Parrots do tricks without looking

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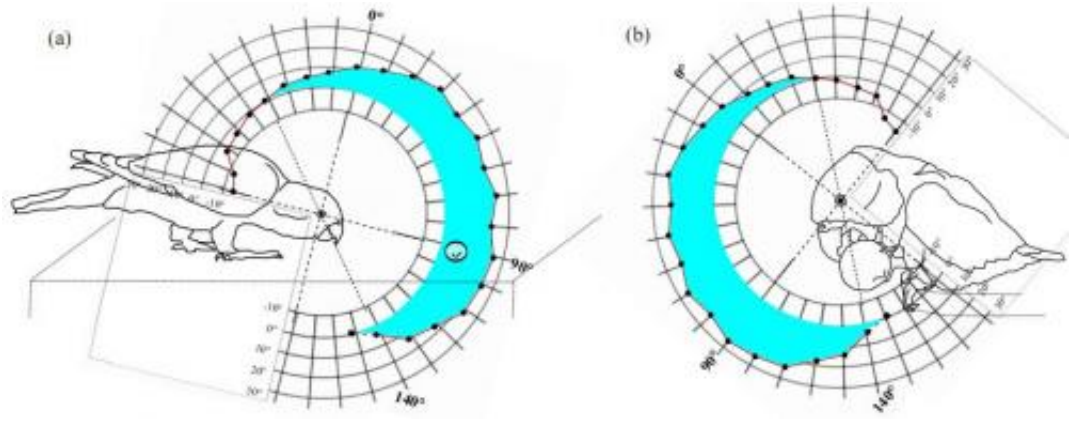

Diagrammatic representation of how the psittacine binocular field is orientated during exploration in (a) an approach to an object and (b) manipulation of an object. In both, the binocular field width is plotted as a function of elevation in the median-sagittal plane. The last point at 150° elevation was extrapolated. Note that where the binocular field (shaded in blue) ends, the blind areas below and behind the head begin. This illustrates that (a) a parrot is likely to approach a target object with its head pitched downwards, so that the object is near the point of maximum binocular width (at 90° elevation) within the bird's field of view, which is thought to be near the point of highest visual acuity. However, once the object is actually grasped (b), tactile exploration, using the bill tip organ and ygodactyl feet, is likely to dominate visual exploration, as the parrot can only see just below its bill tip. Also the unique shape of the bill obstructs seeing the detail of anything held within the bill. Image: *Proceedings of the Royal Society B,* doi: 10.1098/rspb.2011.0374

(PhysOrg.com) -- Ornithologists at the University of Birmingham have discovered that parrots cannot see what they are doing when they carry

out the tricky manipulations of objects, for which they are renowned. While parrots have a good field of vision in front, above and behind their head, they cannot see below their bill into the region where all the manipulation occurs. The research is published today in the journal *Proceedings of the Royal Society B*.

The researchers have been studying Senegal Parrots, which are popular cage birds but come originally from West Africa, where they inhabit woodland and savannah. They live on a diet of seeds, nuts, blossoms and fruit, and are known for their exploratory, playful behaviour and manipulative abilities.

The Birmingham Scientists have discovered that the parrots' visual field is unlike those of any other bird species. It has a broad frontal binocular field and a near comprehensive view around the head. The scientists suggest that tactile cues that parrots receive from their unique bill-tip organ have led to the absence of visual coverage of the region below the bill. Parrots simply feel what they are doing with an object using a special touch sensitive bill-tip organ, but they cannot see what they are doing. The eyes are placed high in the skull to give an extensive field of view in front, above and behind the head, which is very useful for seeing predators or checking out what other parrots are up to nearby.

Because of their dexterity with their feet and legs parrots can if they wish bring food and other items up into their field of vision for close inspection before exploring them with the bill.

Zoe Demery, from the University's School of Biosciences, says, 'It has always been argued that foraging method is the prime determinant of a bird's visual field configuration, but here we show that an investigative, playful nature can also affect how a bird's visual field evolves. We were very keen to study the Senegal parrot as parrots are so unique in terms of their anatomy, foraging technique and intelligence.

Dr Jackie Chappell, who was a co-author on the study adds, 'Parrot fields of vision have never been investigated before. This research suggests that their vision has developed in this way because they are able to do so many things with their bill using touch that they don't need to be able to see what they are holding. At the same time, with this expansive field of vision they can be vigilant against predators.'

Graham Martin, Professor of Avian Sensory Science, who also took part in the study, says, 'We have never seen a visual field configuration like this in any other bird, and we have now looked at over 50 different species. It has always been known that parrots have many special features. We now know that their vision also makes parrots special.'

More information: This research is published in the journal *Proceedings of the Royal Society B,* entitled 'Vision, touch and object manipulation in Senegal parrots Poicephalus senegalus'. doi: 10.1098/rspb.2011.0374

Abstract
Parrots are exceptional among birds for their high levels of exploratory behaviour and manipulatory abilities. It has been argued that foraging method is the prime determinant of a bird's visual field configuration. However, here we argue that the topography of visual fields in parrots is related to their playful dexterity, unique anatomy and particularly the tactile information that is gained through their bill tip organ during object manipulation. We measured the visual fields of Senegal parrots Poicephalus senegalus using the ophthalmoscopic reflex technique and also report some preliminary observations on the bill tip organ in this species. We found that the visual fields of Senegal parrots are unlike those described hitherto in any other bird species, with both a relatively broad frontal binocular field and a near comprehensive field of view around the head. The behavioural implications are discussed and we consider how extractive foraging and object exploration, mediated in

part by tactile cues from the bill, has led to the absence of visual coverage of the region below the bill in favour of more comprehensive visual coverage above the head.

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