to be dead. They may have simply left the area, or become 'trap shy', avoiding equipped feeders.

Figure 2. A) A reusable syringe-style implanter (UNO BV PICO Implanter) suitable for use in implanting pit tags in hummingbirds. B) PICO ID Transponder PIT tags. (UNO BV). This transponder measures 7 mm x 1.25 mm.

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B





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