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mating moves

Meek male albatrosses don't get it

Albatrosses are renowned for their long-term monogamy. They are often portrayed as 'mating for life', although this typically means for the life of their partner, not having a single true love. When an albatross loses its mate, it almost always tries to breed again with a new partner. However, divorces do occur. They are fairly frequent in the smaller *Thalassarche* mollymawks and even occur occasionally in the *Diomedea* great albatrosses. Two recent papers investigate the causes and consequences of divorce among the well-studied Wandering Albatross population on Possession Island in the Crozet Archipelago, south-east of Africa.

In the first paper, Sun et al. (2022, *Ecological Monographs*, doi: 10.1002/ecm.1522) show how over the past 60 years, divorce has been more common among female than male Wandering Albatrosses. This is a consequence of the greater mortality of female Wandering Albatrosses on long-lines. Females usually forage farther north than males and thus overlap more often with long-liners, resulting in greater bycatch mortality. This leads to males being widowed more often than females and thus results in an excess of males in the population. The larger number of males provides females with more mating options, potentially giving them the opportunity to take advantage of this imbalance through strategic divorces.

However, there is little evidence of female choice in the process. If divorce is adaptive, we would expect females experiencing low breeding success with their current partner to stray. Yet the opposite was found – females that divorced tended to have higher than average breeding success prior to the divorce. Also, there is no change in breeding success after divorce and female survival tends to decrease following a partner swap, so females do not benefit from a change of mate. As expected, divorce is more likely among newly established pairs; once a pair gets into a groove, they are less likely to switch partners. However, there is a tendency for older males to be more likely to divorce.

The study concluded that most divorces are non-adaptive and result from a new male displacing the existing partner. This is consistent with the seeming lack of benefit to females arising from extra-pair paternity. Some 10 to 20 per cent of Wandering Albatross chicks are fathered by a male other than the social father, but studies to date have not revealed any significant advantage to females in terms of improved breeding success or greater genetic diversity in their chicks. A previous study at Possession Island concluded that most, if not all, extra-pair copulations were forced, again resulting from the large numbers of unmated males in the population (Jouventin et al. 2007, *Ibis* 149: 67–78).

Competition among males for access to females explains why older, less vigorous males might be more easily displaced and thus suffer a higher divorce rate. But other factors might also play a role. Field biologists have long known that albatrosses vary in temperament; some parents are unperturbed when you check their egg or small chick, whereas others are nervous or aggressive. The second study (Sun et al. 2022, *Biology Letters*, doi: 10.1098/rsbl.2022.0301) explores the impact of bird personality on the likelihood of divorce.

Since 2008, researchers have used the responses of Wandering Albatrosses breeding at Possession Island to score the birds' 'personality'. Using these data, they show that timid males are much more likely to divorce than bold males. They conclude that aggressive males are able to displace more timid males and thus monopolise mating opportunities.

However, what is perhaps most interesting is how divorce appears to be more common among Wandering Albatrosses at Possession Island than at other long-term study sites of the species. A few years ago I searched the breeding histories of Wandering Albatrosses at Marion Island and struggled to find a single case of divorce, even though there is a similar excess of males and occasional forced extra-pair copulations have been observed. It is not clear why there might be this difference.

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above *A recent study suggests that old male Wandering Albatrosses are prone to being displaced from their long-term pair bonds by younger, more aggressive males.*

Into the black (and back)

owl origins

RICHARD DU TOIT

A 55-million-year-old fossil owl indicates that the first owls hunted by day and only subsequently became nocturnal.

Owls are one of the most distinctive groups of birds. Their toes and claws are adapted for killing and their largely nocturnal hunting habits have resulted in major modifications to their visual and auditory systems. To maximise their vision in low light levels, owls have evolved massive, forward-facing eyes that are fixed in their sockets. Owls' ears also are larger than those of other birds and in some species are asymmetrical to allow them to hunt in complete darkness. Linked to these adaptations, modifications to the neck vertebrae allow the head to rotate up to 270 degrees, which compensates for their fixed eyes and assists with locating the source of sounds.

Both these sets of adaptations result in distinctive skeletal features that make it fairly easy to identify owls from fossil remains. As a result, we know that owls were among the first carnivorous birds to evolve in the radiation of modern birds that followed the demise of the non-avian dinosaurs, with the earliest owl fossils dating back more than 60 million years. However, very few of these early fossils preserved any head bones. Now a fossil owl discovered in the UK's London Clay Formation from 55 million years ago provides new insights into the early evolution of owls (Mayr and Kitchener 2022, *Ibis* doi: 10.1111/ibi.13125).

The most interesting finding is that the bird, named *Ypresiglaux michaeldonaldsi*, shows the raptorial leg and foot structure of an owl, but lacks several of the characteristics typical of a nocturnal lifestyle. Its skull has a large supraorbital spur on the lachrymal bone, which protects the eyes of falcons and hawks that kill prey with their beaks. However, this feature has been greatly reduced or lost by modern owls because it is incompatible with their very large, forward-facing eyes. Similarly, the skull shows no sign of an enlarged auditory apparatus and the vertebrae are not modified to allow extra head rotation. In short, it appears as though the first owls were diurnal raptors.

Two hypotheses might explain their switch to a predominantly nocturnal hunting mode: to benefit from novel foraging opportunities or to avoid competition with other predators. The former supposes that owls started hunting at night to take advantage of the diversification of moths (nocturnal butterflies) some 40 million years ago, and/or murid rodents some 20 million years ago. But would a marked increase in nocturnal prey drive all owls to become nocturnal? To me, a more plausible explanation is that they were pushed to forage at night by the evolution of other diurnal raptors. We know that hawks and falcons evolved after owls and their appearance might be responsible for the owls' switch to hunting at night.

Of course, not all modern owls are exclusively nocturnal. A few species are active during the day, such as the Northern Hawk-Owl and Short-eared Owl, as are several *Athene* and *Glaucidium* owls. Because these species share the structural adaptations for nocturnality with other owls, they are assumed to be secondarily diurnal. Another fossil discovery sheds some light on this evolutionary reversal.

Li et al. (2022, *PNAS*, doi: 10.1073/pnas.2119217119) describe an exquisitely preserved, fairly small (30-centimetre) fossil owl *Miosurnia diurna* from the Liushu Formation in Gansu Province, China, that lived between six and nine million years ago. The owl's eye structure is typical of a diurnal bird, suggesting it hunted by day. The fossil even contains evidence of its last meal – a small vertebrate – and the authors surmise that the owl fed on rodents in the arid steppe habitat that characterised the area at this time. It shared this niche with a large kestrel, *Falco hezhengensis*, a fossil of which has been found to contain the jaw of a jerboa (see Li et al. 2014, *Auk*, doi: 10.1642/AUK-13-245.1). They conclude that diurnal activity in owls may have evolved when the climate became cooler and dryer, creating open grasslands with large numbers of diurnal rodents.

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