Asynchronous Hatching, Fratricide and Double Clutches in the Marsh Harrier*

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A brood of four nestling Marsh Harriers *Circus aeruginosus* hatched over approximately seven days. When the three older nestlings were banded, the fourth and youngest was one quarter of the weight of the next older nestling. The youngest nestling was killed and eaten by its siblings during a period of food shortage. One female and one male nestling fledged when 46 and 43 days old respectively. Evidence for double clutching in Swamp Harriers is critically reviewed.

Many raptors lay their eggs at intervals of two or more days and begin incubation before completion of the clutch (Newton 1979). This results in asynchronous hatching and thus the youngest nestling may be greatly disadvantaged when competing with its siblings for food. Newton described aggression between nestmates of large raptors as common, usually resulting in the death of the smallest nestling, while in medium-sized raptors, such as the Marsh Harrier *Circus aeruginosus,* aggression only occurs at times of obvious food shortage. In small species, serious aggression among nestmates does not occur. However, if the nestlings of small species such as the Hen Harrier *C. cyaneus* die they may be fed to their siblings by the female parent (Balfour 1957, Breckenridge 1935). Weis (1923) regarded fratricide among European Marsh Harriers as common.

Nest History

In late 1979 I undertook regular observations of a Marsh Harrier nest built in Common Reeds *Phragmites australis* near the Werribee River, Victoria (37°57'S., 144°40'E.). Observations were made from a hide placed under a row of Pines *Pinus radiata* about 50 m from the nest site on a high bank which allowed a clear view into the nest.

Four eggs were laid in mid-October 1979 and I saw the first two young that hatched in the nest on 14 November. Approximately three and five days later the third and fourth nestlings hatched. When I banded* the three older nestlings on 29 November, the weights of the four siblings in order of decreasing age were: 660, 410, 380 and 95 g.

During four hours of observation on the morning of 4 December I saw the male call the female from the nest only once, at which time he transferred a small bird to her via an aerial pass. During similar periods of observation on seven mornings prior to this time the male brought in larger prey, including six immature Rabbits *Oryctolagus cuniculus,* an Eurasian Coot *Fulica atra* and four unidentified nestling birds. The nestlings were all robbed from the same nest in tall reeds and they were brought in one after the other. These prey provided sufficient food for all of the harriers' nestlings, although the older ones always snatched more than the youngest. On 4 December the female returned to the nest with the small bird, but this time only the two older and the youngest nestlings succeeded in obtaining some of the food that she tore up.

* The author follows Amadon (1978) and Baker-Gabb (1979) who recognised the representative of the Marsh Harrier complex in Australia as being the Swamp Harrier, *Circus approximans,* which is one of the five component species of a Marsh Harrier superspecies.

* Bands used were provided by the Australian Bird-banding Scheme, Division of Wildlife Research, CSIRO.

After feeding the nestlings, the female left and began hunting. She returned without food twice in the next 70 minutes and soared over the nest site for a brief period. When the male's hunting had previously been more successful, the female had remained perched or soared within 200 m of the nest throughout the morning. It is, however, common practice for female raptors to commence hunting during the second half of the nestling period (Newton 1979).

Two hours after his first prey delivery, the male again flew over the nest with a small prey item, but he did not land at the nest and leave the prey as he had done on previous occasions. The female was absent at the time of his return. The nestlings became restless when he departed and shortly afterwards one of the older nestlings began making vigourous pecking motions at an object that was obscured from my view. After about 30 minutes I decided to investigate and found the third oldest nestling had torn most of the flesh from the head of the youngest which was still alive and cheeping plaintively. I culled the seriously wounded nestling and left its 300 g body and that of a laboratory rat in the nest. The latter was left to counter any possible food deprivation of the remaining nestlings caused by my unscheduled visit to the nest of these nest-shy birds (Sharland 1932, Stead 1932, and Soper 1958). When I returned the following day, the rat and three-quarters of the youngest nestling had been consumed. I presume they had been fed to the nestlings by the female.

From 11 December, the last half of the nestling period, the nestlings were seen to clamber out of the nest to individual shady retreats in the surrounding reeds. They returned individually to the nest to be fed. Usually there was one nestling being fed on the nest and another perched in the reeds around the rim of the nest waiting its turn. Sometimes nestlings are fed at their individual retreats (Soper 1958).

After an overnight storm on 13 December the second oldest nestling was found dead over the side of the nest. On 24 December the oldest nestling, a female, weighed 920 g and her younger brother, 700 g. These birds both fledged on 29 December which gave nestling periods of approximately 46 and 43 days respectively.

Double Clutches

It seems that size differences between asynchronously hatched young caused Le Souëf (1903) to state that Marsh Harriers occasionally lay double clutches and rear two broods. I do not believe there is sound evidence for this although Marsh Harriers sometimes replace a predated or deserted clutch early in the breeding season (Soper 1958).

At the two nest sites described by Le Souëf (1903), there were six and four eggs laid which are within the range of clutch sizes of the species (Oliver 1955, Brown and Amadon 1968, Baker-Gabb 1981). Only the nest with six eggs was visited twice by Le Souëf and he described it in detail. One of three fresh eggs was taken from this nest on his first visit in October. When he returned in December, he found that a further three eggs had been laid. Of the first two eggs left in the nest, one had hatched while two of the three eggs laid between visits had also hatched. If a period of two to three days elapsed between the laying of each egg in a single clutch, then the first hatched nestling would have been between two and 12 days older than the next nestling, depending on which eggs hatched. From an examination of the photograph that accompanied the description and my own photographic records of known-age Marsh Harrier nestlings, I estimate that the nestlings Le Souëf (1903) photographed were about three, five and 12 days old. The oldest nestling was almost certainly not a month old as Le Souëf believed and which led him to state that a second clutch must have been laid.

Discussion

It has been suggested that the advantage of asynchronous hatching in raptors is that in times of food shortage the youngest of the brood quickly starves or is killed. This reduces the number of nestlings the parents must feed and also provides a meal for the older nestmates (Lack 1954, 1966). Furthermore, Hahn (1981) demonstrated that for Laughing Gulls *Larus atricilla* there were significantly more young fledged from asynchronously hatched broods than from broods that were manipulated to hatch synchronously. He suggested that staggered hatching is a parental strategy to

reduce broods when food is in short supply. It also reduces sibling competition for parental investment and minimises wasteful competition. Such a mechanism also seems to pertain to Tawny Owls *Strix aluco* (Southern 1970), Goshawks *Accipiter gentilis* (Schnell 1958), and Hen Harriers (Watson 1977). However, Brown *et al.* (1977) stated that their data on African eagles did not support Lack's (1966) hypothesis and the reason why fratricide, and cainism in particular, occurs in raptors remained a mystery. The fratricidal behaviour termed cainism occurs mainly in the nestlings of large eagles that lay on average two eggs (Brown and Amadon 1968). It involves the older nestling killing its younger sibling shortly after it hatches, even during years of abundant food. Stinson (1980) argued that, for eagle species in which cainism is common, the second egg or nestling acts as an insurance against total nesting failure caused either by infertility in the first egg or by early death of the older nestling.

Although food shortage appeared to be the ultimate factor precipitating the fratricide I observed, proximate factors such as the size and delivery rate of prey items to the nestlings may also have been involved. Only when there was a change from regular delivery of large prey items such as immature Rabbits to smaller ones like single small birds was any serious aggression observed. There did not appear to be any marked increase in the rate of delivery of prey items at this time. Although there was a similar number of food items, because they were smaller, the total food provision would have been reduced. It is noteworthy that Schipper (1973) found that no young were fledged from the nests of Marsh Harriers that fed their nestlings with small prey such as insects. Furthermore, Baker-Gabb (1978) recorded, from a study of five nests, that those Marsh Harrier pairs that provided a greater number of large (> 200 g) food items to their nestlings fledged more young. The sample size was too low for statistical comparisons.

The habit of nestling harrier *Circus* spp. of clambering out of the nest to individual retreats during the second half of the nestling period provides them with shade, shelter and concealment from predators (Watson 1977) and aids in nest sanitation (Balfour and Macdonald 1970). Weis (1923) and Meyburg (1974) suggested that prior to this period, a brooding female raptor may be able to prevent fratricide. However, once she begins hunting to help the male cater for the growing demands of the brood during the second half of the nestling period, she is no longer in a position to do this. Therefore, nestling harriers' habit of retiring to individual retreats could also serve to reduce agonistic behaviour between siblings, the number of serious injuries, and fratricide when the female was away hunting. This occurs at a time when younger siblings would probably have already been culled if they were going to be, and considerable parental investment would have been expended on the remaining nestlings.

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