

Mass killing by rats of roosting common noddies

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On a visit to Ile du Lys, Iles Glorieuses, one of the authors witnessed a massive night attack by rats on roosting common noddies. Although introduced rats are known predators of nesting seabirds, there were no previous records of them killing large numbers of non-breeding seabirds. The authors discuss the circumstances of the case and attempt to explain the phenomenon.

Information on the biological impact of introduced rats on birds has been summarized by Moors and Atkinson (1984) for seabirds and by Atkinson (1985) for island birds. These reviews reveal that much circumstantial, but very limited direct evidence points to three rat species (the Polynesian rat *Rattus exulans*, the Norway or brown rat *R. norvegicus*, and the ship rat *R. rattus*) as being important predators of many breeding seabird species, their eggs and their



View from Ile du Lys looking south-west (Rudy van der Elst).

dependent offspring. Here we report an observed case of massive depredation by rats on *non-breeding* seabirds.

Observations were made by R. van der Elst over a 15-hour period in 1985 on Ile du Lys, a 600-m long, low-lying island of coral limestone and sand, which forms part of the Iles Glorieuses (11°29' S, 47°23' E) in the western Indian Ocean. The island was sparsely covered with low scrub and herbaceous vegetation, but with denser vegetation in its southern part where numerous low trees of *Tournefortia argentea* grew. Further information on its geomorphology and vegetation may be found in Battistini and Cremers (1972), who also provide a map and habitat photographs from a visit in 1971. Ile du Lys lacked any resident human population in 1985, whereas the main island of the group, Grande Glorieuse, about 10 km distant across shallow coral and sand flats, supported a small contingent of French meteorological and military personnel.

Results

Upon arrival on Ile du Lys at about 18.00 hours on 18 May 1985, the fauna of the island was seen to be overwhelmingly dominated by rats *Rattus* sp., many of which were criss-crossing the terrain in broad daylight. There must have been many thousands in total, with numerous closely spaced burrows covering those parts of the island suitable for their construction. The amount of other animal life observed was limited. Crabs were plentiful, especially coenobitids and intertidal grapsids. The land crab *Cardisoma camifex* was common in the central swampy area of the island, but the coconut crab *Birgus latro*, formerly present (Stoddart, 1967), was apparently absent.



Common noddie with nest (Rudy van der Elst).



Nesting noddies on western limestone (Rudy van der Elst).

There were signs of considerable nesting activity by green turtles *Chelonia midas* on the few sandy beaches available. The only birds present were common noddies *Anous stolidus*. Approximately 30 individuals were settled on raised limestone rocks along the north-western side of the island, an area depicted on Plate 9 of Battistini and Cremers (1972). At least five active nests were present, some with eggs and others with chicks. The birds appeared unperturbed by the rats that were milling about within a metre of them and their nests. Sooty terns *Sterna fuscata*, the only other seabird recorded this century as breeding on Ile du Lys (Benson *et al.*, 1975), were absent.

Some time after dusk, when it was already dark on a night with a new moon, the otherwise rather silent island became increasingly noisy as flock after flock of common noddies flew in from a north-westerly direction to roost in the *Tournefortia* trees in the south. Although no more than 5 m high, these trees had large dome-shaped canopies that afforded ample roosting sites. Although impossible to estimate with any precision, several thousand birds arrived. It soon became apparent that the birds were being disturbed as they continually took flight, only to resettle a minute or so later. By torchlight the branches of the trees could be seen to be packed with rats, each attempting to catch a noddie. A rat would simply walk to within reach of a bird and then suddenly rush in, usually biting it in the neck, following which both bird and rat frequently plummeted to the ground. On the sand below and between the trees there were frantic struggles, as rats attempted to subdue their prey before dragging it off to their burrows. The rodents were so engrossed in their feeding that they dragged

prey over the feet of anyone in the way. This frenzied foraging lasted for about four hours, ceasing soon after midnight. Quite suddenly, the persistently loud twittering of birds stopped and the island became silent, presumably because the rats were satiated. Between 50 and 100 common noddies had been observed to be attacked, and the total toll must have been considerably higher.

Although originally intending to camp overnight, the party left the island for the boat offshore at about 02.00 hours, 19 May, as a result of harassment by the rats, which attacked human limbs, freshly caught fish or any other edible item. On the following morning the roosting noddies departed at first light, apparently without further disturbance. A return ashore by the party between 05.30 and 09.00 hours again revealed 30 or so common noddies at their north-western breeding site. Remarkably, no nest had been robbed, all the eggs and chicks seen the previous day being accounted for. Elsewhere, bird remains beneath the trees were being scavenged by numerous coenobitids, and there were many further remnants of carcasses and feathers within and around burrows. The rats showed no evidence of aggression during daylight hours.

Discussion

The limited published information available on the biological history of the Iles Glorieuses, summarized by Stoddart (1967), Battistini and Cremers (1972) and Benson *et al.*, (1975), precludes definitive interpretation of this remarkable instance of rat depredation. However, a fortuitous series of published records from Ile du Lys over the six-month period from November 1970 to April 1971 provides a frame-work for a reasonable hypothesis. Rats, species unknown (Atkinson, 1985), were present on Ile du Lys by 1882 (Stoddart, 1967) but, from that date until our own observation, only one published account drew attention to their occurrence. This was at the end of January 1971 when R. Battistini (in Battistini and Cremers, 1972, p. 3) noted that, 'The island is inhabited by thousands of rats.....'. Three months prior to this, at the beginning of November 1970, C. Jouanin had found an enormous breeding colony of sooty terns on Ile du Lys, with all the chicks already hatched and

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well grown, indicating a probable commencement of laying around the beginning of September 1970. In addition, he found about 100 pairs of common noddies in two adjacent colonies containing both eggs and young at all stages of development (Benson *et al.*, 1975). Subsequently, in mid-December 1970, the only sooty terns found by L. Watson were an enormous number of dead chicks, possibly as many as 80,000, almost all of which were fully fledged and estimated to have been dead for more than one month (Benson *et al.*, 1975). The brief published account provides no evidence to suggest that rats had any role in these deaths, which were probably caused by failure of the birds' food supply, not infrequent among tropical colonial seabirds. At the end of January 1971, R. Battistini (in Battistini and Cremers, 1972, p.3) recorded that, 'There is now only a small colony of terns, preserved from the rats on mushroom rocks of *Halimeda* limestone at the western end of the island', and their Plate 9 indicates that these were common noddies, not sooty terns. Finally, in mid-April 1971, A. Barau could find no evidence of breeding by either tern species (Benson *et al.*, 1975).

Although Ile du Lys was still densely vegetated in 1906 (Nicoll, 1906), this plant cover had been largely destroyed before 1970. Possible reasons for this include the intervening presence of a herd of goats *Capra hircus* (Battistini and Cremers, 1972), destruction wrought by a failed attempt at establishing a coconut plantation (Benson *et al.*, 1975) and, conceivably, the effects of the rats themselves in destroying the vegetation and preventing its regeneration. By 1971, Battistini and Cremers (1972) could find only eight plant species present, and much of the island surface was bare. Together with an impoverished terrestrial fauna, this must have tended to depress severely the carrying capacity of Ile du Lys for rats. Periodic nesting by a large colony of sooty terns would radically increase this carrying capacity in the short term, even assuming that the rats restricted themselves to taking abandoned eggs and dead and dying chicks (*cf.* Feare, 1976). Catastrophic failure late in the breeding cycle, as observed by L. Watson, or earlier in the cycle if followed by re-laying (*cf.* Feare, 1976), would extend this period of food surplus to over four

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months. This, in turn, should permit each female rat present to rear two large litters, potentially comprising 10 or more young each (e.g. Smithers, 1983). The disappearance of this food source would subsequently severely depress the carrying capacity again, with accompanying acute food shortage. Finally, starvation would eliminate a large part of the population.

We suggest that our observation of depredation by rats on roosting common noddies occurred soon after the end of an extended period of food surplus resulting from a sooty tern breeding cycle. Incipient starvation of the rats would then tend to account both for their great diurnal activity and for their remarkable aggression in tackling difficult prey. In addition, whereas intense exploitation would in the short term doubtless rapidly eliminate or drive away the roosting birds present, its episodic and transient nature would permit longer-term recolonization by the common noddies.

We emphasize that this hypothesis is merely an attempt to explain, in the face of inadequate evidence, a seemingly unsustainable level of predation in an environment in which predator and prey have apparently co-occurred for at least a century. Certain points defy full explanation, notably the seemingly unaffected presence of nesting common noddies at a time when roosting individuals were being slaughtered in large numbers. The species of rat involved appeared, from its small size and arboreal agility, to be the ship rat, the more widespread species on Indian Ocean islands, but no specimens were collected to confirm this. However, only the Norway rat is known to be a large-scale predator on (breeding) terns the size of a common noddy (Feare, 1984; Moors and Atkinson, 1984). Adults of both common noddies and sooty terns weigh on average about 180 g (Cramp, 1985), a comparable weight to ship rats (100–200 g) but considerably less than Norway rats (250–400 g), again pointing to greater potential vulnerability to the latter (Moors and Atkinson, 1984).

In conclusion, the interactions of rats and seabirds on Ile du Lys are clearly worthy of much closer study; indeed, many relevant details may already exist, but hidden and unconsidered in the



Rat killed on beach at Ile du Lys
(Rudy van der Elst).

notebooks of naturalists who have briefly visited the Iles Glorieuses.

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