

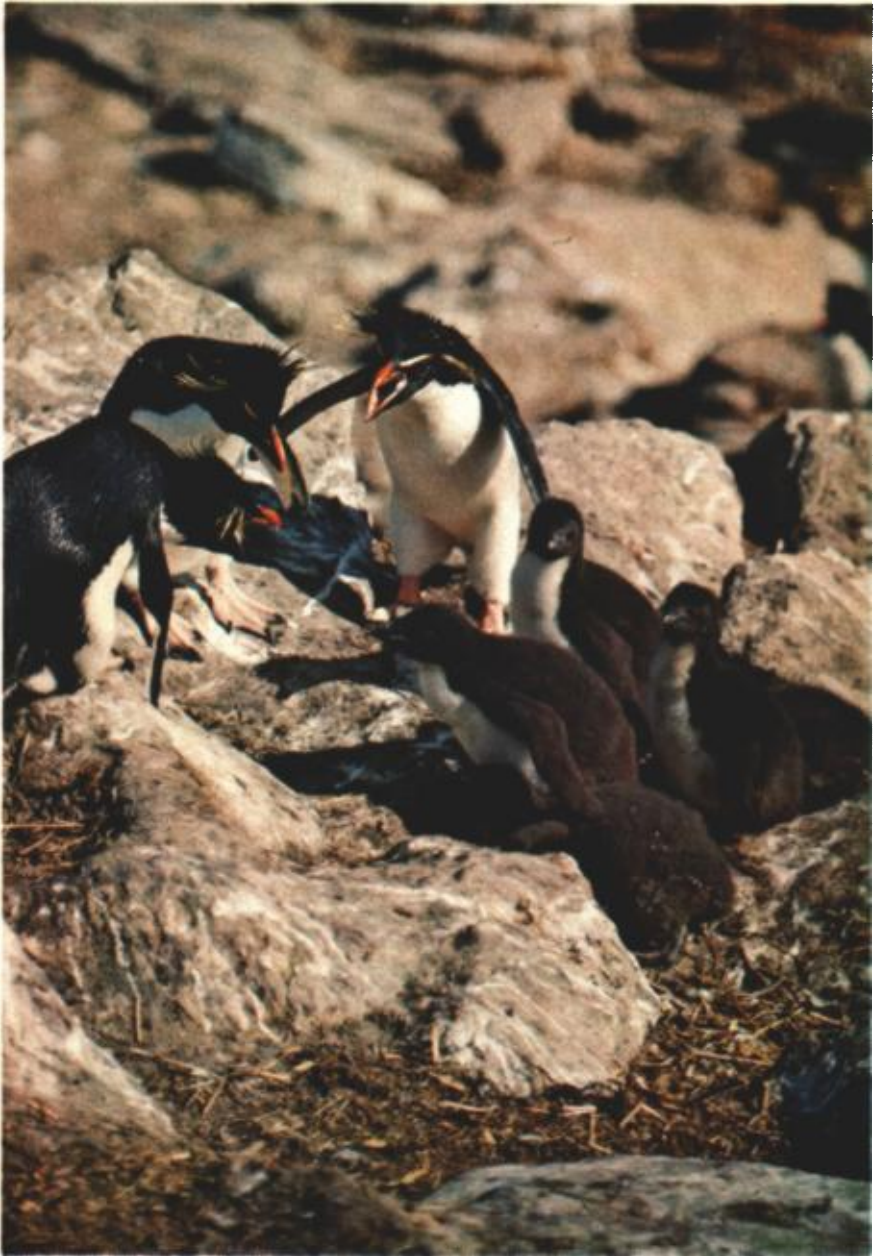
CRÈCHE BEHAVIOR AND INDIVIDUAL RECOGNITION IN A COLONY OF ROCKHOPPER PENGUINS

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CHICKS of several species of colonial-nesting penguins customarily leave their nests and huddle in groups. Earlier observers of this behavior concluded that the chicks were actually coaxed or driven into these formations by their parents, a few of which took up stations close by as "guards" or "nurses" to protect the groups from molestation. The groups were consequently called "nurseries" or "crèches." Along with the belief that the crèches were formed and guarded by the adults was the notion that individual parent-offspring attachments disappeared. Adults thereafter fed chicks communally regardless of family relationships, and the ability of parents to recognize their offspring as individuals, and *vice versa*, virtually ceased, if it had existed at all.

True crèche behavior has long been known to occur in four colonial-nesting penguins—the Emperor (*Aptenodytes forsteri*) and Adélie (*Pygoscelis adeliae*), which are strictly Antarctic in distribution, and the King (*Aptenodytes patagonica*) and Gentoos (*Pygoscelis papua*). But crèche behavior in these species is by no means uniform. All chicks in a colony of King Penguins may mass together in one crèche (Roberts, 1940:223–224), as do chicks in a colony of Emperors (Stonehouse, 1953:20). On the other hand, chicks in colonies of Gentoos and Adéliés have been reported by a number of observers to bunch up in more than one crèche per colony. According to Richdale (1951:270), a crèche of either species may contain approximately 20 to 30 individuals, although Sladen (1958:59) noted that a crèche of Adéliés may be comprised of 100 or more chicks.

Opinions vary with respect to parent-offspring attachments, once the chicks congregate in crèches. Most observers have contended that chicks are fed more or less communally. Levick (1914:96–97) states, for example, that the individual care of Adélie chicks by their parents is abandoned; the adults provide food for the particular crèches in which their young have gathered and "remain faithful" to these crèches "for the rest of the season." The so-called guards around the crèches were, he presumed, the parents of chicks in them. Like most other observers he considered it impossible for adults to recognize their chicks. Recently Sladen (1958:61), by marking both adults and chicks of Adélie Penguins, determined that Adélie adults continue to recognize and feed their own individual chicks at crèche age and that the supposed guards are actually "unsuccessful breeders" and "non-breeders." On the basis of what he has learned from marked birds, it would appear that the earlier observers have overlooked the prevalence of parent-offspring attachments and misinterpreted the status of the guards.



A CRÈCHE OF ROCKHOPPER PENGUINS

The chicks are about 24 days old. Three "guards" are in the immediate vicinity. Photographed at New Island in the Falkland Islands, January 22, 1954, by Olin Sewall Pettingill, Jr., and published with the permission of Walt Disney Productions.

In a visit to the Falkland Islands in 1915–16, Rollo H. Beck (quoted by Murphy, 1936:424) observed that chicks of the Rockhopper Penguin (*Eudyptes crestatus*), which has colonies in many isolated parts of the archipelago, leave their nests when about two-thirds grown and gather in bands of a dozen to 20 individuals. Richdale (1951:270–271) has suggested that Beck's findings may not indicate a true crèche formation, but a behavior comparable to that in the noncolonial Yellow-eyed Penguin (*Megadyptes antipodes*), a species which he has studied extensively by marked individuals. Richdale found that a dozen or so Yellow-eyed chicks may gather in a group along a path that leads from their nests to the sea. This is not a crèche, he believes, but merely a coming together of chicks out of a "penchant for company." An adult may be with them "for the same reason" although "it need not necessarily be a parent of one of the chicks."

THE ROCKHOPPER PENGUIN COLONY

When Mrs. Pettingill and I arrived in the Falklands in October, 1953, to film penguins and other wildlife for Walt Disney Productions, we hoped to follow up Beck's observations on the Rockhopper Penguin by marking a few adults and their young and then following their behavior from day to day. The opportunity came when we established our base for four and a half weeks (December 29, 1953 to January 30, 1954) on New Island and were within easy walking distance of a huge seabird colony that contained, by our rough estimation, 20,000 breeding pairs of the Rockhopper Penguin. At Kidney Island, where there was a smaller aggregation, we had a chance to make a few additional observations before and after our stay on New Island.

The New Island colony extended over the upper slopes of several rock-strewn bluffs, 200 to 300 feet above the sea. Because the bluffs were separated by intervening crags and crevices, the colony was discontinuous, being comprised of several sections, one to each bluff. Between the colony and the sea were perpendicular cliffs, cutting off access to the colony except through two steep ravines. The entire penguin population consequently climbed through these ravines on well-worn paths until, above the cliffs, it spread out on many paths to the different bluffs where the nests were located.

When we first visited the colony on December 29, about 80 per cent of the nests contained chicks of ages ranging from the day of hatching to about one week; 10 per cent contained chicks somewhat older; the remainder held eggs. All the nests were being attended by at least one adult. We noted that the ages of the chicks in any one section of the colony were usually the same, but that there was a considerable difference in ages among the sections. Apparently nesting in some sections of the colony had started earlier than in others.

Of the few nests with eggs, about 70 per cent held one egg only; the others held no more than two eggs. We occasionally noticed a nest with as many as two chicks, but we were never certain whether two chicks in a nest belonged to the same parents, or whether one chick had come from a neighboring nest, perhaps prompted by our having disturbed the *status quo*. Gwynn (1953:4) believed it a very rare occurrence for a pair of Rockhoppers to rear two chicks and observed no such instance himself.

Throughout the daylight hours at New Island adult Rockhopper Penguins moved up and down the paths between the sea and the colony, but toward evening there was a noticeable increase in the number of birds coming up to the colony. As each bird arrived at the nest, it was joined by its waiting mate in a mutually performed display, or "greeting ceremony," accompanied by raucous vocal sounds.

METHODS OF STUDY

We were easily able to identify the sexes of nesting Rockhoppers by the bill, which, as Murphy (1936:418) has pointed out, is longer, higher, and wider in the male. The difference in the over-all bill size was so evident that it was possible for us, after a little experience, to determine the sex of one bird without another bird of the opposite sex present for comparison.

On January 4 we selected for special study 10 nests that were near together on the edge of a section of the New Island colony farthest inland from the sea. We marked one nest X and the others 0 through 8. Nine of the nests contained one chick each; the other (Nest 3) held one egg. All the chicks were uniform in size and estimated by us to be six days old. Each chick was being brooded by a male; the egg in Nest 3 was being incubated by a female. We marked all the chicks and adult males present by painting on their backs large bright yellow marks corresponding to those given their nests, and the female with red. The paint we used was Testors Dope, a commercial product which dries quickly and holds fast for at least two weeks.

CHRONOLOGY OF OBSERVATIONS

In the period from January 5 through 15 we made 12 visits to the 10 selected nests in order to note the position of the chicks and parents with respect to their nests and to one another, and to make observations on activities and behavior. An abridged account of our observations, obtained after arriving at the nests, follows:

January 5, mid-morning: All chicks being brooded by the same correspondingly marked males. A female close to the male on Nest X. *Late afternoon* (about an hour before sundown): All chicks being brooded by same males. No female in evidence near Nest X, but Nests 2, 4, 7, and 8 each has a female standing beside it. These four birds were caught and their backs marked in red with the numbers of their nests.

January 7, late afternoon: All chicks being brooded by same males; no females present.

January 8, late afternoon: All chicks being brooded by same males. The only female present is Female 8 beside Nest 8. She has evidently just returned from the sea as she is very clean and glossy.

January 9, late afternoon: All chicks being brooded by same males. The only female present is beside Nest 6. She was caught and marked with the number of the nest.

January 10, late afternoon: Chicks X, 0, 1, 2, 4, 5, and 8 being brooded by same males. Chick 6 being guarded by Female 6; no male present. Male 7 sitting on his nest, but the chick has moved under a rock about five feet away.

January 11, early afternoon: Males X, 0, 1, 2, 4, 5, and 6 are on their nests and partially covering their chicks. Though Males 7 and 8 are sitting on their nests, their chicks are huddled with four other unmarked chicks of similar age five feet away. *Evening:* All males are on their nests. Chicks 1 and 5 not under males and cannot be found in the gathering dusk. All other marked chicks, including Chicks 7 and 8, are under males.

January 12, late afternoon: All males on their nests, except those of Nests 6, 7, and 8 which are absent and cannot be found. All chicks—including Chicks 1 and 5, which were unaccounted for the evening before, and Chicks 6, 7, and 8, which are unguarded—are in or beside their nests.

January 13, evening: All chicks are in or beside their nests, except Chick X, which has moved to a point under a rock near Nest 5, 15 feet away, and Chick 2, which is in a crèche. Males on all nests, except Nest 7, which has no attending adult. Females 6 and 8 are standing beside their nests.

January 14, evening: All chicks are huddled in two different crèches. One, in the area of the 10 marked nests, contains Chicks X, 0, 1, 2, and 7 together with three unmarked chicks of similar age; the other, just outside the area, contains the remaining four marked chicks and five unmarked chicks. Males 0, 1, and 7 on their nests. No other marked adults observed.

January 15, morning: All chicks in one large crèche, containing altogether 18 individuals, just outside the area of the 10 marked nests. No marked adults observed, but as many as six unmarked adults of both sexes stand near the group.

On all our visits, Nest 3, which contained one egg, was always being attended by the marked female. A male, however, stood beside her on January 8 and 13. On January 10, the egg was found a foot from the nest and broken, but the female was still sitting on the nest on this date and during our succeeding visits until January 14 when we found the nest unoccupied.

CRÈCHE FORMATION AND RELATED BEHAVIOR

We noted that the chicks remained steadily with their brooding parents until well after the first week. The first chick we found out of the nest was Chick 7, on January 10, at 12 days of age. The first case of huddling in a crèche was seen on January 11. This involved Chicks 7 and 8, at 13 days of age. But it was not until January 14, when all 9 chicks were 16 days of age, that all were in crèches. Sladen (1958:60) concluded that the average age of an Adélie chick, when it goes into a crèche, is about one month.

The chicks left their nests of their own accord, even while their parents were brooding them. Departure from the nests was sometimes caused by

disturbances. For example, when a group of nests with brooding adults was approached abruptly by us, the chicks left their nests and parents, occasionally to hide under rocks, but more often to join other chicks. Or when a brooding adult and its chick were vigorously attacked by a strange adult, the chick soon left and frequently sought the company of chicks its own age. During the first absences of their young, the adults continued to sit on their nests alone, but by the time all the young had gathered in crèches, the adults no longer sat steadily on their nests and eventually deserted them entirely.

The end of a chick's stay in a crèche seemed to be determined by hunger. When in need of food, it returned to its nest site. If a parent was already on the nest, it proceeded to beg, but if not, it waited either on or near the nest, or begged for food from a neighboring adult without success. The return from a crèche was frequently hastened by a parent arriving at the nest and joining the other parent in a greeting ceremony, thereby providing a clamor sufficient to attract the chick's attention and stimulate its coming back sooner than it might have otherwise.

Among our marked birds we recorded two instances in which chicks left their crèches to join their own parents and be fed. The first was on January 13. Male 2 was alone on his nest while his chick was in a crèche 10 feet away. Female 2 soon returned from the sea to the nest and was at once joined by the male in a greeting ceremony. In a few minutes the chick left the crèche, approached its parents at the nest, gave begging calls for a short period, and was thereupon fed by the female. The second instance, on January 14, involved the family at Nest 0. What we recorded in all respects duplicated the above observations at Nest 2. In this case the chick emerged from a crèche only four feet away.

Elsewhere in the colony we saw many chicks leave crèches, walk up to displaying adults at nests, beg, and be fed. Usually each chick left by itself, but now and then we saw chicks leave a crèche together to meet an adult at a nest all the while begging anxiously, but only one chick, undoubtedly the offspring of the adult concerned, ever succeeded in getting food. The other chicks were refused food and were often vigorously repelled by jabs from the bill and whacks from the flippers.

As the chicks approached full body size (about January 25 to 29), they were fed more often by parents away from their nesting sites. Quite commonly they left crèches and approached adults as they entered the colony from the path or began walking through the colony. In places where no nests had ever been, they begged for food and frequently received it. When full growth had been attained, or nearly so, and the crèches had become loosely formed (see below), the chicks seemed to be fed anywhere in the colony and even down the path to the sea where they wandered.



FIG. 1. A crèche of Rockhopper Penguins at New Island, Falkland Islands, January 22, 1954. The chicks are about 24 days old.

Crèches varied from day to day in number, size, and composition. At first they were many and small, each one of about a half dozen individuals; later they were fewer and larger, containing as many as 15 to 35 individuals. Rarely did the crèches contain the same combination of individuals for more than a few hours, because they were almost constantly reforming throughout the day. On leaving their nests after feeding, the chicks gathered in different combinations each time. (The Frontispiece of this article shows a few chicks starting a new crèche.) However, in their later stages, crèches more often contained the same individuals since they involved nearly all the chicks in a given section of the colony (see Fig. 1).

On January 15, when we terminated our daily visits to the marked nests, the chicks were 17 days of age—about two-thirds grown—and still down-covered. Crèche formation was at its peak, as all the individuals were in groups. Judging by what we saw in all sections of the colony during occasional visits from January 15 to 30, the crèches continued to be closely compacted groups until the chicks attained nearly full body size and had lost their down. Thereafter, the crèches became looser, the chicks standing farther apart and showing a decreasing tendency to huddle. Later, during mid-February, in the Kidney Island colony, we found crèches nonexistent; all chicks were widely dispersed among yearling birds and molting adults.

During evenings in the New Island colony, when more adults returned than at any other time in the twenty-four hours, the crèches tended to be smaller because many chicks had joined their parents for food. But the

crèches nevertheless stayed formed all night. Just before midnight on January 22 we found young in crèches, though the crèches were noticeably smaller than they were during the day.

DISCUSSION

Our observations show that chicks of the Rockhopper Penguin are normally fed exclusively by their own parents up to, and during, the crèche stage. In the Adélie Penguin, Sladen (1958:60-61) saw only two instances of a parent giving a strange chick food, and never saw any unmarked adult feed a marked chick of marked parents. It was his conclusion that, if parent Adélies were lost, the chick died. It would therefore seem that the parent-chick bond, through the crèche stage, is a strong one in the colonial-nesting penguins. But after the chicks attain full body size and the crèches break up, I am not at all sure that the chicks are then fed, as a general rule, by their parents. At Kidney Island, in February, when the crèches were no longer in evidence, we saw fully grown young being fed by adults on the paths at great distances from the nest sites. I noted at least one instance when an adult, climbing up from the sea, responded to the begging of a fully grown young bird by regurgitating food; then, continuing up the cliff, the same adult was accosted by another begging young bird of identical size and obliged it by regurgitating more food.

The question of whether or not parents recognize their own young as individuals, and *vice versa*, interested us greatly. Our findings tend to confirm those of Sladen (1958:73) on the Adélie Penguin, namely, that adults recognize their own young, and the young their parents, by the time the young gather in the crèches. Richdale (1951:276-279) has also reported that, in the Yellow-eyed Penguin, parents and young recognize each other, but he does not indicate when recognition begins.

I am inclined to believe that a Rockhopper chick of crèche age has already become familiar with the particular greeting ceremony of its parents and learned to associate it with availability of food. On hearing and/or seeing the ceremony from the crèche, the chick promptly recognizes its parents and, if hungry, approaches them at once. I am also inclined to believe that parents recognize their chicks by appearance and begging calls. This is borne out in the cases I have described where an adult refuses food to all chicks except one, no doubt its own. Sladen (1958:72-73) holds similar concepts, based on observations closely corresponding to ours. He believes, however, that parents and chicks recognize each other more by sight than by any other means.

The Rockhopper chick's urge to leave the nest and participate in crèche formation is no doubt innate, since it shows up without fail at a certain age in all individuals. Entering a crèche is, therefore, a social response that appears early in the life of a bird noted for its pronounced social habits.

Besides satisfying an urge for companionship, does the crèche have other functions? One possibility is that a crèche may be a means whereby chicks, still downy but becoming too large to be satisfactorily brooded by their parents, may continue to offset loss of their body heat by huddling together. Admittedly this idea would seem to be more applicable to crèches of penguins in the Antarctic where air temperatures are prevailingly lower than in the Falklands. Rockhopper chicks, we found, huddled together at any time, even during the warmest hours of the warmest days. It seems to me that there would have been a fluctuation in intensity of crèche behavior in accordance with fluctuation in air temperature, had the crèche been a means of conserving body heat.

A more certain function of the crèche is that it may provide protection through "safety in numbers." We noticed that whenever we disturbed Rockhopper chicks of crèche age at their nests their tendency was to collect in bunches rather than to scatter and hide at random. Moreover, whenever we approached a crèche, the chicks in it, instead of scattering, bunched still closer together and began moving away from us as a compact group. I could not escape the conviction that huddling in a crèche was a deterrent to attacks by the Falklands' principal predator on penguin chicks, the Skua (*Catharacta skua*). Time and again we saw Skuas kill lone chicks unguarded by their parents, but no instance of a chick taken from a crèche. Most certainly the crèches must have been in some way discouraging to Skuas for otherwise we would have seen at least a few chicks taken from them. Contrary to our observations, Sladen (1958:66) noted instances in which Skuas actually pulled Adélie chicks from the crèches. However, he was impressed by the fact that Skuas were much more inclined to take weakling chicks or others that were slow to learn the dangers of being isolated from crèches.

Almost invariably we saw adults, males and females, loitering in the vicinity of the crèches (see Front. and Fig. 1), but their relationships, if any, to the chicks in the crèches were not determined. None of our marked adults was ever seen near the crèches—they were either attending their nests or absent from the colony. I watched one adult approach a crèche containing a half dozen chicks about two weeks old and attempt to brood first one and then another; and several times we watched adults approach crèches, wantonly torment the various chicks by jabs with bills and strikes with flippers, and then casually retire. It was my conclusion that these were in some cases parents which had lost their young, and in other cases were wandering non-breeders, such as Sladen (1958:61) had noted in Adélie Penguins. In no sense did they play the role of guards. They moved away from us without reluctance or protestation, even before the crèches moved. And they showed no aggressiveness toward Skuas which occasionally flew low over them or

walked up close. However, it is entirely possible that these loitering adults inadvertently served as guards against Skuas by the mere fact that they were adults and thus potentially capable of warding off attacks on the chicks near which they were standing.

SUMMARY

Chicks of the Rockhopper Penguin in the Falkland Islands show true crèche behavior by leaving their nests of their own accord after about 12 days of age and huddling in groups. The crèches become fewer and larger as the chicks grow older. Crèche formation reaches its peak when the chicks are about 17 days of age. As the chicks attain nearly full body size and lose their down, the crèches become increasingly less compact until they break up entirely. The chicks are not fed communally, at least through the crèche stage; instead, they are fed exclusively by their own parents. The ability of adults and young to recognize each other as individuals seems apparent. A crèche satisfies a chick's innate urge for companionship, functions possibly as a means of offsetting loss of body heat, and almost certainly provides protection against the Skua through "safety in numbers." Adult birds which commonly loiter in the vicinity of crèches are in some cases parents which have lost their young and in others wandering nonbreeders. Although these adults play no guarding role whatsoever, they may inadvertently serve, by their mere presence, to ward off attacks by Skuas.

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