

INSIDE JEB

Baby bats get to grips with echolocation before taking to the wing



A 16-day-old big brown bat (*Eptesicus fuscus*) pup. Photo credit: M. Brock Fenton.

It's generally wise to learn how to walk before trying to run. YouTube is awash with the first tottering steps of creatures ranging from pandas and giraffes to polar bears and elephants. But bat pups face a different challenge. It would seem to make sense for baby bats to get to grips with the finer details of echolocation before taking their first tentative flaps and, most essentially, that they hone the specialised series of cries that guide them in for landing. 'There has been lots of previous work looking at how flight and echolocation develop individually in juvenile bats, but understanding how both traits develop with respect to one another hasn't really been examined', says Heather Mayberry from the University of Toronto, Mississauga, Canada. Having explored how pups transition from producing the calls that they use to stay in touch with mum to adult-like echolocation calls during her Master's degree with Paul Faure at McMaster University, Canada, Mayberry decided to integrate her interest in bat development with how they coordinate echolocation and flight when she joined John Ratcliffe

in Mississauga. This time, she focused on finding out how fledgling bats develop their acoustic guidance system before taking to the wing.

'Working with baby bats is rewarding', says Mayberry, who recalls gently separating newborn pups from their mothers to record their earliest attempts at echolocation as they made their first attempts at flight. 'I held the baby bats and let them move themselves off my hand over a foam landing pad', says Mayberry. Over the course of the next month, Mayberry recorded their developing calls as the pups became more independent, until they were fully grown at the age of 32 days. Initially, the tiny youngsters simply flopped off Mayberry's hand onto the soft sponge beneath, making no attempt to flap their wings. However, around the age of 5–6 days, the pups began attempting to flap, albeit unsuccessfully, until they reached 16–17 days, when the youngsters' efforts became more successful, and they managed to propel themselves forward as they fell, before taking full control of their

wings around the age of 24 days. But how did their voices develop over that time?

Analysing the high-pitched cries that the youngsters made as they fell and searching for clusters of calls known as sonar strobe groups – which indicate that the bat is alert – Mayberry was intrigued when she realised that some of the tumbling pups were able to string calls together around the age of 6 days. And when she analysed the pups' cries for evidence of the distinctive buzz that guides the adults in to land, the youngsters were producing them at around 17 days. 'We were surprised that pups were able to produce adult-like call groupings and landing buzzes so early in their development', says Mayberry. However, the youngsters weren't timing their landing buzzes well, with several producing the distinctive cries even before Mayberry had released them from her hand; they still needed to learn how to coordinate the cries with flight to effect an effortless touchdown. And when Mayberry compared the pups' physical development with the age at which they mastered flight, it was apparent that the youngsters whose wings had grown faster than their bodies – to reach the body weight to wing area ratio of adults – took to their wings first.

So, bat pups start getting to grips with echolocation long before they have need of their acoustic guidance systems, and Mayberry now hopes to find out how the pups learn to coordinate their breathing with their echolocation calls as they develop into adults.

10.1242/jeb.215822

Mayberry, H. W., Faure, P. A. and Ratcliffe, J. M. (2019). Sonar strobe groups and buzzes are produced before powered flight is achieved in the juvenile big brown bat, *Eptesicus fuscus*. **222**, jeb209163. doi:10.1242/jeb.209163

Kathryn Knight
kathryn.knight@biologists.com