

Human Pressure on Adelie Penguins in Antarctica

Paul W. Richard

ADELIE PENGUINS, *Pygoscelis adeliae*, occupy a cold desert biome where humans have been only occasional visitors. In past centuries, human influence on these bird populations has been minimal. Today, however, the pattern is changing; increased human activity within the realm of these flightless avians poses a threat to their very survival.

Antarctic penguin rookeries were not visited by humans until the twentieth century. Most recently, visits have increased during observance of the International Geophysical Year (IGY). Though their total influence is difficult to evaluate, preliminary findings indicate that such visits may be having an alarming impact on the penguins.

Adelie penguin ecology reveals relationships common to other flightless avians. Not only are they influenced by predation and disease, they also maintain a dynamic equilibrium similar to flying avians. The aquatic world constitutes the major part of Adelie territory; thus it, rather than the land, is the basis of the food relationships necessary to penguin survival. Yet, Adelie penguins must breed and nest on barren land that increases the danger from predators.

Aquatic Predators

The leopard seal, *Hydrurga leptonyx*, has been a known predator of the Adelie penguin in Antarctica since the early 1890s. This powerful animal is rarely seen except

during the Antarctic summer in waters bordering penguin rookeries. Solitary by nature, the leopard seal establishes aquatic hunting territory along the beachline adjacent to the rookeries.

A number of these 800-pound seals patrol separate sections of rookery coastline without intruding into one another's established territory. Intruders are driven away by teeth-clicking underwater displays by adult seals. As many as five different leopard seals have been observed feeding at the Cape Crozier rookery in separate aquatic territories during one afternoon.

Adult penguins entering the water seeking food are captured, skinned alive, and eaten at the alarming rate of 0.61 birds per hour during some feeding periods (Penny 1967). Immature Adelies first entering the water in the fall may be killed and eaten even more quickly (Muller-Schwarze 1971). Leopard seals sometimes feed twenty-four hours a day on penguins entering and leaving rookery areas.

Studies have revealed that over 5% of the total penguin population is killed by the seals during the summer months. Though, as the figures cited above show, the impact of the seals on the penguin population is substantial, this natural predation does not appear to influence the natural balance of a rookery population adversely. It is probably an essential population control that has always existed.

The degree to which leopard seals consume Adelie penguins during the winter months spent in pack ice at sea remains to be elucidated. It seems likely, however, that this natural predation does not harm the penguin population.

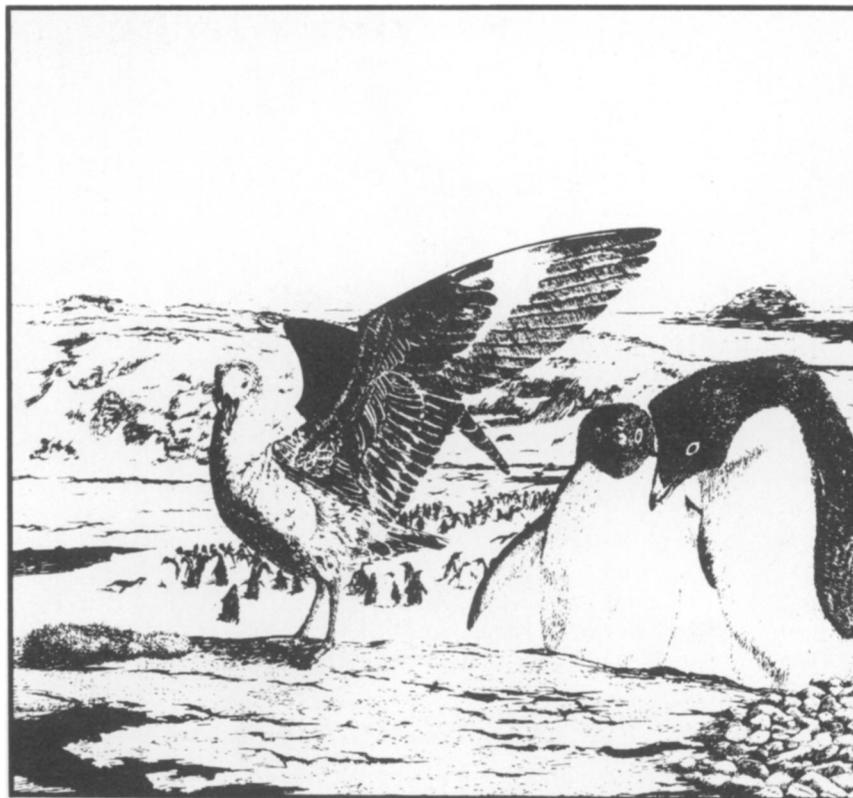
Terrestrial Predators

South Polar Skuas (*Catharacta skua maccormicki*) are found in close association with Adelies during the summer breeding season. These far-ranging avians often nest adjacent to Adelie rookeries and function as predator-scavengers. Maher (1966) found that the skua's activity pattern confirmed their dependency on the penguins. Skua eggs are laid later in the season than Adelie



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FIGURE 1. South Polar Skua predation of an Adelie penguin chick. (Illustration by Paula M. Chandler)



eggs. Thus penguin chicks are available as food when skua eggs are hatched later. Also, skua food consumption peaks when unprotected penguins enter the crèche stage. Though skuas also have been known to eat fish from the Antarctic waters, their major food source is the rookery and its penguin population. Studies have shown that a pair of adult skuas can consume over 100 penguin chicks during a single summer season lasting three months. Data on the influence of skua feeding on rookery populations are incomplete at this time.

Skuas do not attack and kill healthy adult penguins because they are smaller and unable to compete with the Adelie adults' ferocious and aggressive behavior. Instead, skuas steal unprotected eggs during the early breeding season. After the eggs begin to hatch in the rookery, skuas concentrate on taking and killing young chicks by constantly swooping over and standing about the rookery.

When both penguin parents are required to go to sea and find food for their young, a crèche of young birds is formed. A crèche consists of a large number of immature penguins bunched together in islands for mutual protection. Chicks seem to find security in numbers. The South Polar skuas surround the crèche, but they do not attack the chicks within it. Usually they seek out and kill only the unhealthy chicks lingering at the edges of the creche.

This predatory relationship has probably existed for centuries with little harm to the Antarctic penguin population. The leopard seals and skuas have been natural biotic influences that, in the long run, benefitted the penguins. They remove the deformed, weak, diseased, and

starving penguins, thus indirectly regulating the size of penguin communities which must exist on limited rookery space. Leopard seals, skuas, and weather conditions account for the loss of 50 to 55% of all penguin eggs and young each year (Pryor 1965). It is the other human influences on penguin habitats that appear to pose the greatest threat to the bird population.

Indirect Human Pressures

Humans indirectly influence the penguin population because they either lack knowledge of or are indifferent to the relationships between penguins and other avians in Antarctica. Generally speaking, few people are aware of the possible harm practices such as keeping a pet dog, photographing penguins, and disposing of garbage carelessly can cause penguins.

Methods for disposing of human sewage and garbage have received little attention as humans have increased their activities on the White Continent. Discarded boxes, cans, paper, bottles, and rusted equipment litter the sites of past expeditions and surround abandoned camps and old bases. Even modern McMurdo Station is surrounded by litter and junk.

Organic litter decomposes slowly in the cold and dry climate of the Antarctic. Organic materials are collected and pulled by bulldozer and wagan onto the sea's ice at McMurdo. There they remain until the sea ice breaks up (in late January), at which time the refuse either sinks or floats along the shoreline. For many months, therefore, the McMurdo garbage pile serves as a primary feeding area for hundreds of skuas when they return to Ross



FIGURE 2. Leopard Seals often attempt to capture adult Adie penguins on ice floes. (Illustration by Paula M. Chandler)

Island each Austral spring. Nesting areas have even been established on Hut Point and Cape Armitage adjacent to this refuse.

Many questions remain regarding the use of this garbage as a food source. With such a supplemental food supply, are skua population numbers now increasing on Ross Island? How might an increase in the skua population influence the penguin population living nearby? Will an increase in skuas result in a decrease of penguins? Will the skua population become dependent on human refuse and prey less on the penguin population? Can the penguin population remain healthy with reduced predation? What influence might the departure of humans from Antarctica have on both the skua and penguin populations? To what extent is human intervention upsetting the dynamic equilibrium of the penguin population? These questions deserve the attention of scientific investigators.

In many cases, the influence of humans on the avian population is indirect. Dogsleds were for many years the traditional means of transportation for Antarctic explorers and researchers; they have, however, been replaced by modern methods of transportation. Yet, the dogs remain in Antarctica as pets and reminders of past ventures. Lost and escaped dogs have lived for months by preying on penguins and seals in Antarctica. Pet dogs frequently kill penguins for sport. Because the penguins evolved and developed their rookery nesting patterns in an environment free of land-borne mammalian predators, they have no protection from these dogs.

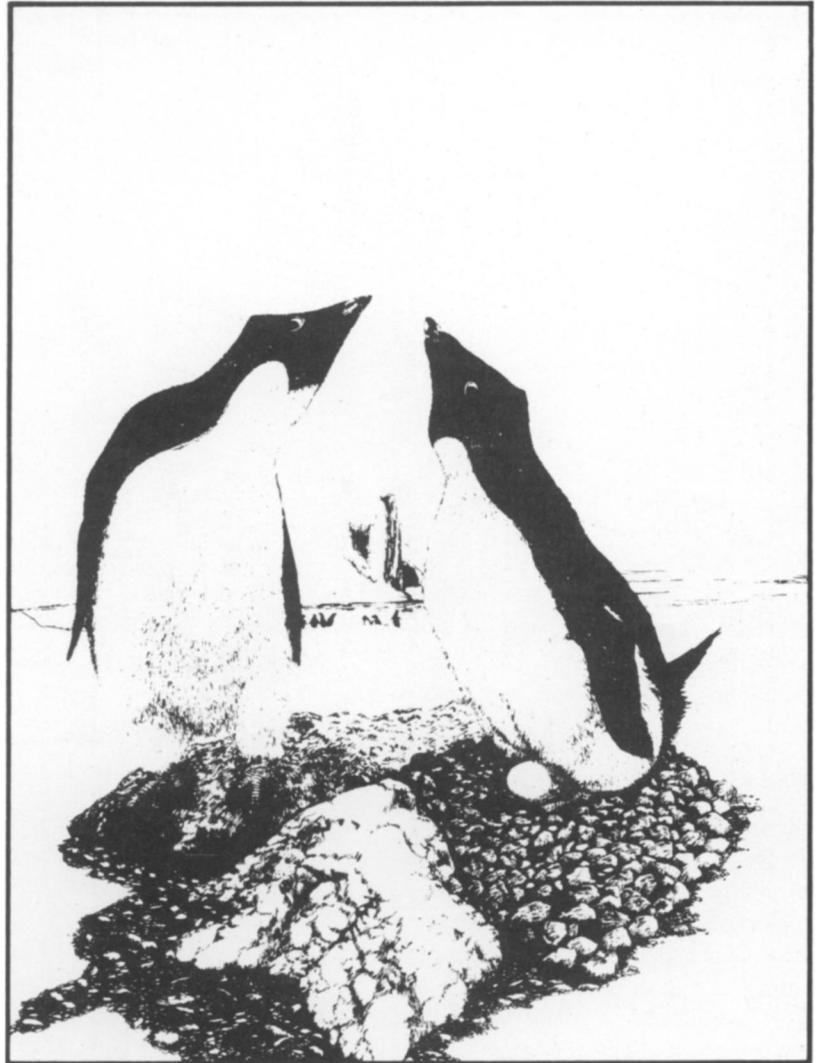
Another indirect influence is the effect of pesticides

such as DDT. First discovered in penguin tissue over a decade ago (Sladen 1966), these pesticides stem from sources outside Antarctica. Yet, because penguins, unlike most birds, undergo periods of stress that result in fat utilization, the accumulation of DDT in tissues has potential for future extermination of penguins. Male Adies may lose 40% of their body weight during courtship, breeding, and incubation of eggs. Such stressful periods allow fatal doses of pesticides to be released from storage in fatty tissues; these pesticides then reach the brain through the bloodstream. Thus, the small quantities of pesticides stored in fatty tissue could eliminate the entire penguin population. The pesticide build-up in the Antarctic aquatic food chain continues, and it poses a long-range threat to the penguins. The occurrence of polychlorinated biphenyls (PCBs) in the food chain of Antarctica may pose still another threat to penguins (Giam 1973).

Direct Human Pressures

Direct human influence on Adie penguin populations is the greatest potential threat to the species' survival. Military operations in support of scientific research are often conducted with little apparent concern for the welfare of the penguin population. Aircraft buzz the penguin rookeries, and military pilots fly directly over the birds during sightseeing tours. These activities have had a detrimental impact on propagating Adies. In addition, aircraft landing areas have been located too closely to rookeries and nesting areas. Perhaps the helicopter has caused the greatest disturbance because it can hover over

FIGURE 3. Adult Adelie penguins with eggs on their next of rocks. (Illustration by Paula M. Chandler)



and land among the birds in the rookery. Using helicopters in such a manner can drive adult Adelies from the nests and eggs and thus result in loss of penguin lives. Unprotected eggs and chicks are quickly gathered by the waiting skuas. Increased visits and frequent harassment from aircraft at the Cape Royds Rookery decreased the penguin population from 2,000 to 1,000 pairs by 1962 (Stonehouse 1965).

Decreasing penguin numbers may have little influence on reducing the predator skua population. Skuas can maintain their numbers simply by feeding on the garbage at Ross Island stations. It appears that predator pressure from skuas has increased as the number of penguins has declined in this situation.

Ornithological research accounts for little of the increase in human visits to the rookeries each summer. Many of the flights are for the benefit of dignitaries and scientists from nonbiological fields who feel they have not seen Antarctica unless they visit the penguins. The rookeries are not within walking distance of McMurdo, so flights increase during the Austral summer to accommodate these curiosity-seekers. Almost any excuse is suffi-

cient to land a glaciologist, physicist, or Congressional representative among the birds.

Excessive visits by humans to the rookeries preclude normal avian activity, and they may interfere with the population balance. The Adelie population decline at the Cape Royds Rookery has coincided with the period of increased helicopter visits. Observations suggest that continual summer harassment of breeding birds may cause further declines in reproduction.

On the ground, visitors who lack a background in ornithology unknowingly cause more harm. Because tight flight schedules preclude adequate time for cautious photographing of the birds, visitors race about the rookery taking advantage of the photographic opportunity of a lifetime; and in disturbing the penguin chicks and the eggs, they provide excellent openings for the airborne skuas. Sometimes eggs may even be broken by fleeing penguins or taken by visitors.

Many an Antarctic visitor proudly displays a penguin egg from Antarctica in the university office or at home. Other biologists collect adult eggs solely for the purpose of an institutional mounting or a department study skins

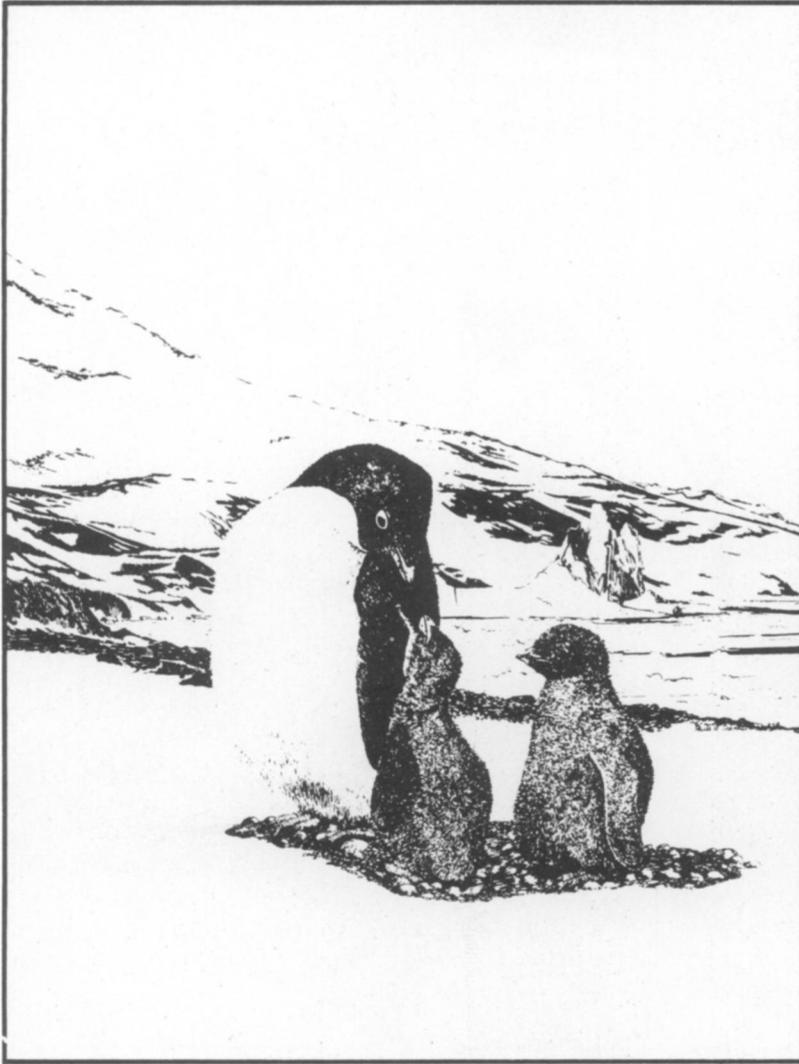


FIGURE 4. Chick Adélie penguins with an adult. One chick begs for food. (Illustration by Paula M. Chandler)

display. These raids are compounded by those of military personnel who collect the eggs for their station-bound friends. At McMurdo, for example, penguin eggs are extremely valuable black market trade goods.

Destroyed eggs and chicks are significant because Adélies do not successfully nest until they reach four or five years of age. The environmental hazards during some years have reduced the reproduction rate to near zero in some rookeries (Sladen 1966). Reproductive success is low even among the large numbers of birds in the giant, undisturbed rookeries such as Cape Crozier. In 1969, for example, no new birds were produced from the Crozier rookery that houses 150,000 breeding adults.

What will be the influence of these continual careless visits to the rookeries? Ornithologists working with Adélies gnash their teeth each time an unnecessary visit is made to see and photograph the birds. But frantic pleas to leave the birds alone have fallen on deaf ears; penguin visits are part of the entertainment program the National Science Foundation provides to ensure overall financial support for its programs.

The big, red sign at Cape Royds reads, "Cape Royds,

the Most Southerly Penguin Rookery in the World—Please Help Protect It." There, even the untrained eye goes to the sizeable areas of cream-color guano on low-lying ridges. These areas at one time supported penguin populations. Now only penguin droppings and empty nests testify to their absence. At the Hallet Station Rookery, the penguin population has steadily declined because of human influences (Baker 1973).

The number of tourist visits to Antarctica will increase in the near future; and this increase will, as has been true in the past, occur at the expense of penguin lives.

Conclusion

It is time to consider leaving some creatures on this earth alone so that scientists can observe the natural environmental processes in motion. Adélie penguins are a logical choice for a "hands-off" policy; but given the present trends, these birds seem unlikely to be awarded such status.

Life is difficult enough for the birds in the harsh Antarctic climate. Natural predators ensure overall popula-

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land life, we think the students will welcome the question posed by Darwin of why so many of these organisms are unique to these islands. They should now be ready to accept the same conclusion as Darwin did. Let them first try to induce the concept of evolution, and then, in turn, deduce the history of any one organism from the evolutionary concept.

Now spring on them the fossils, geological strata, embryo similarities, and they may be able to handle the incomparably long time spans necessary to produce new genera, families, orders, classes, and phyla.

We realize that this short description of the ecology of the Galapagos is very sketchy. It only serves to emphasize the limited number of animals and plants found in the islands. The finches make up half of the 25 or so land birds present there. Combine this dearth or paucity (a word Darwin used to describe the ecology of the islands) of organisms with their novelty, their fearlessness, their uniqueness, and the fact that so many are endemic, and it would make any biologist sit back and wonder. At least that is what happened to Darwin who was an extremely capable observer.

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tion stability; however, the weather still makes their existence marginal. When human pressures are added to these natural conditions, the penguins' position grows even more tenuous. Only an increased human sensitivity to the plight of these birds will reverse the trend and allow the Adelie penguins to have a place on this earth.

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