Evolution's parent trap

Science

Pete Wilton | 28 Jul 10

In mammals, many birds, and some invertebrates young offspring are totally dependent on their parents for food and protection.

But why is such helplessness a good strategy? And how has evolution resulted in 'lazy' youngsters trying to out-beg their siblings for a feed?

New research led by Andy Gardner of Oxford University's Department of Zoology, published in Proceedings of the Royal Society B, uses mathematical models to examine how some of these traits are related. I asked Andy about the costs and benefits of intensive parenting:

OxSciBlog: What are the advantages of having young that are more dependent on their parents for food/care?

Andy Gardner: In the animal world, the most basic form of parental care is when the parent guards their offspring from predators while the young forage for their own food. This can evolve as a simple extension of egg guarding, for example.

However, innovations in parental care that lead to parents actually feeding their own offspring can be favoured, because this allows parents to make their nests in safer - but food-scarce - environments.

An extreme example is when birds nest in trees. The safety of the canopy means that parents can leave the

nest in search of food, without needing to guard their young. But, apart from the odd insect hovering around the nest, there isn't much scope for the offspring to feed for themselves - which makes them fully dependent upon their parents for survival.

OSB: How might ecological conditions drive species to have more dependent young?
AG: Whether the initial innovation of parental feeding is favoured depends upon a number of factors, for example the relative efficiency of parents feeding their offspring versus offspring feeding themselves. If food items are difficult for the young to process - they may not have very strong jaws - then it may be more efficient for parents to chew up the food for them.

OSB: What links have you found between this dependency and traits such as nest choice/sibling competition?
AG: The parents' choice of nest site can play a huge role in deciding how dependent the young will be on their parents for survival. Obviously, if the nest is situated far from sources of food, this leaves the young totally dependent upon their parents.

But, more subtly, parental feeding can lead to offspring being even more helpless, as natural selection will favour those offspring that give up even trying to feed themselves and instead compete with their siblings for the food that their parents bring to the nest.

OSB: Why do we think evolution of dependency is 'one way' - with species unlikely to reverse to evolve more independent young?
AG: Sibling competition for parentally-derived food puts parents in a cruel bind. The more food they offer to their offspring, to supplement that which the offspring have foraged for themselves, the less interested the offspring are in their own foraging, and the more effort they put into begging their parents for food.

Parents are then forced to increase the amount of food they give to their offspring, just to make up for their offspring's laziness. This reinforcement between parental feeding and sibling competition means that, once parental feeding is established as the norm, it is difficult to return the species to its ancestral state - even if environmental conditions change to make parental feeding less efficient.

This just emphasises that evolution progresses for the good of individuals, in this case lazy offspring, and will not generally find the most efficient solutions for the family unit.

Dr Andy Gardner is a Royal Society Research Fellow based at Oxford University's Department of Zoology. The research was carried out by Dr Gardner and Per Smiseth of Edinburgh University.

Image: A chick begging for food. Photo: freeparking via Flickr.

Previous post