UN environment programme

Convention on the Conservation of Migratory Species of Wild Animals

CMS

2nd CMS Workshop on Conservation Implications of Animal Culture and Social Complexity – Part II

Parma, Italy & online, 3-4 April 2023

UNEP/CMS/Culture-2-2/Doc.4.3/Rev.1

Reports of the Taxonomic Sub-Groups: Reptiles[1]

Species of Interest:

- *Chelonia mydas*
- *Caretta caratta*
- *Eretmochelys imbricata*
- *Lepidochlys kempii*
- *Lepidochelys olivacea*
- *Dermochelys coriacea*
- *Podocnemis expansa*
- *Gavialis gangeticus*

Current knowledge

Recent research has revealed evidence of complex social cognition in chelonia. Gaze following (aligning gaze direction with that of another individual) is considered adaptive as it is likely to alert individuals to the presence of important stimuli in the environment. Geometric gaze following (following gaze behind a visual barrier) is considered complex as it requires an animal to assess the difference in the visual perception between themselves and the cue-giver. There is evidence that red-footed tortoises are able to follow the gaze of a conspecific both into distant space (Wilkinson, Mandle, Bugnyar, & Huber, 2010) and around a barrier (Toone, Clegg & Wilkinson, in prep). In contrast, work in this area with crocodilians has revealed evidence of gaze following into distant space but no evidence of gaze following around a barrier (Zeiträg et al., submitted).

Social learning is adaptive as it can allow an animal to solve a task without the costly process of trial-and-error learning and is considered the basis for cultural transmission. Davis and Burghardt (2011) show that the terrapin *Pseudemys nelsoni* can learn to select a stimulus associated with a reward through stimulus enhancement. Red-footed tortoises are also able to learn from observing the behavior of a conspecific (Wilkinson, Kuenstner, Mueller, & Huber, 2010) in a detour task. All animals in the observer group successfully reached the goal whilst all of the control animals failed (Wilkinson et al., 2010). The social learning mechanisms that control this behavior remain unclear; however, later tests revealed that the tortoises did not simply learn to follow the particular route that the demonstrator took, but rather, learned some general principles about how to solve the task (Wilkinson, & Huber, 2012). There is also evidence that one of the key species of interest, *Podocnemis expansa*, vocalises when migrating to nesting beaches and during communal nesting events; embryos vocalise prior to hatching, possibly to synchronize hatching or to attract the attention of adult females who do respond to vocalisations (Ferarra et al., 2013;

[1] Prepared by: Anna Wilkinson, Dan Noble & Martin Whiting

2014). To our knowledge, despite evidence of complex vocal communication (reviewed by Reber., 2020), there is no evidence of social learning in crocodilian.

The evidence highlighted above reveals the paucity of social cognition studies in Chelonia and Crocodilia. However, there is strong evidence that chelonians, at least, are able to socially learn, and that it can profoundly impact their behaviour. It is therefore essential to investigate these abilities in at least one of the key species in question.

Future Plans

One possible solution to this lack of knowledge is to solicit help from conservation programs on the species list, particularly sea turtles, to conduct some basic social learning experiments that would allow us to assess these key abilities.

- Gaze following
- Stimulus and local enhancement
- Accessing complex food puzzle; train an animal to learn a novel food location/colour and see how it spreads (if at all)

The aim would be to use a citizen science approach where we provide protocols to interns/students that can be applied to species in question. These experiments would be useful in providing some answers to questions outlined in Brake *et al.* 2021. We are in the process of contacting relevant agencies.

We also believe that it would be valuable to have a crocodilian expert in this working group and suggest Stephan Reber who is currently running a series of experiment investigating cognition (including social cognition) in alligators.

References

Davis, K. M., & Burghardt, G. M. (2011). Turtles (Pseudemys nelsoni) learn about visual cues indicating food from experienced turtles. *Journal of Comparative Psychology, 125*(4), 404.

Ferrara, C. R., Vogt, R. C., & Sousa-Lima, R. S. (2013). Turtle vocalizations as the first evidence of posthatching parental care in chelonians. *Journal of Comparative Psychology*, *127*(1), 24.

Ferrara, C. R., Vogt, R. C., Sousa-Lima, R. S., Tardio, B. M., & Bernardes, V. C. D. (2014). Sound communication and social behavior in an Amazonian river turtle (Podocnemis expansa). *Herpetologica*, *70*(2), 149-156.

Reber, S. A. (2020) Crocodilians Are Promising Intermediate Model Organisms for Comparative Perception Research. *Comparative Cognition & Behavior Reviews*, 15.

Wilkinson, A., & Huber, L. (2012). Cold-blooded cognition: reptilian cognitive abilities. *The Oxford Handbook of Comparative Evolutionary Psychology. Oxford University Press, New Jersey*, 129-143.

Wilkinson, A., Kuenstner, K., Mueller, J., & Huber, L. (2010). Social learning in a non-social reptile (*Geochelone carbonaria*). *Biology Letters*, rsbl20100092.

Wilkinson, A., Mandl, I., Bugnyar, T., & Huber, L. (2010). Gaze following in the red-footed tortoise (*Geochelone carbonaria*). *Animal cognition*, *13*(5), 765-769.