BIO AND TECHNO-SIGNATURES IN EARTH BOUND SPECIES: WHAT WE KNOW.

D. L. Herzing[1,2] [1]Wild Dolphin Project, P.O. Box 8436, Jupiter FL 33468, [2]Dept of Biological Sciences, Florida Atlantic University, Boca Raton, FL 33431, dlherzing@wilddolphinproject.org.

Introduction: The Wikipedia definition of Technology is "the collection of *techniques, skills, methods and processes* used in the production of *goods or services* or in the accomplishment of objectives, such as *scientific investigation.* Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in *machines,* which can be operated without detailed knowledge of their workings." A list of the human species' use of technology starts with the conversion of *natural resources* into simple tools. Along with control of natural resources the list includes reducing physical barriers to communication, using skills, methods, and processes, and the creation and use of weapons.

Based on these definitions we note that non human animals 1*) control natural resources* e.g. use tools to gather and process food, build nests, manipulate sound, light; 2) *increase communication* e.g. modulate signals and learn alarm calls of neighboring species, 3) *use social skills and processes* e.g. manipulate others by deception and politics, and 4) *create and use weapons* e.g. use clubs, focus sounds. Non human technology (NHT) manifests itself based on need, beyond the natural evolutionary developments and physical aspects of a species, ex. antlers or teeth as weapons. NHT typically involves the adaptation or adjustment of natural items in the environment, the use of species-specific sensory systems, and the comprehension and manipulation of intra or interspecies relationships.

Of specific interest is the process of interspecies communication. Some interspecies interactions on Earth are complex and include passive signal reception (sentinel birds) and others are active signal exchange. Species can and do decode each other in functional and meaningfull ways. Recognizing alarm calls of another avian species [1] have been reported. Dolphins create mutual systems of communication between neighboring dolphin species [2, 3]. Do taxa that engage in interspecific exchange need to be closely related to communicate? Or can species bridge the gap between sensory systems and communication modalities to interact?

Elements conducive towards interspecific signal exchange including mimicry, synchrony, and imitation should be studied in Earth bound species and between non humans and humans [4].

Applying new pattern recognition algorithms to animal communication and signal use may provide insight into how non human cultures manifest information [5,6]. Bio signatures may not be mutually exclusive to techno signatures and may also overlap. For example, natural communication signals that are both detectable and decodable can be utilized to create processes, e.g. the deception or stealth communication by cephalopods to avoid predators. While searching for bio signatures or patterns, we may detect the technological process or method of a species. Signatures may include environmental manipulation, communication driven processes, and goal driven technologies. Detecting and decoding NHT in other species will help us prepare for deciphering any "technologically" sent messages in space, or for direct contact.

References:

[1] Munn C. A. (1986) *Deception: Perspectives on Human and Nonhuman Deceit,* 169-176. [2] May-Collado L. J. (2010) *Ethol.* 116, 1065-1074. [3] Yurk H. et al. (2002) *Anim. Behav*. 63, 1103-1119. [4] Pryor K. and Lindberg J. (1990) *Mar. Mamm. Sci.* 6, 77-82. [5] Kohlsdorf D. et al. (2014) ICASSP, 8242-8246. [6] McCowan B.R. et al. (1999) *Anim. Behav*. 57, 409-419.