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UNDERWATER INTELLIGENCE

By Amanda Dale

The octopus is an enigma to many, an eight-legged creature who lurks at the bottom of the deep. It inspires fear and wonder, but few people realise just how intelligent it is. Ollie, Inkjet, Calypso, Ziggy, Octavian and Gumby are now helping to prove the brainpower of their species by taking part in a remarkable experiment at the Bermuda Institute of Ocean Sciences. Dr. James Wood is working on a unique research project to see how fast these common octopus solve puzzles and reveal their food preferences.

Dr. Wood, from Florida, arrived at BIOS in 2003 after studying for a PhD at Dalhousie University in Canada and a post-doctorate at the University of Texas Medical Branch. He is one of 400 experts on cephalopods (octopus, squid, nautilus and cuttlefish) around the world, and studied the deep sea octopus for his doctorate.

There have been experiments in the past to discover the degree of an octopus's intelligence, but Dr. Wood is taking studies on prey (food) preferences a step further.

Whereas researchers at Seattle Aquarium



Inkjet attempts to show how adept he is at problem solving. Photo By Akil Simmons: July 17, 2007



Scientist Dr. James Wood is attempting to find out whether an octopus's food preferences change the harder it is for it to reach its prey. July 17, 2007. Photo By Akil Simmons.



Inkjet attempts to show how adept he is at problem solving. Photo By Akil Simmons: July 17, 2007

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recently used clams to try to discover the limits to which an octopus would go to find sustenance, Dr. Wood is using different foods sealed in artificial containers.

His research involves placing different kinds of food in four Kinder Eggs. One of the plastic containers is black, the other three are yellow — one of which has black stripes, another polka dots, and another is plain.

Each egg also has a different texture — one has a rough surface from sand sprinkled on clear paint; another is sand-papered smooth; and one has grooves cut from a razor blade.

Each container always has the same type of food placed in it. Ollie, Inkjet, Calypso, Ziggy, Octavian and Gumby will be given a choice of shrimp, mussels, and even sushi-quality tuna (only the best at BIOS).

Dr. Wood also places an equal weight into each egg, consisting of two marbles and eight wooden beads. Once the octopus realises the beads are inedible, they float to the surface.

“We’re putting an exact weight into all these containers so the effort to open them and the weight is the same,” said Dr. Wood. “It’s a controlled experiment.”

The process results in each octopus being “trained” to choose a



Scientist Dr. James Wood is attempting to find out whether an octopus's food preferences change the harder it is for it to reach its prey. July 17, 2007.

Photo By Akil Simmons.



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Scientist Dr. James Wood is attempting to find out whether an octopus's food preferences change the harder it is for it to reach its prey. July 17, 2007.

Photo By Akil Simmons.

container based on food preference. They open the Kinder Eggs using the suckers on their arms.

Each octopus was brought to the lab at Ferry Reach from the waters around Bermuda and Ollie, Inkjet, Calypso, Ziggy, Octavian and Gumby will be put back in exactly the same place they were found — unharmed — at the end of the experiment.

Dr. Wood said: "We're in the training stage now, training them to open the containers. It's fun work, it's learning. It's seeing how fast they learn different puzzles and solve problems. But in the long term I want to see their preferences for food. I want to know if their preference changes the easier they find it to get to the food.

"For example, do they prefer fish over shrimp? If they know food is in a container which is harder to open, will they go to the effort of opening it just to get the food they like, or will they just go for the easier option?

"In nature, when they're hunting for prey, they are exposed to other predators, so there's likely to be a lot of pressure on them to hunt for easier food. We will see whether they are making that switch to an easier, but less preferred, food."

Dr. Wood said: "Octopuses are really interesting animals. They have many fascinating behaviours you don't really associate with invertebrates. They're active, they change colour and shape, and they get into and out of things with incredible ease. They learn to do discrimination tests and open boxes."

The 35-year-old scientist admitted he was getting attached to his eight-legged assistants, and said each octopus had its own personality. "Inkjet and Ollie are highly outgoing and they adapted quickly to life here in the lab," he said.

Ollie has now passed his training and is at the experiment stage where he will be given more food 'choices'.

"They learn quickly," said Dr. Wood. "They come up with different kinds of solutions to problems that we wouldn't even think about."

Illustrating how inventive an octopus is at problem solving, Dr. Wood explained that if Ollie was presented with a bottle and cork stopper, as well as just pulling the cork off, he would also get to the food at times by reaching in with one arm, tearing the food into pieces, and then pull out morsels through a tiny hole in the cork.

As we are talking, Ollie crawls up the side of his tank and waves one of his arms at me, as if to say 'hello'. It is more likely however, that he is looking for lunch as he has spotted Dr. Wood, who is holding a plastic cup.

"When I'm around, they come out of their lairs and are ready to be fed. They train very quickly," said Dr. Wood.

"Octopuses have a brain-to-body mass ratio that is higher than fish and reptiles, who are vertebrates, so that's pretty amazing for an invertebrate. They have a different intelligence to us and the number of nerves they have in their body means they have a distributive network similar to the Internet, with lots of different

nodes.

"If they lose their arm it can crawl away and act as a decoy while they get away from a predator. The arm then recuperates. They have a very different nerve system to us."

He said: "In the wild, octopuses are exposed to predators such as whales, dolphins, seals, fish and marine birds. These animals are highly evolved to protect themselves. They have camouflage and an ink jet, and they live in lairs, but when they're out in the open and hunting they are exposed, so if they switch to easier prey this is probably to limit the time of exposure.

"Predation (the risk of being eaten) seems to drive the evolution of these animals. My long term goal with this research is to do food discrimination, to see if there's a switch to easier prey if they have to make a harder effort to get at the food they prefer."

The BIOS scientist is being helped in his research by two summer interns. Dawn Formica, 21, is from Eckerd College in Florida and studies marine biology. Matthew Viney, 18, is from St. David's and is to study science at Bermuda College.

He said: "It's awesome, they're very intelligent. I've seen a lot of animals but it is so impressive to see them learning like this."

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