TCRF Report Laser MicroMill

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A substantial component of the research program for the Marshall and Wells laboratories is the analysis of biotracers (stable isotopes or trace metals) stored within hard tissues from our study organisms (fish otoliths, shark vertebrae, sea cow tusks, dolphin teeth and sea turtle humeri [arm bones]). The hard anatomical parts that comprise vertebrate skeletons grow throughout an animal's life by laying down mineralized growth-layer groups (GLGs) in a manner analogous to a tree laying down rings. These GLGs are deposited on an annual basis and are used to age these animals. Additionally, these GLGs capture a chemical record of these animals environment over their lifetime. In addition to aging, material from within each GLG can provide critical information regarding the trophic level at which they are feeding at and how that has changed through the life of the animal (its ontogeny). Likewise the body of water in which an aquatic animal inhabits leaves chemical signatures within GLGs. For example, migration between saltwater and freshwater, or any body of water with a unique chemical signature, is recorded within the GLGs and can be followed over the ontogeny of the animal. That is, at the end of their life, information regarding their first years of life are still recorded in these hard structures. The analyses of these biotracers within the context of the history of their lifetime leads to detailed studies of foraging and movement ecology in aquatic vertebrates. To collect this information it is necessary to drill (mill) out the hard material precisely between GLGs. This is accomplished by a Laser Micromill, which allows the user to zoom into the minute areas between GLGs and subsample that material.

We have purchased the Laser MicroMill but had to navigate several IT cybersecurity compliance hurdles from Texas A&M University. Once ordered, the equipment was on backorder. It is schedule to arrive October 2019 and we expect it will take several weeks to unpack, assemble and get the equipment running. We will be processing samples by November 2019. This piece of equipment is critical to conducting stable isotope and biotracer analyses. This particular model is widely used among the scientific community that conducts this work. The micromill is a hybrid between a small drill and a microscope; the movement of the drill bit is computer controlled and programmable. The equipment allows precise microsampling from hard structures such as fish ear bones (otoliths), backbones (vertebrae) and teeth. This particular micromill features sub-micron sample motion control, sample height detection, tilt correction using a drill-tip sensor and precise computer driven movement in X, Y and Z axes. The microscope features high limit of 40X zoom with two CCD camera for magnification of samples and a live video feed. It is designed for the high-resolution milling that is needed by several researchers at TAMUG (Marshall and Wells). Maintenance will be covered by a 12-month warranty and then the costs thereafter will be split among the primary users through extramural grants and contracts (i.e., Marshall and Wells). We have several projects in the queue waiting to use the new equipment including our dugong tusk (Marshall) and tuna otolith (Wells) stable isotope projects.