

Site 1 was in an area of sandy soil; Site 2 was in an area of firmly packed gravel. The numbers of surface nests and burrows in use at each site were counted during five visits in winter (June–August) and summer (February).

African Penguins nested on the surface at sandy Site 1 more frequently in winter (19 surface nests, 111 burrows) than in summer (3 surface nests, 60 burrows) ($\chi^2 = 4.08$, $df = 1$, $P < 0.05$). Season had no effect on the number of surface nests at Site 2 ($\chi^2 = 0.025$, $df = 1$, $P < 0.01$) (winter: 3 surface nests, 97 burrows; summer 3 surface nests, 85 burrows), which is not susceptible to burrow-flooding and collapse. In winter a significantly greater proportion of penguins nested on the surface at Site 1 (the sandy site), which was susceptible to burrow-flooding and collapse than at Site 2 ($\chi^2 = 8.81$, $P < 0.01$, $df = 1$). In summer there was no significant difference in the proportion of surface nesters between the two sites ($\chi^2 = 0.176$, $P > 0.05$, $df = 1$).

The results indicate that, for African Penguins, ambient temperature and insolation affect the proportion of the population that occupies surface nests. Sclaro (1984) found that Magellanic Penguins (*S. magellanicus*) show a tendency to nest in soils of high clay content compared to soils of low clay content. The results of this study confirm the tendency of penguins preferentially to burrow in suitable substrata and suggest that the quality of the burrowing substratum is important for spheniscid penguins.

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A case of polygyny in the Black-throated Blue Warbler.—Polygyny has been reported for only 12 of the some four dozen species of North American Parulinae (for a review, see Ford, Current Ornithol. 1:329–356, 1983). Here, we document the first reported case of polygyny in the Black-throated Blue Warbler (*Dendroica caerulescens*).

Observations were made in spring and summer 1986 in the northern hardwoods forest of the Hubbard Brook Experimental Forest, West Thornton, New Hampshire. The study area and habitat at this site have been described by Holmes and Sturges (*J. Anim. Ecol.* 44: 175–200, 1975). Adult Black-throated Blue Warblers were captured in mist nets and banded with U.S. Fish and Wildlife Service aluminum bands, and with unique combinations of colored plastic leg bands.

The polygynous male's first nest (A) was initiated on 13 or 14 May, 1986, with the female (F1) completing a four-egg clutch by 24 May. Three eggs hatched on 5 June, and three young fledged on 15 June (the fourth egg was infertile). The male fed nestlings regularly at nest A. During this period, the male displayed what appeared to be normal territorial behavior, engaging in frequent countersinging and territorial fights with males on three adjacent territories.

On 27 May, we observed the male following a nest-building female (F2) approximately 300 m from nest A (where F1 was incubating). The male exhibited behavior indicative of courtship, including "soft singing" (singing in a distinctly lower volume than regular song), close surveillance of the female as she foraged and gathered nesting materials, and frequent chases through the forest shrub layer. F2 completed a five-egg clutch in this nest (B) on 7 June. No other Black-throated Blue Warbler territories intersected the area between nests A and B, even though the habitat in this area was continuous and presumably suitable. Thus, the male was able to travel between the two nest sites without interference from other males.

The male spent a far greater proportion of time near nest A than in the vicinity of nest B. The close proximity of three neighboring males to nest A, and the lack of males near nest B, may have necessitated greater territorial vigilance by the male at nest A. During the laying and incubation phase at nest B the male made only sporadic visits there. These visits usually lasted no longer than 5 min and were characterized by bouts of intensive singing near the nest followed by long flights back towards nest A. Twice during the polygynous male's absences, we observed two other male Black-throated Blue Warblers in the vicinity of nest B (extraterritorial intrusions; Ford 1983). Both intruding males sang within 10 m of the nest and one banded male, known to have an active nest approximately 350 m away, was seen to chase F2 as she returned to her nest after foraging. The second male, which was unbanded and probably not mated, was not seen again.

Following fledging of young at nest A, the male continued to feed one color-banded fledgling while maintaining territory A. He continued to feed the fledgling until at least 7 July.

On 19 June, all five nestlings hatched in nest B. We observed attentiveness of both adults from a blind 12 m from the nest, for almost 27 h during the first eight days. Observations were made primarily during morning and early afternoon, with most sessions lasting 2.5–3.5 h (range = 1–6 h). F2 made 2.5 times more feeding trips than did the male (294 vs 115). In monogamous Black-throated Blue Warblers, feeding duties are shared approximately equally by the sexes (C. P. Black, Ph.D. diss., Dartmouth College, Hanover, New Hampshire, 1975; pers. obs.). Here, the disparity in parental care may have resulted from the male's preoccupation with the fledgling from nest A and with the continued maintenance of territory A.

On days 7–9 the young in nest B appeared extremely hungry. On at least six occasions, F2's attempts to settle on the nest to brood were obstructed by the vigorous gapes of the nestlings, which forced her to back away from the nest. After each unsuccessful brooding attempt, F2 departed the nest to continue foraging. Feather development was clearly retarded in these young relative to nestlings of identical age. On day 8, weights of these nestlings were considerably lower than those of similar-aged nestlings of monogamous pairs (K. E. Petit and R. T. Holmes, unpubl. data).

On day 9, we observed a red squirrel (*Tamiasciurus hudsonicus*) prey upon the nestlings in nest B. In most Black-throated Blue Warbler nests, nestlings fledge prematurely if disturbed after day 7. The fact that the nestlings could not escape the squirrel's attack indicates their retarded state of growth.

A second clutch (nest C) was initiated by F1 and the polygynous male on 29 June. Four eggs in this third nest hatched on 14 July and feeding duties appeared to be shared equally by the male and female. The four young in nest C fledged on 24 July. Thus, this male was presumably responsible for fertilizing 13 eggs, 12 of which hatched, and seven of which resulted in fledged young.

Of 20 Black-throated Blue Warbler pairs closely monitored at Hubbard Brook in 1986, this was the only case of polygyny we found. Monogamy is thought to occur in birds when parental care is needed to successfully raise the young (Lack, *Ecological Adaptations for Breeding in Birds*, Methuen, New York, New York, 1968). Our observations of the failure of nest B support this contention. Additional work is required to explain the proximate causes of this reproductive strategy.

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Two nests of the Azure-hooded Jay with notes on nest attendance.—The Azure-hooded Jay (*Cyanolyca cucullata*) inhabits humid montane forests and forest edges from south-central Mexico to western Panama (Carriker 1910, Miller et al. 1957, Slud 1964, A.O.U. 1983). In Costa Rica the species occurs mainly on the Caribbean slope of the central highlands, but it is also common at Monteverde, on the Pacific slope of the Cordillera de Tilaran (Slud 1964), where we discovered two active Azure-hooded Jay nests. This report is apparently the first published nesting record for the species.

We discovered the first nest on 14 April 1983 when one adult came to feed a small, naked nestling that was barely able to lift its head. The nest was 7 m high in a tree (*Saurauia veraguensis*; approximately 8 cm dbh) overhanging the bank of a dirt road that bisects the Monteverde Cloud Forest Reserve, Puntarenas Province, Costa Rica (1510 m elevation; Lower Montane Rain Forest life zone [Holdridge 1967]). On 2 and 3 May, we saw two adults bring katydids (Orthoptera: Tettigoniidae) to at least two nestlings, now with well-feathered heads. The young fledged between 3 and 7 May, and thus spent at least 20 days in the nest. On 7 May an adult visited the nest several times without food, and the young had left.

On 15 May, we found two adults and two fledglings calling near the nest, and KGM easily captured a fledgling by hand. The color pattern of the plumage was similar to the adults' except that the hood was duller blue and the back feathers were a duller, less shiny black. Both the bill and the body were noticeably smaller than those of the adults. The fledgling "squawked" repeatedly for 4 min while held, eliciting alarm calls from the other fledgling and the two adults.