FORMAL PRESENTATION ABSTRACTS

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WHICH WAY DID I GO? REMOTE TRAINING OF A SPATIAL MEMORY TASK TO ASSESS THE EFFECTS OF DOMOIC ACID EXPOSURE IN STRANDED CALIFORNIA SEA LIONS

Peter F. Cook, Amy K. Bernard*, Colleen Reichmuth
Long Marine Laboratory, University of California, Santa Cruz, CA

We developed a rapid remote training protocol for use in memory tests with stranded California sea lions *(Zalophus californianus)* exposed to domoic acid (DA). DA is an increasingly prevalent neurotoxin produced by the algal diatom *Pseudonitschia*, and is implicated in mass stranding events in California sea lions (Goldstein et al., 2008). DA damages the hippocampus; a part of the brain essential for memory, and the behavioral effects likely impact survival in exposed animals. In an effort to better understand these effects, we have partnered with The Marine Mammal Center (TMMC), a stranding and rehabilitation facility in Sausalito, CA. Together, we are conducting a series of behavioral assays examining memory in animals diagnosed with DA exposure. Due to this unique partnership, we have a large subject pool to draw from, and our training and testing protocols allow for rapid throughput of subjects. Studies have shown that hippocampal damage does not interfere with procedural learning, but does contribute to short-term memory loss. Laboratory animals with hippocampal damage can learn an alternating spatial response pattern, but cannot maintain it when a short delay is enforced at the beginning of each trial—once they pause, they can't remember which way they had previously gone (Ainge et al., 2007). To test this hypothesis in California sea lions, we train individuals to perform a task involving an alternating pattern of left and right responses in a maze. We then compare performance in the task with and without an imposed time delay.

Due to the fact that this work is being done with stranded animals, training and testing must be as quick, non-invasive, and low-contact as possible. All training is done remotely, and individuals complete training and testing within two weeks. Training is incremental, comprising a sequence of stages leading up to the alternating (left, right, left, etc.) response pattern in the maze with a delay interval eventually imposed at the beginning of each trial. Training begins with baiting to establish the initial movement pattern and acclimate the animals to the maze. We then transition to approximation, in which the animal must interact with the maze in an operant manner to receive a fish reward. The animal's behavior is progressively shaped to meet criteria through selective reinforcement. Through the use of this remote training paradigm we are able to quickly and effectively train a complex behavior chain with minimal human interaction. After completion of testing with each sea lion, we obtain images of their brains using MRI and then return them to TMMC. We then look for a relationship between the extent of brain damage and performance on this spatial memory task.

Operant research with stranded animals is rare, due both to the difficulties of conducting meaningful tests under time restrictions and the danger of habituating animals slated for release—in this instance we have surmounted these obstacles, and hope that this work paves the way for similar collaborations and other naturalistic studies of wild populations.

Ainge, J.A., Van der Meer, M.A.A., Langston, R.F., & Wood, E.R. (2007). Exploring the role of context-dependent hippocampal activity in spatial alternation behavior. *Hippocampus*, 17, 988-1002.

Goldstein, T., Mazet, J.A.K., Zabka, T.S., Langlois, G., Colegrove, K.M., Silver, M., Bargu, S., Van Dolah, F., Leighfield, T., Conrad, P.A., Barakos, J., Williams, D.C., Dennison, S., Haulena, M., & Gulland, F.M.D. (2008). Novel symptomatology and changing epidemiology of domoic acid toxicosis in California sea lions *(Zalophus californianus)*: an increasing risk to marine mammal health. *Proceedings of the Royal Society B*, 275, 267-276.