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overland approaches, and the fishermen's village of Porto do Una. This area should be subject only to the existing laws of expropriation, and no habitational development should be allowed. It should be covered also by a network of permanent environmental monitoring stations.

An intensive educational programme, especially among the school and student populations of the surrounding villages and towns, should ensure the understanding and support of the local population. Environmentalist circles, such as the one existing in nearby Itanhaem, should be stimulated. The population of 'Caçaras' within the Reserve should be more involved in nature-warden activities than at present, and in eventual tourist guidance. 'Ecosystemic' sources of revenue such as honey-bee farming, based on the local, wild stingless bees, should be activated.

It is hoped that, through close cooperation and understanding between ecologists, the nuclear industry, and the local population, the Juréia Ecological Reserve will turn into an example of successful management, research, and above all coevolutionary conservation, of a set of natural ecosystems and the surrounding industrial world.

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Cameroon: National Parks and Nation-building

Special interest in the conservation of African resources has stressed creation of national parks and equivalent reserves as a means of preserving snatches of Africa's impressive wildlife. Results are most obvious in East and southern Africa, where many parks have become legendary. The fruits of conservation in West Africa have been more modest; nonetheless, Senegal, Congo, and Cameroon, have made impressive strides in park establishment. The United Republic of Cameroon was presaged by German colonization in 1884. Divided between British and French protectorates after World War I, the modern nation was born in 1961 with the unification of the former French Cameroun and the southern portions of the former British Cameroons. The modern nation is an officially bilingual, single-party, unaligned state with a predominantly agricultural economy. It is in the enviable position of being, for all practical purposes, a net producer of food with no significant debt and an acceptable balance of trade. Far from being a wealthy nation, it is relatively poor, with an economic policy that is best summarized as realistic, responsible, and austere.

Cameroon is diverse in its biological regions. The north is Sahel, grading to the south into the Sudanese Savanna and the (Guinea) Savanna. Tropical forest is found in the southern one-third of Cameroon, and mangrove is common on the coast. Most of Cameroon's nine national parks are located in the savanna and Sahel regions (Table 1). Among these, Faro National Park is isolated, little publicized or visited, and has few facilities to support visitors. On the frontier with Chad, Kalamaloue, established as a national park in 1972, is a specialized elephant watering-point that is also isolated and little prepared to accommodate visitors. In order to protect

Black Rhinoceros (*Diceros bicornis*) and Derby Eland (*Taurotragus derbianus*) Bouba-Ndjidah was reserved in 1947 and elevated to the status of a national park in 1968. The area is accessible with relative ease during the dry season and has much unrealized tourist potential. Similarly, Benoue National Park's potential remains largely unexploited. This 180,000 hectares park, created in 1968 from a 1932 forest reserve, is managed by a conservator and 23 guards, and has a single encampment capable of sleeping 44. The positions and relative areas of Cameroon's 9 national parks and 7 reserves are indicated in Fig. 1 (page 72).

The jewel in Cameroon's national park 'crown' is Waza. Reserved in 1934, the 165,000-hectares area became a national park in 1968 and has often been referred to as 'the Serengeti of West Africa'. Like Tanzania's Serengeti, its relief is monotonous, but mammal and avian populations are large and the ecological relations are complex. Waza comprises two areas of roughly the same size - thorn-bush savanna and tall-grass savanna (the yaérés). Lack of all-weather roads forces park closure with the onset of rains in June. The park opens in November but the yaérés, flooded each year, generally remain inaccessible through February. Between November and February, visitors are confined to the western wooded savanna, where Giraffes (*Giraffa camelopardalis*) and Elephants (*Loxodonta africana*) are abundant, and bird life is prolific. Shortly after the retreat of the floods, the yaérés is opened and antelope, buffalo, Lions (*Leo leo*), and an abundance of birds, provide views that are seldom excelled. Waza has 600 kilometres of internal dry-season roads, well established 'blinds' at major watering holes, an airstrip, and a well-provisioned modern hotel that is capable of sleeping 100.

TABLE I
National Parks and Reserves of Cameroon.

Name	Date Reserved	Size	Habitat (region)
Korup Nat'l Park (1982) ¹	1962	125,900 ha	Forest
Pangar-Djerem Nat'l Park (1982) ¹	1968	300,000 ha	Forest-savanna
Dja Nat'l Park (1982) ¹	1950	526,000 ha	Forest
Kalamaloue Nat'l Park (1972) ¹	1947	4,500 ha	Savanna
Waza Nat'l Park (1968) ¹	1934	165,000 ha	Sahel savanna
Faro Nat'l Park (1980) ¹	1930	330,000 ha	Savanna
Benoue Nat'l Park (1968) ¹	1932	180,000 ha	Savanna
Bouba-Ndjidath Nat'l Park (1958) ¹	1947	220,000 ha	Savanna
Mozogo-Gokoro Nat'l Park (1968) ¹	1932	1,400 ha	Savanna
Kimbi River Wildlife Reserve	1964	5,625 ha	Montane
Mbi Crater Wildlife Reserve	1964	370 ha	Montane
Douala-Edea Forest & Wildlife Reserve	1932	160,000 ha	Forest
Campo Forest & Wildlife Reserve	1932	300,000 ha	Forest
Kalfou Wildlife Reserve	1932	3,000 ha	Savanna
Lake Ossa Natural Reserve	1968	4,000 ha	Forest
Lobeke Lake Forest Reserve	1974	43,000 ha	Forest

¹ Year of National Park Designation.

Tropical Rain-forest

In the tropical forest, three reserves have existed for half-a-century on Cameroon's coastal margins. The southernmost of these, Campo, occupying the southwestern corner of the country, has pre-existing timber contracts which preclude its elevation to national park status. In 1971, Cameroon ordered the Douala-Edea reserve in the central coastal area, and Korup Reserve on the border with Nigeria, to be conserved as wildlife parks for scientific purposes. The possibility of oil reserves existing in the Douala-Edea forest area has frustrated its elevation to national park status; however, Korup was advanced to a national park in 1982. Also in 1982, two additional tropical parks were designated. One of these, Dja, sitting astride the transition from the coastal forest to the Congo forest proper, is particularly rich in primates, including Western Gorillas (*Gorilla g. gorilla*), and, being practically surrounded by the Dja River, constitutes a complete and nearly isolated ecological unit.

The other additional tropical park is Pangar-Djerem, which transects the floristically interesting and scientifically important savanna-forest transition. Containing examples of both biomes; being more open, particularly in its northern extent, than the other forest parks; and being closer to the established tourist areas of northern Cameroon, this park may become interesting to tourists. Currently it is isolated, undeveloped, and subject to poaching.

Savanna Biome

Parks within the savanna biome, having a spectacular population of ungulates and their predators, are capable of supporting a modest tourist industry and thus contributing to local economic development. Recently-established parks in the tropical forest have little such potential, though representing a scientific contribution of world importance (Gartland, 1932). Tourism in tropical parks is apt to be limited by the fauna's elusiveness, the esoteric nature of the insect populations and flora, and the discomfort which such a closed environment may cause to many tourists. Cameroon certainly has resources to attract far more park tourists than it currently does -- particularly from France, Britain, and Germany. Airport expansion that is currently being developed in northern

Cameroon will make European connections easier than hitherto, but the travel-tourism industry in Cameroon is young and much in need of managerial expansion.

Recent reorganization, placing wildlife management under tourism rather than forestry, will increase emphasis on the fuller utilization of wildlife in the tourism industry. However, priority must be given to keeping more of the parks open longer than at present. The visitor season, limited by the onset of rains in June and lack of all-season roads, accords very poorly with the European vacation season. Construction of all-season roads is, however, expensive and risky if based solely upon speculative returns of a yet-to-develop tourist industry. For this reason experiments with expansion of the season at Benoue National park should probably take precedence over Waza, if only because Benoue is already skirted and traversed by all-weather roads.

Wisdom of Establishing National Parks

Despite these difficulties, Cameroon has taken an active and bold role in the establishment and management of national parks. Why? The real or potential contribution of national parks to the national economy provides only part of the answer. Cameroon is an amalgamation of diverse tribal, language, and religious groups and there has been little assurance that these diverse groups could form national loyalties transcending tribal institutions. Achievement of nationhood, namely political development, is valued beyond immediate economic return. National parks and equivalent reserves serve the political aims of the state, and consequently they are supported. Though visitation of the parks by Cameroonians is slight, their conservation has been the subject of an aggressive public education programme which has the effect of focusing attention on the nation, its beauty, and its diversity, rather than upon any particular locality. Visitation of the parks by foreigners is noticeable and a source of pride. Use of the parks by international research scientists is likewise a point of pride, as is Cameroon's prestige among nations and international conservation organizations.

Emphasis on conservation serves to distinguish Cameroon and Cameroonians from neighbouring countries, which are considered unfortunate, unpredictable, and even dangerous. A proof of Cameroonian wisdom

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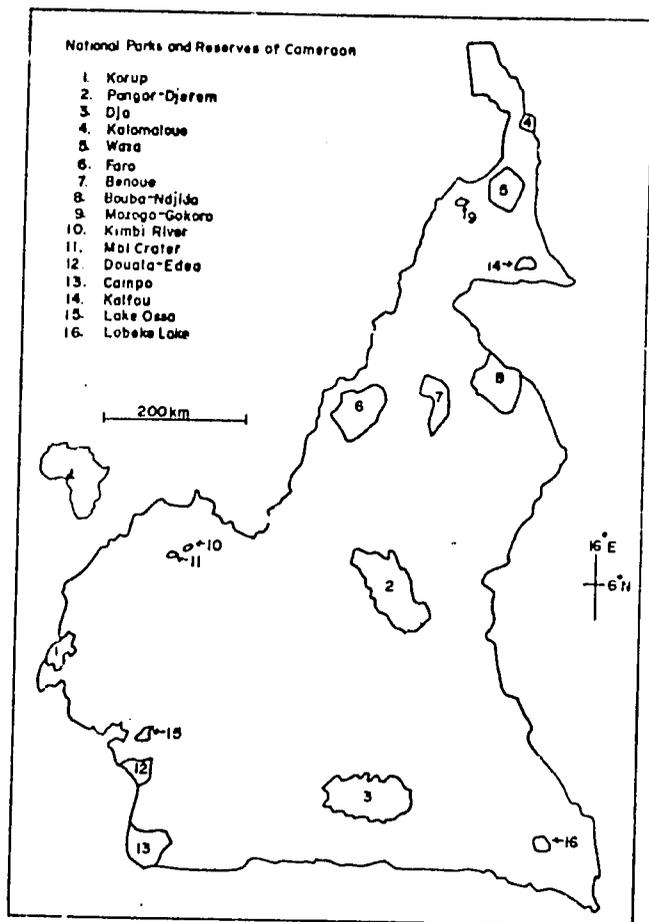


FIG. 1. Sketch-map of Cameroon, indicating positions of the 9 national parks and 7 reserves.

and maturity is the country's responsible attitude towards its resources as demonstrated by its parks. Time and time again it has been said of a neighbouring country that, 'They are different from us, they have killed their Elephants.' Internally, realization of the beauty and diversity of Cameroon, and, externally, the respect which it gains for its conservation efforts in the family of nations, and the distinction that sets it apart from its neighbours, contribute to beneficial nationalism and national political development.

The greatest assurance for the future of Cameroon's national parks is their integration into the fabric of Cameroonian nationalism - a task which Cameroon appears to be taking seriously. While ability to sustain a conservation movement and to integrate established areas into society remains uncertain, Cameroon's lesson is that, far from being an unnecessary luxury, conservation, even in the face of stark poverty, contributes to the development of nationhood. Functionalist approaches to resource exploitation, which would dismiss conservation as a luxury pitted against economic development, fail to grasp this simple lesson. Conservation, rather than blind adherence to resource exploitation for the simple generation of wealth, is a foundation of nationalism.

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Juan Fernández Islands: A Unique Botanical Heritage

The outstanding interest of the flora of the Juan Fernández Islands has been widely recognized through the years, most notably as a result of the extended and distinguished studies of the late Carl Skottsberg and his associates. The three scattered islands comprising this remote group, which are Tertiary in origin and lie in the Pacific Ocean between 665 and 835 km west of the middle of the coast of central Chile, are characterized by a variety of unusual growth-forms among plants and nearly 60% endemism among the vascular species. An alarming number of these unique plants are now threatened by erosion and by the continuing spread of aggressive continental species introduced by Man.

Peculiarities of the Flora

One hundred and forty-six species of native flowering plants have been recorded from the archipelago, including 1 endemic family (Lactoridaceae), 10 endemic genera, and no fewer than 97 endemic species (Porter, 1984). The ferns and fern allies are represented by 54 species, 19 of which are considered to be endemic; *Thyrsopteris*, one of four genera of tree-ferns, forms the endemic monotypic family Thyrsopteridaceae (Kunkel, 1968). The high percentage of endemics (nearly 67% of phanerogams as compared with some 42% for the Galápagos Islands) is attributed to the extended isolation of the Juan Fernández Islands, to a low incidence of

colonization by natural immigration from mainland sources, and to a wide range of habitats provided by the prominent geographical relief of the two main islands (Table I).

Most spectacular has been the evolution in the family Compositae (Asteraceae), with 5 of the unique genera. Of a total of 30 species, 28 are endemic (Kunkel, 1968). The majority of these are shrubby or arborescent in habit, ranging from 1 to 5 m in height, with typically erect branches supporting terminal rosettes of large leaves; several of the species of *Dendroseris* (Table II) have been given the name of 'cabbage trees' of these islands (Fig. 1).

Temperate yet humid forest conditions in the more elevated parts of the islands (Fig. 2) have favoured the development of a woody growth habit also in a number of other families that are more commonly associated with herbaceous species. Among these may be cited *Selkirkia* (Boraginaceae), *Wahlenbergia* (Campanulaceae), *Chenopodium* (Chenopodiaceae), *Plantago* (Plantaginaceae), *Erygium* (Umbelliferae), and *Boehmeria* (Urticaceae). By contrast, two species of the composite genus *Robinsonia* have the unusual habit and habitat of epiphytes on tree-ferns.

Adaptive radiation occurs in *Robinsonia* (see Carlquist, 1974, for detail) and, more strikingly, in *Dendroseris* and its segregate genera (*Phoenicoseris*, *Hesperoseris*, and *Rea*), among species that are typical of arid coastal or