The Life and Status of the Polar Bear

By C. R. Harrington

Polar bears are on the IUCN list of endangered species. In 1961, when there were signs of serious depletions, the Canadian Wildlife Service started a five-year research project on the polar bear's biology and ecology, and the author is engaged on this work. He points out that polar bears are a most valuable resource, especially to the Canadian Eskimos, and if their numbers are allowed to dwindle to the point at which they have to be given complete protection they will have little more than aesthetic value, which in the case of an Arctic species is limited. These extracts from a comprehensive paper on the polar bear's life history and status are reproduced from "Canadian Audubon" by kind permission of the author and editor.

ONE biting cold afternoon in late February on Southampton Island, Pameeoolik, his son Tony, and I punched a narrow hole in the snow roof of a polar bear den. After recording the temperature inside the den by lowering a thermometer, we opened the hole wider to find out more about the occupants. A glistening black eye and twitching muzzle were instantly applied to the aperture by the mother bear. While she paced the den floor beneath us, uttering peevish grunts, we were just able to discern her two young cubs huddled against the far wall of their snow house. These were the first polar bears I had seen in their natural surroundings, and they prompted many questions. What features separated the polar bear from other bears? How had they evolved and adapted to such a rigorous arctic environment? Were they really in danger of extinction?

The earliest known North European record of polar bears is of the transfer of two captured cubs from Iceland to Norway about 880 A.D. At that time the animals were commonly offered to European rulers, who rewarded the donors on various occasions with ships carrying cargoes of timber or even with bishoprics. Intensive hunting of polar bears began in the early 17th century when ships in search of whales penetrated the core of their range. By the middle of the 19th century there was evidence that the bears were decreasing on the west coast of Spitsbergen and Novaya Zemlya, and they were also being heavily hunted by whalers in Baffin Bay and northern Hudson Bay, and by the Russians on islands in the Bering Sea.

When the sealing industry began to replace the impoverished whaling industry, the pressure become more deadly, particularly in the waters east of Spitsbergen and Franz Josef Land, the Greenland Sea and the Canadian Eastern Arctic. In 1942 Norwegian seal hunters alone killed 714 polar bears. The later-developing fur trade was an additional stimulus to hunters, and the polar bear's range has shown signs of significant contraction since the 1930's at least.

In outlining the polar bear's existing range it is advisable to consider

first the "core areas"—regions in which the species is most abundant and where it breeds most successfully. In Alaska there appear to be no major concentrations of white bears, but they may occur seasonally, or den occasionally near the northern and north-western coasts. In Canada a quadrangle (63°N-75°N and 60°W-95°W) encloses the most productive polar bear areas. Denning seems to be commonest on northern Baffin Island, Southampton Island, Simpson Peninsula, and on the small islands near Cornwallis Island. In Greenland polar bears are most abundant along the east coast, especially the fiorded north-eastern coast, largely because seals are so abundant there. They are abundant also in Svalbard, a group of islands including West Spitsbergen, which belongs to Norway; they are often found on the east coast of West Spitsbergen, and den on Kong Karls Land, and Edgeoya. In the Soviet Union the best denning areas are chiefly on the archipelagos off the north coast, including Franz Josef Land, Novaya Zemlya, the New Siberian Islands, and Wrangel Island.

Beyond their usual north-south range bears penetrate especially to Hudson Bay and James Bay (where they are relatively common), the coast of Newfoundland, the Gulf of St. Lawrence, Iceland, northern Scandinavia (Finnmark), and northern Japan. Such deviations result from extraordinarily strong southerly circulations of ice-filled arctic water. Occasionally they have been known to penetrate 100 miles or more inland in Canada, Alaska, and the Soviet Union. They rarely appear in the zone of permanent north polar ice, but have been recorded as far north as 88°. Understandably, polar bears prefer areas with suitable combinations of pack ice (a hunting platform and protective cover), open water (where seals are able to reach the surface and are often abundant), and land (for denning, cover, and auxiliary food supplies when seals are not available). Although seals are usually present wherever there are bears, bears are not found everywhere that seals are. Human hunters also limit the bears' range.

Adaptation to the Arctic

Polar bears are well adapted to an arctic environment. Their thick winter coat of white guard hairs and dense, cottony underfur, together with often thick subcutaneous fat layers, provide protection against both cold air and water. Moreover, the fat layers, sometimes three inches thick on the haunches, help to increase the animal's buoyancy in water. Fat is also a source of energy during periods of poor hunting, which frequently occur in the Arctic. The hair's whiteness not only decreases heat loss, but also serves as camouflage, resulting in more efficient hunting. The short, furry ears are similarly well adapted for life in a cold climate. Their teeth show a most interesting and important adaptation to their environment. There has obviously been a specialisation from a formerly omnivorous diet back to a carnivorous one (seals). This is indicated by reduction of ridge and tubercle development on the occlusal surfaces of the teeth, and increased elevation of the cusps. In hunting the bears rely mainly on their keen sense of smell, which may lead them to food many miles away, and

they have little trouble sniffing out seal dens covered by layers of ice and snow three feet or more thick.

Polar bears have great strength and endurance. Their normal gait is a slow, distance-devouring walk, but they may gallop when hunted. Although immature bears can run rapidly for many miles, older bears seem to tire quickly. Shereshevsky and Petryayev recorded a bear's speed over pack ice at between 12 and 18 miles per hour. Their ability to scale very rough pressure ridges and steep slopes with apparent ease and their clever use of cover, be it crushed up ice, land, or water, promote their survival by aiding their hunting or their escape from man. Their swimming ability also helps them to escape from hunters, as well as to approach their major prey, the seals. Using their large paws as powerful oars, they can sometimes reach a speed of about six miles per hour at the surface. Underwater they normally keep their eyes open, their nostrils closed, and their ears flattened back, and it is claimed that they can remain under water for two minutes. Their pelts are well adapted to shedding water, because of the slipperiness of the guard hairs, and after a swim they usually shake themselves like dogs, thereby decreasing any chill effects.

The Cubs

Denning begins about October, when the pregnant females search for deep snowdrifts. Very often they excavate their dens on south-facing slopes of hills or valleys, where prevailing northerly winds have built up thick snowbanks. The dens vary in size, but may be 8 feet x 10 feet x 4 feet high, and when occupied the inside temperature can be about 40°F. warmer than outside air temperature. Normally they keep a small ventilation hole open. The young are born in late November or early December—usually twins, sometimes a single cub, rarely triplets, and extremely rarely, quadruplets. Young females often produce only single cubs. At birth the cubs are remarkably small, measuring about 10 inches in length and weighing little more than 1½ lbs. They are blind and deaf, and cannot see or hear well until a month or more after birth. The mothers' fat-rich milk has the appearance and consistency of cow's cream, smells somewhat like seal, and tastes like cod-liver oil.

The family groups leave their dens in March or April after a short period in which the mothers feed on local vegetation and exercise themselves and their cubs in the surrounding area. On the journey down to the sea ice, the females may stop two or three times a day to rest, feed the cubs, and play with them. They often choose resting spots in the snow which are sheltered from prevailing winds by large rocks, against which they can recline, and where they get a good view of the surrounding country and can bask in the sun's warmth. During April and May the young cubs follow their mothers closely while they prowl along leads and fractured ice margins in order to catch scent of snow-covered seal dens, for the young seals, or "whitecoats" constitute by far the greatest part of the polar bears' diet in spring. After smashing in the seal dens and scooping out their

prizes, the mothers dispatch the seals quickly, gulping down fat and skin which they strip from the carcases, in order to nourish themselves, and indirectly the cubs through their milk. Generally, bears eat little seal meat.

Mating usually occurs in April, when most polar bears are out on the pack ice and enjoying the tasty "whitecoats". The gestation period averages about eight months, and although there is no scientific proof of delayed implantation in polar bears, there is good reason to believe that it exists and that embryonic development begins about late September or early October. Females become sexually mature when they are approximately three years old, males when they are four. Adult females can bring forth cubs the third winter after a previous birth, or sooner if the cubs die or are lost. This accounts for the rather slow rate at which depleted populations may revive. It has been estimated that white bears remain fertile to 25 years of age.

Although lactation may continue for 21 months, the cubs are generally weaned by July, when they have acquired a taste for seal blood and fat. As the summer progresses, the bears hunt at the seal holes where they wait patiently for their dinner. As the ice begins to drift apart they sometimes stalk seals basking on ice pans, by silently swimming up and pouncing on them. They feed most heavily on ringed seals, but also eat other species such as harp seals, bladdernose seals, and occasionally bearded seals, and very rarely, they may kill walruses, white whales, or narwhals. They are by no means always successful in their hunting.

A Varied Diet

By August or September, when much of the pack ice has drifted ashore or melted (depending upon regional conditions), the bears often begin to patrol coastal areas for washed-up seal, whale, or walrus carcases. When confined to the land, they may feed on lemmings if they are abundant. Only a few cases are known of bears killing and eating caribou and musk-oxen. Arctic hares and foxes are generally too fleet-footed. But when food is difficult to obtain, foxes caught in traps set by northern natives are often devoured by bears. In Svalbard, the ptarmigan baits for fox traps are also eaten. Polar bears sometimes feed on seabirds (e.g. eider ducks), their young or their eggs. They have also been reported to eat fish. Another common food item during the late summer is vegetation—seaweed, lichens, moss, mountain sorrel, sedges and grasses. They seem to be very fond of crowberries, bilberries, and cranberries, where they are available. Sometimes, they show a definite need or desire for plant food. Reginald Koettlitz once observed that a polar bear, directly after feeding on seal, travelled three miles to obtain grass, which it ate abundantly. The items that polar bears have eaten since man began to penetrate the Arctic are amazing in their variety: bacon, cheese, tea, apples, engine oil, flour, raisins, biscuits, rope, canvas, cardboard, etc. In extreme situations they will even kill a man—but there are few documented cases. They will not

usually attack a man unless protecting cubs or provoked by hunger or wounds.

Moulting, which begins as early as May, is generally completed by August. Variations in the moult are due to age, sex, and fatness.

The cubs are usually abandoned in the late summer or autumn when they are approaching two years of age. At this stage they are extremely vulnerable, for if they do not starve during the winter, they may be killed by older bears or human hunters. Young bears weigh about 130 pounds by their first August and about 400 pounds a year later, when they reach approximately five feet in length. Although adult females (sows) grow little after their fourth year, and weigh about 700 pounds, adult males (boars) only approach their maximum size by eight years. Large males measure from eight to eleven feet in total length, and may weigh over 1,000 pounds.

Little is known about the life span of polar bears. One, a female in the Washington Park Zoo, Milwaukee, died a natural death at the age of 35, and another lived to an age of 40 years in the Regent's Park Zoo, London. From the appearance of some skulls, and the degree of tooth wear, it seems likely that a few bears attain similar ages in the wild.

The Primary Predator

Man has a great influence on the white bear, not only because he methodically and efficiently hunts the seals, the bears' main prey, but also because he is the primary predator of the bear itself. Thus man is displacing the animal in its ecological niche as a ruling carnivore of the arctic coasts. Today, the economic importance of polar bears depends fundamentally on capturing or hunting restrictions imposed by governments. If the animals are deemed too few and complete legistlative protection is imposed, then they can have little more than limited aesthetic value. It is certainly to our advantage to see that polar bear population levels are sufficiently maintained for optimum use on a sustained yield basis. The bears are hunted mainly for their skins. Prices vary from $70 to $200 for a good pelt, and apparently higher prices are paid in Alaska. As the Canadian polar bear fur production value totalled $34,500 in 1961, Eskimo purchasing power can clearly be augmented significantly in this way, and the money may be particularly valuable during poor trapping periods.

Not all skins are sold. Eskimos in the Northwest Territories keep about 20 per cent. of the pelts for use as sled robes, sleeping platform covers, and occasionally, trousers, boots, or mitts. Fragments of hide are also used in icing sled runners, and commercially for the production of fishing flies (because of the water resistance and buoyancy of the hair). In Scandinavia, pelts with poor fur are often tanned to produce excellent leather, and there also bear fat is processed in factories, like seal blubber. It is interesting to note that polar bear gall is used as a domestic medicine in northern Norway. The meat is especially palatable when taken from younger animals. It has a good flavour, but tends to be stringy and tough. High vitamin A concentra-

tions in the liver can be poisonous and probably fatal in some cases. In the Northwest Territories approximately half the meat is consumed by the Eskimos, the remainder being used for dog food. Until recently, on the northern coast of Ontario, the polar bear was primarily valued as a source of dog food and secondarily as a fur trade item.

Capturing Live Cubs

In some countries the capture of live cubs can be very profitable, although they may not rate bishoprics as in medieval days! Odd Lønø states that some ships in the Norwegian Arctic have made up to 50 per cent. of their income from this source. But, in the opinion of a buyer in Tromsö, captured cubs average 6 per cent. to 8 per cent. of total catch values. Evidently, live cubs were worth about 1,000 kroner (approximately $150) each in 1961. In the Soviet Union, a captive bear cub is much more valuable than the best bear skin.

In 1959 Scott and others[1] estimated the world population of polar bears at 17,000-19,000 animals. S. M. Uspenskiy[2] estimated in 1961 5,000-8,000—less than half. My estimate of 6,000-7,000 polar bears for the Canadian Arctic, although worked out roughly on the basis of: (a) aerial censuses in Ontario and Manitoba, in conjunction with knowledge of the variations in bear productivity in different regions of the Canadian Arctic; (b) Scott's method; (c) an approximation of Uspenskiy's method, is still only an informed guess. Nevertheless, I believe it is safe to say that the world polar bear population is well over 10,000. The total annual kill of polar bears now is probably about 1,300. The annual Alaskan polar bear kill has recently been about 200. The Canadian kill has approached about 600 and minimum annual kills for Greenland and the Norwegian Arctic are about 150 and 300 respectively. Until 1956, when severe restrictions were imposed on hunting the species in the Soviet Arctic, at least 120 were killed each year.

Decline in Greenland and USSR

Generally, it seems that Alaska, Canada, and perhaps Norway possess the "healthiest" white bear populations. Significant depletions, attributed to over-hunting, have occurred in Greenland and the Soviet Arctic since about the 1930's. Still, environmental and ecological conditions may exert an unknown but powerful influence where such depletions take place. Spärck's figures[3] clearly indicate a decline in polar bear stock which is most pronounced on the western and south-eastern coasts of Greenland. Both Sdobnikov and Uspenskiy have stressed the rarity of polar bears in the Soviet Union, although the close protection there since 1956 seems to be having beneficial results. It is fortunate in many respects that polar bears live far away from heavily populated regions and are thus, in part, naturally protected. But increasing ease of human transportation poses a constant threat to their security.

Polar bear regulations in Alaska have changed little over the past three years. The season there is open from October 15 to May 10 and there is a bag limit of one bear. The taking of cubs (bears up to two years old) or females accompanied by cubs is prohibited. Residents may take polar bears without limit for food (except cubs and females accompanied by cubs), providing they are not taken by means of aircraft, but licensed hunters may use aircraft to hunt the animals. A non-resident game tag for a polar bear costs $150. In Canada, only Eskimos, Indians, and the few holders of general hunting licences may legally hunt this wildlife resource. Polar bear hunting is forbidden to sportsmen in Manitoba, Ontario and Quebec, as well as in the Northwest Territories. Existing legislation also prohibits the killing of cubs under one year of age, or females accompanied by cubs under one year of age. Scientific licences to take polar bears are issued with great care. An export tax of $5 is imposed on each skin leaving the Northwest Territories. Revisions to present legislation are being considered. In Greenland hunting has been prohibited from June 1 to October 31 on the northeast coast—a frequent denning zone. The taking of cubs, or females with cubs is forbidden, but bears may be shot at any time in self-defence.

Hunting Regulations

In the Norwegian Arctic (Svalbard) regulations are few. The bears are protected in Kong Karls Land and in adjacent territorial waters. Trappers are forbidden to capture cubs unless they have a licence from the Ministry of Fisheries and a guarantee from an approved zoological garden that the cubs will be accepted; about 26 are captured annually. Otherwise polar bears can be hunted throughout the year, in any part of the archipelago. There is a bag limit of one bear each to foreigners hunting in the Norwegian Arctic. In the Soviet Union, where the hunting of polar bears was prohibited in 1956, live cubs may be captured for zoological gardens, and about 20-40 are taken each year for this purpose. The temporary sanctuary (effective for two to five years) has been established on Wrangel Island, one of the most important denning areas in the Soviet Arctic and the closed season is strictly enforced there.

In 1961, prompted by significant depletions in the polar bear population of the Soviet Union and Greenland, and rising kills in Canada, the Canadian Wildlife Service initiated a five-year polar bear project. The objectives are to review the effectiveness of protective legislation and to integrate, verify and add to the scattered and often fragmentary information existing on polar bears. Consequently an extensive review of the literature is being undertaken in order to assess the status of research on the subject, and to discover basic problems requiring further investigation. So far, biological work has involved collection of liver and kidney specimens for vitamin A analysis, and the collection of pathological, reproductive, and skeletal material. Detailed studies have been carried out on lactation in polar bears and the composition of their milk. Emphasis has also been

placed on studies of den ecology and life history. A taxonomic investigation is being completed for the Canadian Wildlife Service by T. H. Manning, who is reviewing the relationships of various polar bear populations throughout the species' circumpolar range. In Norway the Fiskeridirektoratets Havforskningsinstitutt is beginning a long term study of polar bear biology. During the autumn of 1962, a team sponsored by the New York Zoological Society undertook a partial study of polar bear behaviour and physiology in the regions south of Svalbard. Evidently they were able to drug and handle one of the animals.

Counting Dens in the USSR

In the Soviet Union, some interesting work is being directed by S. M. Uspenskiy on Wrangel Island. With the co-operation of local hunters, both Chukchi and Eskimo, Uspenskiy has apparently obtained a fairly accurate count of bear dens within a number of hunting areas. Their data have served as a basis for a total estimate of dens on Wrangel Island. Uspenskiy feels that dens there can be counted at the end of April from an aircraft, and intended to carry out a count with ground checks in 1964. That study may be of singular importance for assessing the numerical status of polar bear stocks in the future, although areas of very rugged terrain would present difficulties. Two of the greatest problems in polar bear research and management involve the establishment on regional, national, and international scales of: (1) confident population estimates, and (2) major patterns of population movement. Various methods of estimating polar bear populations should be tested, and the most successful one applied.

There is a definite need for an internationally co-ordinated programme of marking polar bears, once an effective technique is developed. This would indicate how much of an international problem polar bear management is. Pederson's hypothesis of a continuous, circumpolar bear migration, which has extremely tenuous factual foundations, should be rigorously examined. International meetings on polar bear conservation should be initiated when and if the evidence shows them to be necessary. Meanwhile, until we know enough about the numbers and movements of polar bears to begin really enlightened management programmes, each nation concerned should make every effort to protect adequately this valuable and impressive wildlife species.

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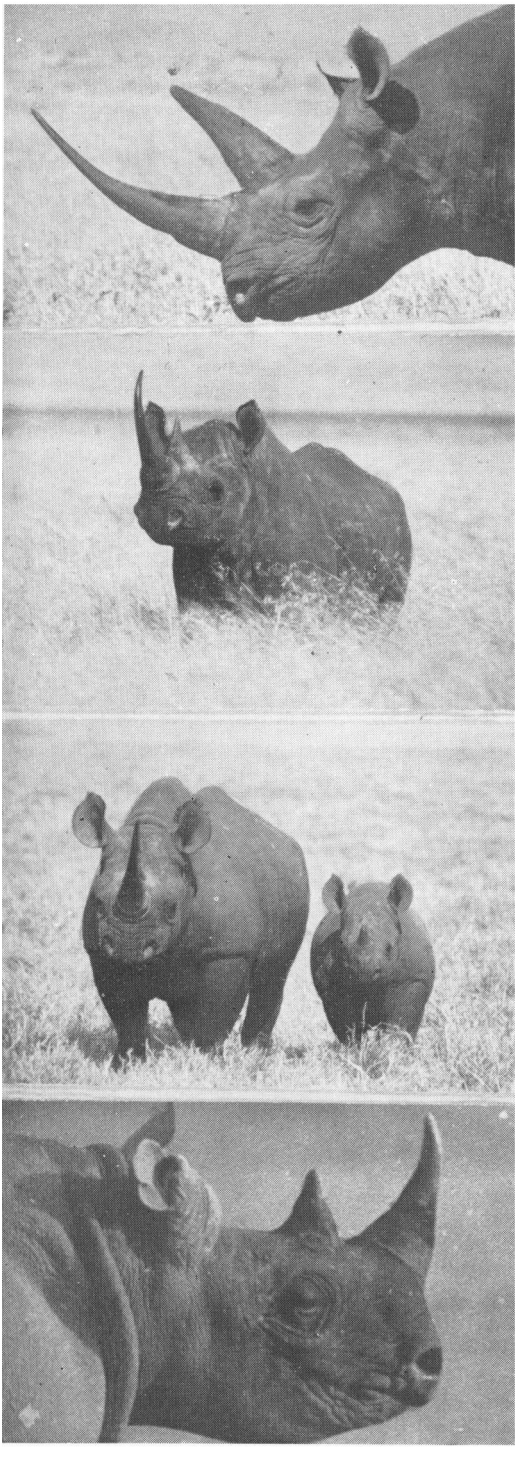
Plate 1 NGORONGORO CRATER H. A. Fosbrooke



RHINOS IN NGORONGORO

Plate 2; Some of the photographs used by research scientists to identify individual animals visiting the Crater

John Goddard

https://doi.org/10.1017/S0030605300004518 Published online by Cambridge University Press

Plate 3

LIONS IN NGORONGORO

H. A. Fosbrooke

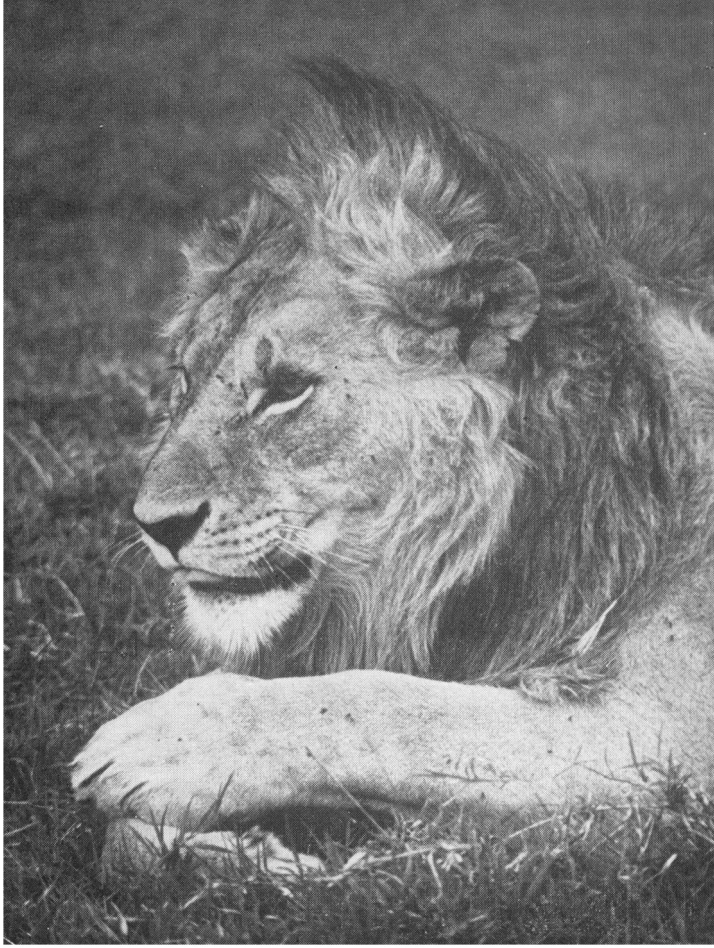


Plate 4

Plate 5: Cubs riding on their mother's back to make a quick getaway. These photographs were taken for an aerial census in Hudson Bay.

POLAR BEARS IN HUDSON BAY

Plate 6: The mother adopts a defensive attitude towards the photographer's plane, and then leads them away across the tundra.

Ontario Department of Lands and Forests

OPERATION NECKTIE *U. de V. Pienaar*

Plate 7: A method of marking animals that is used in the Kruger National Park, in South Africa, to study the migration routes of the zebra and wildebeest herds. The animals are immobilised to enable the scientists to fit the collars and make observations for their records, and then released to rejoin the herds. Last year visitors to the Kruger were asked to help in keeping records of the marked zebras. Each visitor was given a guide to the 12 different kinds of neckband together with cards on which to enter observations, and as a result much useful information about the zebras' movements and grazing was collected.

https://doi.org/10.1017/S0030605300004518 Published online by Cambridge University Press

Kai Curry-Lindahl

Plate 8: The bare ridge of southern Mt. Nimba, Liberia, deforested for mining operations which have cut a large piece out of the top.

MOUNT NIMBA IN LIBERIA

Plate 9: Roads cut into the forest on Liberian Nimba for the mining operations.

PARINARI FOREST

Plate 10: In this "mist" forest above the cloud line, on the ridge of Mt. Nimba in Guinea, the tree trunks are covered with filmy ferns, mosses and lichens.

https://doi.org/10.1017/S0030605300004518 Published online by Cambridge University Press