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NOTES FROM THE EDITOR

It is with regret that we inform readers of the deaths of Sir Edmund Leach and Professor William Geddes. Each contributed substantially to research in Borneo, and we express our condolences to their families. Obituaries will appear in the September issue of the Bulletin.

Two recent events emphasize the importance of responsible and reliable research. The first was the release of the movie, "Farewell to the King," filmed in Sarawak in 1988. Though containing spectacular footage of the environment, as described by the film critic of the New York Times, the film was a technical disaster, with a confusing story-line and sloppily edited. It was a disservice to all residents and students of Borneo, representing local societies as leaderless and caricaturing all as "Dayaks" and "Penan". One scene portraying an aborted act of infanticide was a distortion of circumstances in which such acts are reported to have occurred and a gratuitous contrast of the noble "king" and his savage followers.

The second event began to unfold early this year when officers of the Borneo Research Council were contacted by a consultant with the Bank Information Center in Washington, D.C. Through a series of conversations, the officers learned that the consultant was to lead a delegation of congressional aides and State Department staff to Sarawak to investigate human rights violations and destruction of the environment. As much as we defend human rights and are concerned for Borneo's environment, our exchanges with the delegation were disappointing. The experience confirms our position that there is far more to be gained through open exchange of scientific facts than by the selective manipulation of misinformation and disregard of complex issues.

We appreciate your continuing support of the work of the Council, and especially the generous contributions of the following persons: George N. Appell, Laura P. Appell-Warren, Tim Babcock, Martin Baier, Peter Brosius, Paul Bucher, Patrick K. Cassels, Gale Dixon, Michael R. Dove, John Elliot, Richard C. Fidler, Charles Folland, Bill Funk, Jack Golson, Peter Grey, P. B. Griffin, Timothy C. Jessup, Linda Kimball, Jeffrey G. Kitingan, Paul H. Kratoska, Jonathan H. Kress, Clive W. Marsh, Allen R. Maxwell, Donna Mayo, Peter Metcalf, Kal Muller, John Musgrave, Shuichi Nagata, Rodney Needham, H. Arlo Nimmo, Stanley J. O'Conner, Robert M. Pringle, Graham Saunders, William Schneider, Bernard Sellato, Orville A. Smith, Jack Stuster, Peter Thomas, Phillip L. Thomas, H. L. Whittier, W. D. Wilder and Leigh R. Wright.

RESEARCH NOTES

SPECIES RICHNESS, DIVERSITY, STRUCTURE AND PATTERN CHANGES ALONG ECOLOGICAL GRADIENTS:

1. Preliminary Borneo-Hainan Comparison

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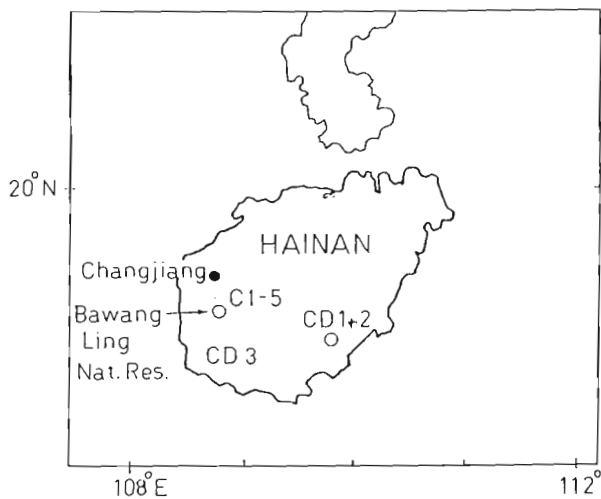
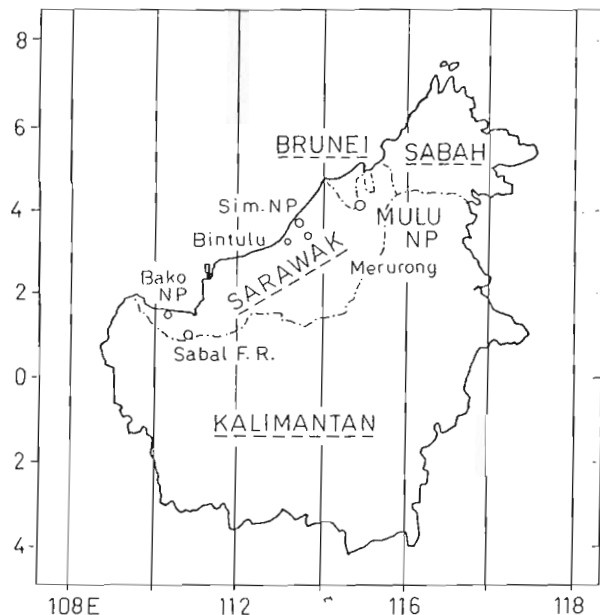
INTRODUCTION

The floristic and architectural structure of natural forests in Sarawak and Brunei show characteristic patterns of change along ecological gradients which can be explained as adaptations to the chemical and physical site conditions, modified by the effects of stand dynamics (Fig. 1a and b; Bruenig, 1966, 1970, 1973; Newbery *et al.*, 1986). Ashton (1967) suggested that these changes of mature forest stand structure may correspond to changes along the latitudinal gradient away from the equator into seasonal evergreen and deciduous forest, except of course for the features connected with deciduousness. The data from a reconnaissance survey of natural forest in Hainan by one of the authors provided the opportunity to test this hypothesis.

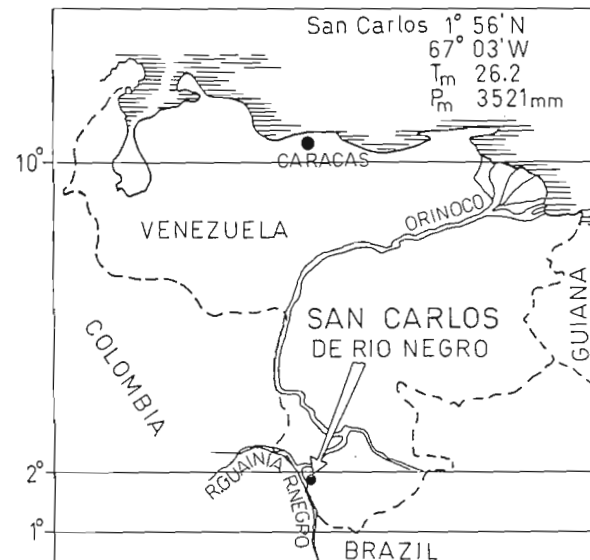
Sarawak lies between 1 and 3 N and enjoys a maritime, weakly seasonal, humid equatorial climate. Hainan lies due north between 17 and 20 N and has a similarly maritime, but seasonal-monsoonal subhumid tropical climate (Fig. 2).

Floristically, the "climatic climax" lowland forests on moderate soils and sites in Sarawak and Brunei are dominated by members of the Dipterocarpaceae, which generally become rarer with increasing altitude above the lowlands, and with increasing adversity of site and soil in the kerangas-kerapah forests, where in the kerangas Fagaceae, Myrtaceae, Sapotaceae, Guttiferae, Casuarinaceae and conifers (Agathis, Dacrydium, Podocarpus) become relatively more important (Bruenig, 1966).

In Hainan, the lowland forests on moderate ("average") soils and sites still contain a few species of Dipterocarps (Vatica, Hopea), but these are only locally dominant, especially on more exceptional soils and sites (Lu Yang, 1986; Yu T. Q. 1983). The most common species in the three lowland forests (sample plots CD 1, 2 and 3) in the canopy A-layer are Vatica



Localities Used for Comparison



astrotricha, Heritiera parvifolia, Schima superba and several species of Lithocarpus, Castanopsis, Quercus and locally Litchi chinensis, Lasianthus chinensis and Schefflera octophylla, while conifers (Dacrydium, in some places Pinus) increase with altitude, when also Syzygium spp., Schima, Englhardtia and Sarcosperma become more common.

The change with increasing altitude and exposure is similar to that in C - F. The dimensionless aerodynamic roughness parameter Z changes concordantly from about 500 - 600 in A to > 600 in B and then falls gradually to 150 in F.

MATERIAL FOR COMPARISON

In Hainan, 8 reconnaissance survey plots were enumerated in mature natural forests, 3 plots in dipterocarp-bearing lowland forest below 500 m a.s.l. (CD 1 and 2 in southeastern Hainan and CD 3 in southwestern Hainan), 1 in upper lowland forest (500 - 800 m) (C 3) and 4 in montane forest (1100 - 1460 m). The corresponding plots selected for comparison in Sarawak are part of a sample of 55 small (0.2 ha, some smaller) reconnaissance plots enumerated between 1955 and 1960, and part of a 20 ha plot in Sabal Forest Reserve which was enumerated in 1962. Additional data were obtained from the Amazon Forest Ecosystem MAB - Pilot Project at San Carlos de

from the Amazon Forest Ecosystem MAB - Pilot Project at San Carlos de Rio Negro (Bruenig et al., 1979) and from a biomass plot in "tierra firme" forest near Manaus (Bruenig and Klinge, 1976). The selection of indicating parameters of species richness, diversity and stand structure and pattern was restricted by the small size and number of plots in Hainan. This excluded a comparative quantitative analysis of species pattern and phytomass density and structure, but a comparison of species richness, diversity and leaf-size spectra was possible.

SPECIES RICHNESS AND DIVERSITY

The McIntosh index of diversity was calculated for groups of 100 neighbours in all sample plots. The scatter of values shows that the Hainan forest stands fit into the scatter of the Sarawak and Amazonian stands as follows:

- o on similar soils and sites the Hainan stands have fewer species - the evenness of mixture (diversity) in Hainan is similar to Sarawak and Amazonia on kerangas/caatinga.
- o stands of equal species richness and diversity in Borneo and Amazonia stock on much less favourable soils and sites, such as kerangas and caatinga forests on podzolic and podzol soils, than in Hainan.

SPECIES DOMINANCE DIVERSITY

The dominance-diversity curves of Whittaker give "an indication of the type of species-abundance relationships present, and the slope of the upper part is an indication of the degree of dominance, in the sense of one or few species contributing a large proportion to total biomass" (Greig-Smith, 1983, p. 161-162). This indicator of dominance diversity is particularly useful if the smallness of the sample and the plots prohibits the application of more sophisticated quantitative methods of comparison.

Generally, the slope of the upper part of the curve indicates the tendency to gregariousness and dominance, resulting from an interplay of site opportunities for growth and the presence of aggressive dominant species which have a high potential to exploit and monopolize site resources. The lower part of the curve is shaped by the rarer, non-aggressive species which seem to be more numerous in forests with high levels of dynamic changes on medium sites. The steepness of the dominance-diversity curves in Sabal (Fig. 4) is steepest on shallow humus podzol in 216, simple sclerophyllous kerangas, and becomes continuously flatter in the lower part (rarer species) on medium deep humus podzol in 25 and 368, single-species dominant kerangas (soil colour 10 YR 7/2) and in 241 and 240, complex mixed

kerangas (10 YR 5.5 - 7.5 / 3.5 - 2.5) to 15 and 3, transition to mixed Dipterocarp forest on loamy ferralsol. The high dominance in 450, mixed Dipterocarp forest on red-yellow clay (9 YR 7.5 / 8) is caused by the gregariousness of Dryobalanops beccarii on the relatively most fertile soil and sloppy site.

In Sabal, as generally in the kerangas and kerapah forests and in the transitions to mixed Dipterocarp forest, and also in Hainan, the independence between the slope of the upper part of the curve and the lower part is noticeable. This indicates the difference of mechanisms which lead to dominance, mainly among upper-canopy tree species, and to species richness mainly supplied by moderately rare to very rare species. Examples are the curves in Fig. 4, 5 and 6 where on the more favourable sites the gregariousness of such species as Agathis borneensis (better type of podzols), Dryobalanops beccarii (ferralsols), or Vatica astrotricha (acrisols and limestone soils) cause a steep upper part of the curve.

The dominance-diversity curve for Manaus is added, as in Fig. 3, as an example of an extremely species-rich and diverse forest. In this case, the phytomass has been used instead of the simple parameter basal area. This should exaggerate the dominance of species with larger trees of high basal area dominance, because of the additional effect of tree height and crown volume. Therefore, the low dominance and high diversity of the phytomass in the "tierra firme" forest near Manaus is particularly notable. The dominance-diversity curves in Fig. 5 represent, within kerangas forests, several ecological gradients:

- o first, altitudinal-physiographic from 730 m (Merurong Plateau, 55, 57, 54) to 100 m on a coastal exposed plateau (Bako National Park, 15 kerangas, 17 ca. 120 years old secondary kerangas, 16 transitional to Dryobalanops beccarii dominated mixed Dipterocarp forest adjacent to the permanent plot established by P. S. Ashton).
- o second, time of development from early Pleistocene to Holocene.
- o third, soil fertility from more favourable humus podzol soil (16, 30, 28, 46, 45) to less favourable humus podzol (31, 43, 44) and peaty histosol (29, 32). The shape of the curves expresses well the relative adversity of site conditions, but also the tendency to more dominance where an "aggressive" competitive species has a relative advantage. High dominance may occur especially on relatively more favourable sites (e.g. 43 and 44). Similarly, very high dominance of Hopea spp. (H. andersonii) has been reported from deep, nutrient-rich rendzina soils at the base of limestone hills in west Sarawak (Bruenig, 1966).

The Dominance-Diversity curves in Hainan (Fig. 6) represent the altitudinal gradient from montane (C 5 and 4) through submontane (C 1 - 3)

to lowland "climate climax" forest (CD). The shape of the CD-curves does not correspond to the curves of Mixed Dipterocarp forest in Borneo (Fig. 3, Nr. 15, 3, 450) or Manaus (Fig. 3, MA), but much more closely to the curves in Kerangas forest in Sarawak.

LEAF SIZES

Leaf size is one of the features by which trees can adjust to environmental conditions. Leaf size spectra of forest stands are useful and simple indicators of possible ecological stress factors operating, if episodically, on a site. Therefore, the leaf size spectra of the 8 Hainan forest stands have been calculated and compared with stands in sample plots in Sarawak (Table 1).

The Hainan plots have been arranged in the same order as previously (Fig. 6) from more adverse to more favourable sites. Sample plots on similar sites in Sarawak have been selected on the basis of stand structural features and placed correspondingly below. The match of the spectra between corresponding pairs of sites is close. Also close is the match between the means of Borneo and Hainan respectively. But the matching twin stands in Hainan stock on ferralsols and acricols, not on podzols. This would, if on a narrow data base, corroborate the hypothetical assumption that the structural changes along the gradients Mixed Dipterocarp-Kerangas/Kerapah (increasing site adversity) corresponds to the change of the physiognomy of the evergreen forests along the latitudinal gradient equatorial Borneo-tropical Hainan (increasing seasonality with lowered levels of the rainfall during low-rainfall season). Essential features of this change are a general tendency towards:

- o increase of the dominance of leptophyll and microphyll leaf sizes
- o increase in sclerophylly
- o decrease in stature (lesser tree heights and lower h/d ratios).

The leaf size spectra for the 10 associations (forest types) in San Carlos de Rio Negro have not yet been calculated. The raw data suggest that it is probable that they would fit in with corresponding forest/site types in Borneo. This would conform with the fit of other structural features (Bruenig et al., 1979). But a major difference is the absence in San Carlos of such sclerophyllous leptophylls as the coniferous *Dacrydium* spp. and the cladophyllous *Casuarina* spp., which are characteristically common in kerangas and kerapah forests in Borneo. *Dacrydium* is also common in montane forests in Hainan, where also occasionally pines occurs.

If smaller leaf sizes are in fact related primarily to water stress, and to nutrient deficiencies, the trend Borneo-Hainan would seem to express

primarily the effects of seasonality on evergreen trees of seasonally regularly deficient water availability. The differences between Bornean kerangas and Amazonian caatinga, both on sites with almost identical climates as expressed by long term climatic means (Fig. 2) and with identical soils, may perhaps relate to the occurrence of episodic extreme climatic events which are apparently more frequent in Borneo. On both sites, drought conditions occur commonly (Bruenig, 1969, Heuveldop, pers. comm.), but in South-east Asia, in contrast to Amazonia, the unique El Niño anomalies cause rare, episodic extreme and prolonged drought conditions which are known to stress the natural vegetation and have caused widespread fires already recorded from the 19th and early 20th century, but particularly at the present time after agriculture and forestry opened and fragmented the forests and increased fires susceptibility. It could be speculated that the persistence (survival) of conifers on extremely unfavourable lowland sites in Borneo, in contrast to their absence on the same sites in lowland Amazonia, while they occur in the Andes at higher altitude, is related to the severity of the extreme cases of El Niño droughts in the former.

CONCLUSION AND OUTLOOK

The results of the analysis of plot data for some features of forest structure from reconnaissance surveys in Hainan and Sarawak, and from 20 and 10 ha research plots in Sarawak and Amazonia respectively, are tentative. But they indicate similarities of structural change along the edaphic, altitudinal and latitudinal gradients. A major problem for analysis and interpretation is the small size of the reconnaissance plots. Some features, such as species richness per 100 individuals, species diversity and dominance pattern, and leaf size spectra can be easily determined with reasonable representativeness and reliability. Other features, such as tree-size-class frequencies, phytomass densities, species distribution patterns, canopy architecture (aerodynamics) and their variation over the area and changes over time require larger areas and long term observation in permanent research plots.

Among the many difficulties of matching vegetation/site-units between different humid tropical regions are:

- o any common denominators of correspondence are imperfect and of limited significance, consequently uncertainty arises which stands or eco-units should be selected and compared by which features of the eco-systems?
- o the generality of apparently adaptive and easily observable features, such as sclerophylly, xeromorphy etc. which makes interpretation difficult.

- o the great number of adaptive mechanisms which are more difficult to observe, often unknown and inaccessible, such as physiological and exchange processes in the phyllo- and rhizosperes.
- o the vagaries of evolution and migration of species interacting with the vagaries of variation and change of environmental conditions, leading to different compositional constitutions of species, life- and growth-forms on apparently "identical" sites in different biogeographical regions.
- o the consequently great floristic variation and the uncertainties about functional and social roles and ecological significance of such components as conifers, or Dipterocarps or Fagaceae in Borneo and Hainan, and the uncertainty about the significance of the absence of some species, groups or guilds from some sites, such as Fagaceae from Sri Lanka, or conifers from lowland Amazonia.

The difficulties of assessment of the state of a forest ecosystem by easily observed structural features for comparison are enhanced by:

- o the history of site and vegetation is usually more or less obscure.
- o the growing awareness that it is not the events around the means within the range of standard deviation of environmental factors which make the most decisive impacts on the structure, functions, dynamics, inputs, flows, fluxes and outputs of forest ecosystems but the rare, episodic, unpredictable, sometimes unique and unexpected, extreme events which often cause catastrophic changes and collapse of system structure and functioning, e.g. extreme droughts (Bruenig, 1971) or combinations of unusual climatic and biological events causing sudden flushes and cascades of actions and reactions (e.g. Bruenig and Schmidt-Lorenz, 1985) - the stresses imposed by such episodic extreme events on the tropical forest is likely to affect growth processes, vitality (e.g. Muellerstael and Bruenig, 1987) and consequently demographic dynamics, about which little is known from temperate, let alone tropical forests.

Improvements in this respect can only come from integrated interdisciplinary long term ecosystem research in the field and in the laboratory. The newly established Chinese-German Cooperative Ecological Research Project (CERP) is designed on these lines. A number of large forest ecosystem research areas will be linked to similar projects in Southeast Asia, Africa and America. The project is funded by China and Germany and administered by the MAB-Secretariate of Unesco which facilitates linkage with other bilateral or multilateral projects and with the emerging international networks of the Unesco-Programme "Man and the Biosphere" (MAB), the IUBS/ICSU programme "Decade of the Tropics" and the forestry programme "Tropenbos" (Bruenig and Huang, 1986).

ACKNOWLEDGEMENTS

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This paper is dedicated to the memory of the late F. F. Browne, eminent entomologist with an international reputation as specialist on tropical bark and ambrosia beetles who, as Conservator of Forests, Sarawak, first suggested and supported research into the structure and functions of the kerangas forests of Sarawak and Brunei during the fifties. Much of the information in this paper draws on the data base which was consequently established. F. G. Browne died on 1st January, 1987.

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kerangas and caatinga soils with respect to their role as sink and source of carbon in the face of sporadic episodic events. In: Degens, E. T. and Kempe, S. (ed.) Transport of carbon and minerals in major world rivers. Part 3, Vol. 58, Carbon Unit., Hamburg, Geol.-Palaeontolog. Inst., Hamburg Univ., p. 107-122. _____ and Hung Ya-Wen. 1986. Bawang Ling Nature Reserve: a potential international research and demonstration site and MAB Biosphere Reserve. IUCN Forestry expert group meeting on tropical forest conservation and buffer zone management, Merida, Dec. 1986, IUCN, CA 1196 Gland, Switzerland, Mimeogr. 30 pp.; public. in Bahasa Melayu/Indonesia. Inst. Wissensch. Zusammenarbeit, Tübingen. Greig-Smith, P. 1983. Quantitative plant ecology. Oxford, Blackwell Scientific Publications, 3rd ed., 359 pp. Lu Yang, Li Ming-Guang, Huang Yawen, Chen Zhang-He, Hu Yu-Jia. 1986. Vegetation of Bawangling Gibbon Natural Reserve in Hainan Island. Acta Phytocologica et Geobotanica, 10:106-114. Muellerstael, H. and Bruenig, E. F. 1987. Water relations and gas exchange of tropical rainforest tree species under stress: *Manilkara* sp. from high caatinga forest at San Carlos de Rio Negro, Venezuela, Chapt. 7 in Sethuraj, M. R. (ed.) Physiology of tree crops. Amsterdam, Elsevier (in press), p. 121-138. Newberry, D. McC., Renshaw, E. and Bruenig, E. F. 1986. Spatial pattern of trees in kerangas forest, Sarawak. Vegetatio, 65:77-89. Yu Tong-Quan. 1983. The mountain rainforest of Hainan Island. Ecologic Science, 2:25-33. Weiscke, Andrea S. 1982. Struktur und Funktionen in Waldokosystemen: Strukturvergleich zwischen Kerangas und Caatinga. (Structure and functions of forest ecosystems: Structural comparison between Kerangas and Caatinga. 83 p.; Hamburg University, World Forestry.

FIGURE 1a

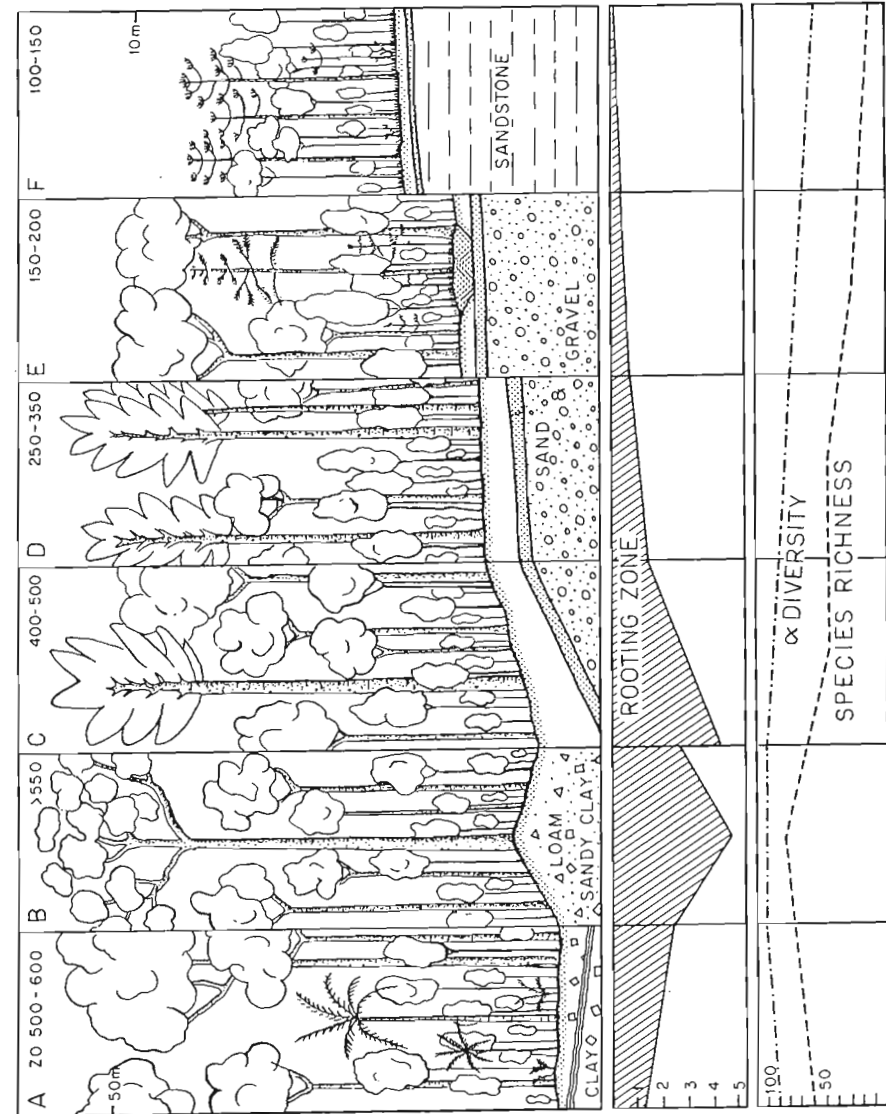


FIGURE 1b

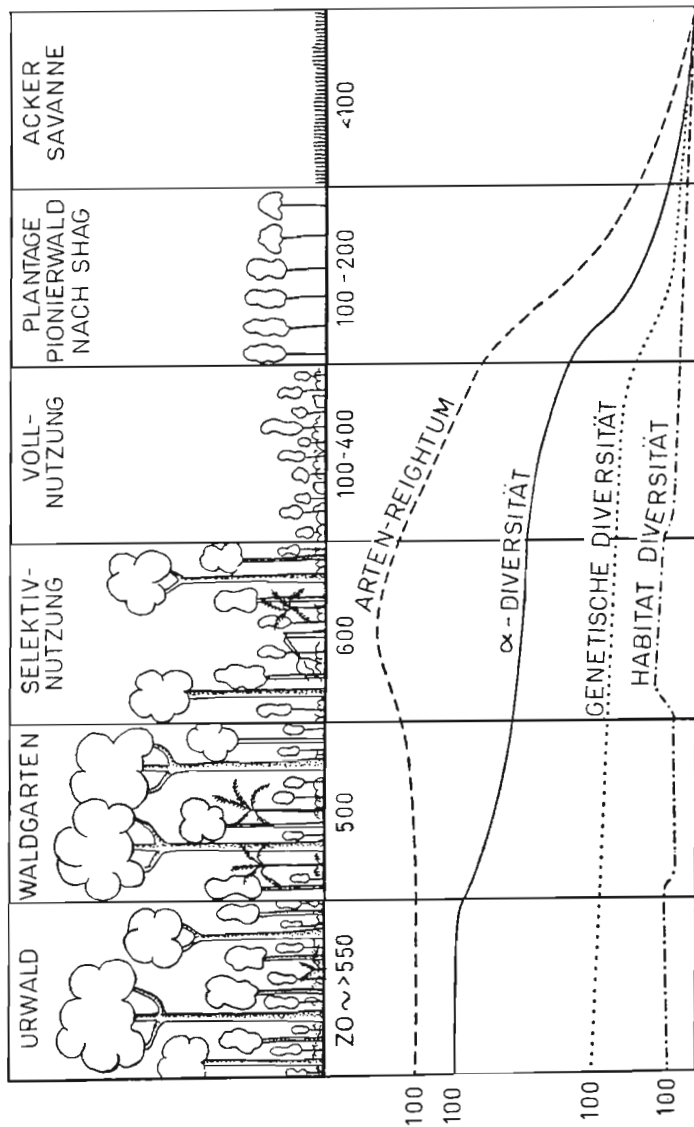


FIGURE 2

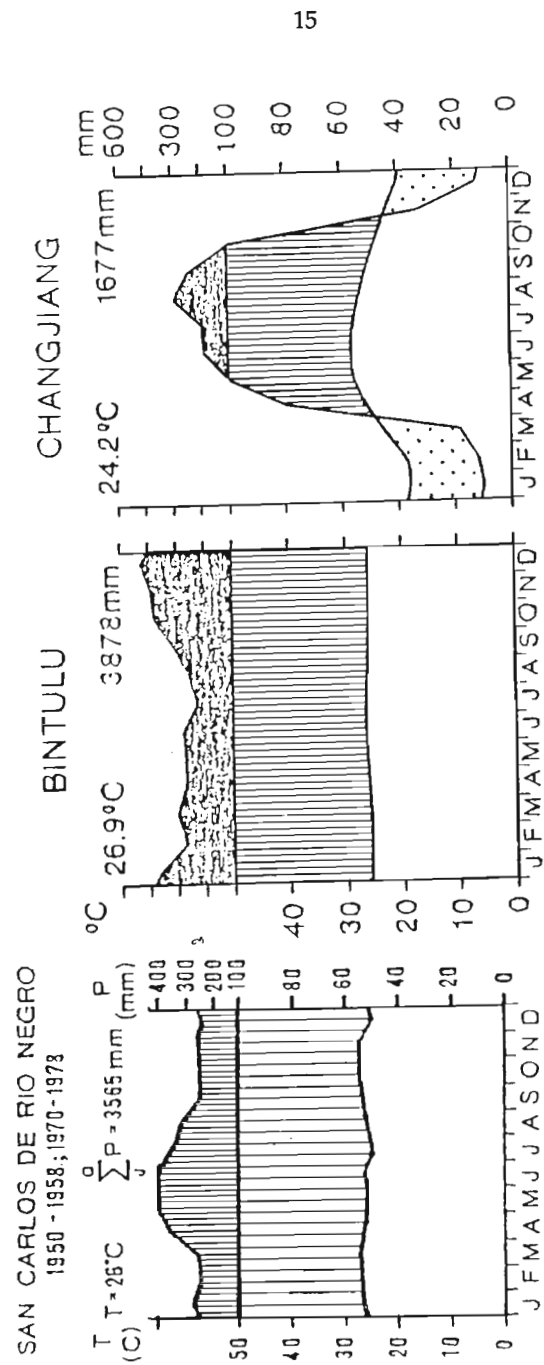


FIGURE 3

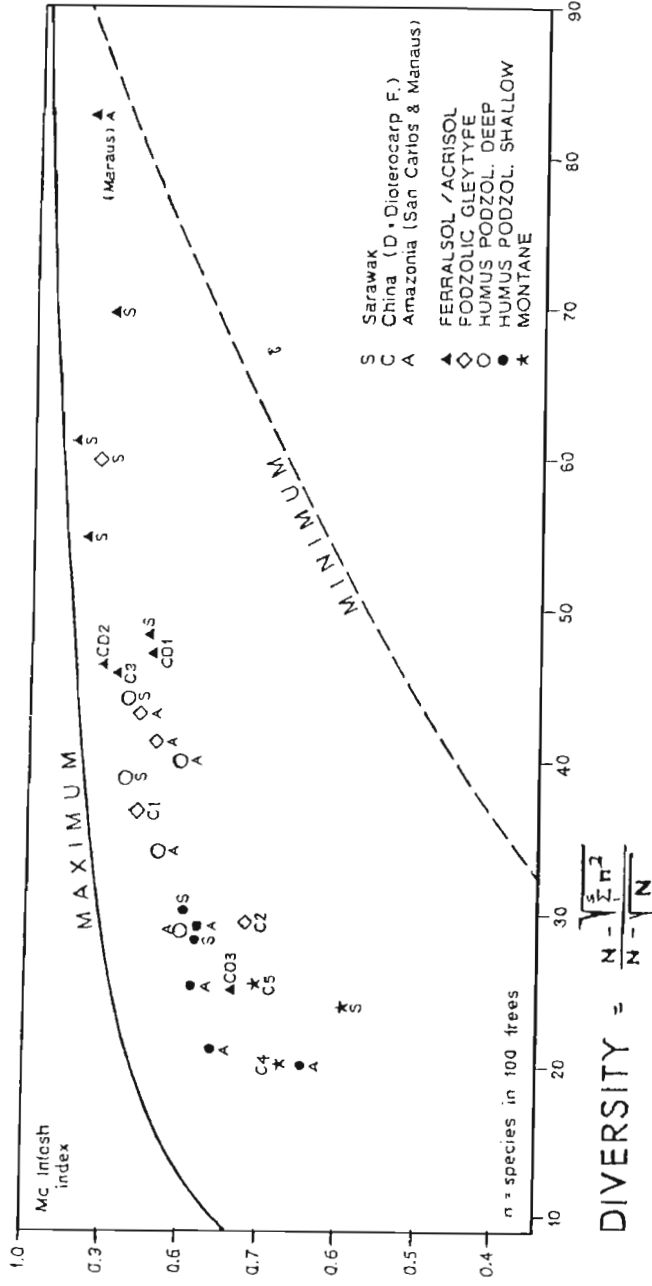


FIGURE 4

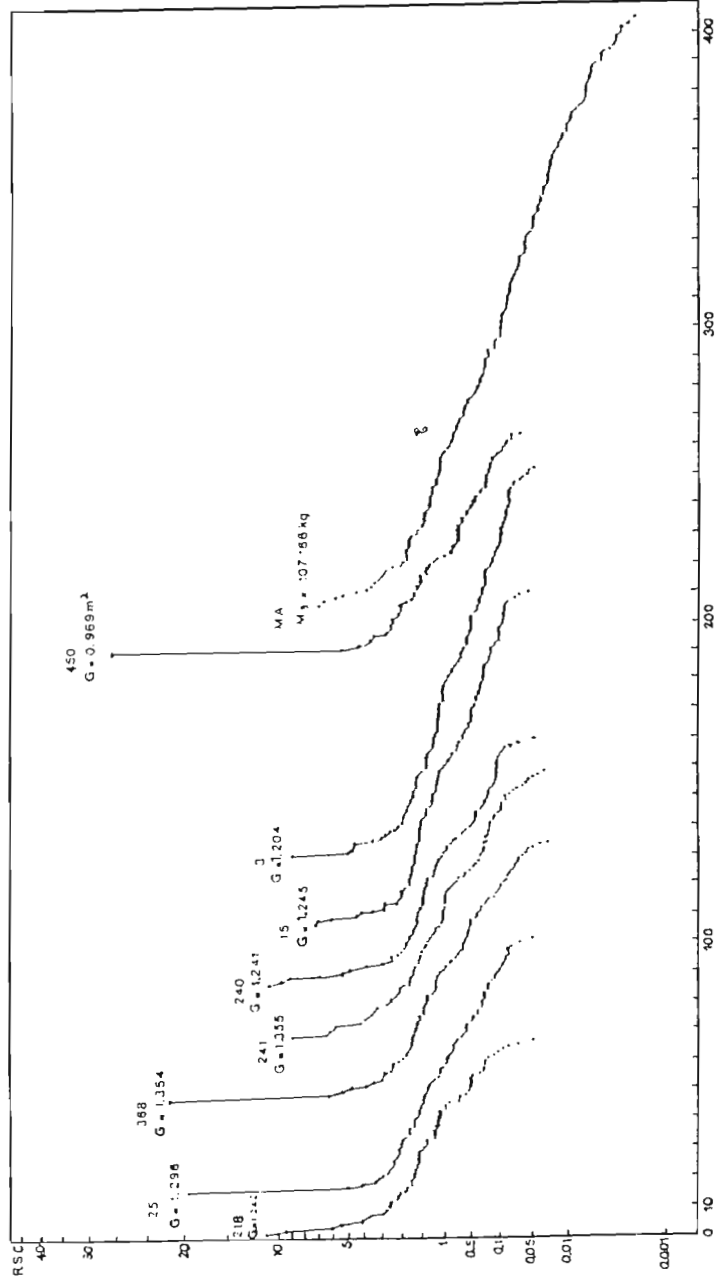


FIGURE 5

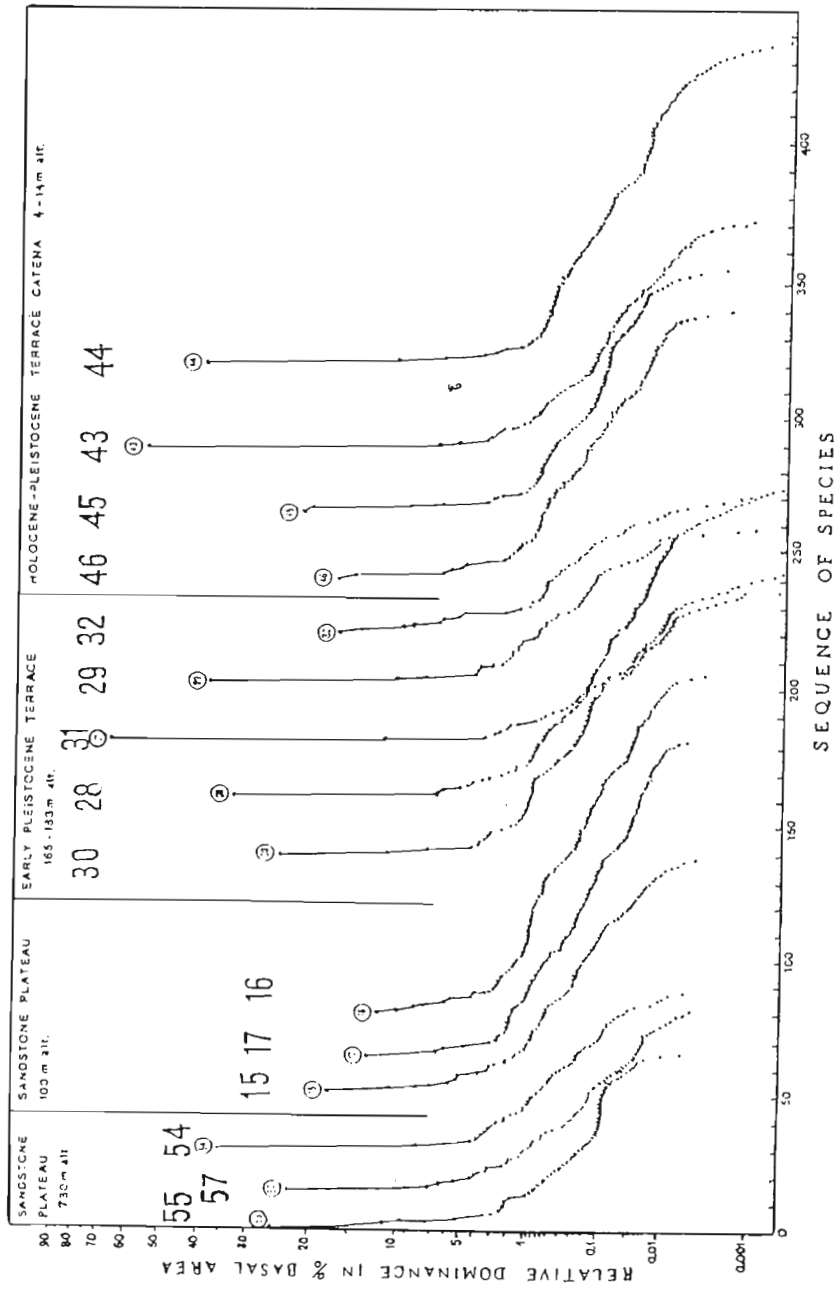


FIGURE 6

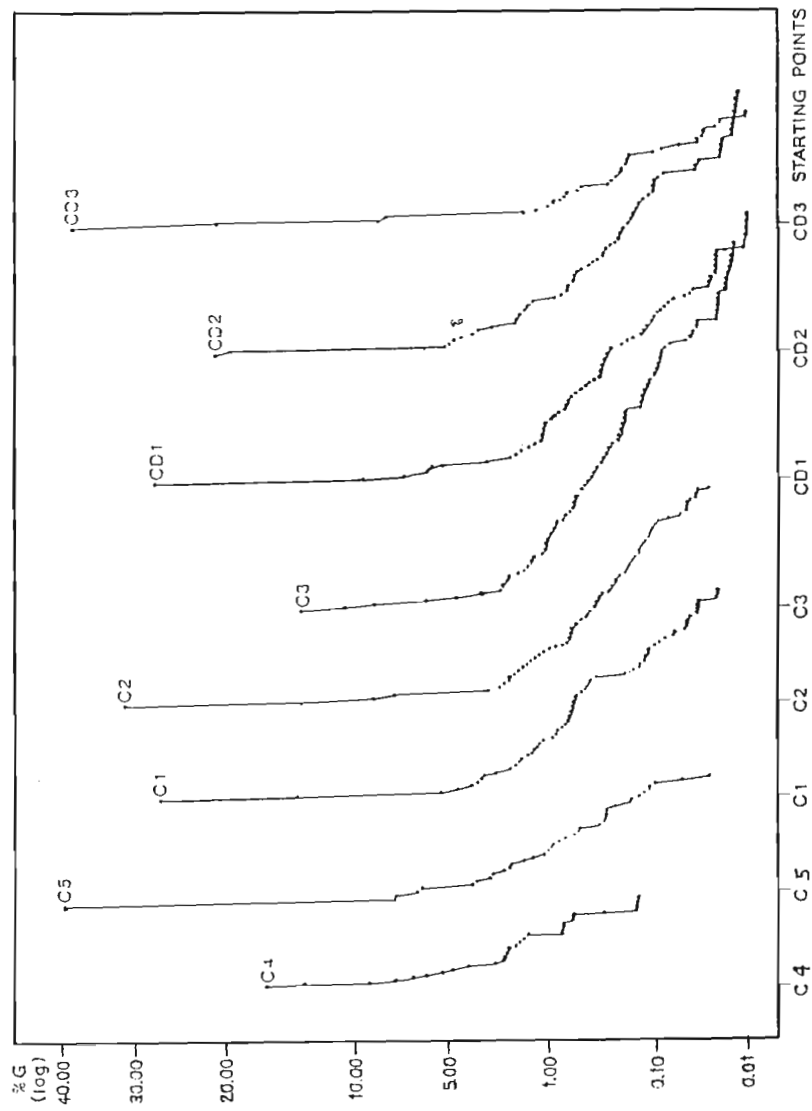


TABLE 1

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TABLE 1

Leaf Size Class (Upper Limit in cm)	Leaf Size Spectra, % of Basal Area of Plot										Mean
	C 5	C 4	C 1	C 2	C 3	CD 1	CD 2	CD 3	Mean China		
Macro (1640)	00.0	00.0	00.0	00.0	00.1	01.1	02.4	00.0	00.3		
Meso (182,25)	00.5	18.6	03.7	05.2	21.9	16.3	27.5	04.5	12.3		
Noco (50.0)	52.3	39.4	39.2	20.0	53.4	37.4	40.2	64.1	43.3		
Micro (20,25)	29.9	39.2	26.5	29.2	15.2	41.7	17.1	10.4	26.2		
Nano (2,25)	00.0	00.0	26.3	30.2	00.0	00.0	00.0	00.0	07.6		
Lepto (9,25)	17.3	02.8	04.4	15.4	09.4	03.6	12.8	21.0	10.8		
Sample Plot	C 5	C 4	C 1	C 2	C 3	CD 1	CD 2	CD 3	Mean China		
Macrophyll	00.0	00.0	00.1	00.1	00.2	03.0	02.0	00.0	00.7		
Mesophyll	08.5	38.7	24.6	23.1	44.6	11.0	40.0	26.5	27.1		
Notophyll	33.2	15.8	45.4	29.8	35.1	35.0	46.0	65.0	38.2		
Microphyll	21.2	36.6	24.1	45.9	13.5	51.0	12.0	08.5	26.6		
Nanophyll	01.1	00.1	00.2	01.1	00.1	00.0	00.0	00.0	00.3		
Leptophyll	36.1	08.8	05.6	00.0	06.5	00.0	00.0	00.0	07.1		

Leaf size spectra in percentage proportion which each class contributes to basal area in sample plots in Hainan (8 plots at the top) and in corresponding plots in Sarawak and Brunei (8 plots at bottom). (Hainan data are from Huang (unpubl.), Sarawak data are from Bruenig, 1966 (EFB) and Ashton, 1964 (PSA)).

C = China; D is for dipterocarp-bearing forest, D 1 + 2 in the southeastern (P 2400 mm) and D 3 in the southwestern (P 1200 mm) part of Hainan.

KF = Kerangas forest and sample plot number

DF = Mixed Dipterocarp forest, 1: mean for Andulau F.R., 2: valley bottom at Belalong, 3: clayey mountain ridge, Belalong (Ashton, 1964, Fig. 37).

TABLE 2

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TABLE 2

Plot No.	Plot Size	Alt.	Soil Texture	N Total	P Total	K Total	Spp.	N/ha	G/ha	V/ha	Crown area/tree	d max (m)	h dom.	h/d range	
C 1	0.30	1000-1340	Sandy loam	4.7	0.273	0.046	1.5	109	5733	64.4	654	3.6	1.5	35	39-485
C 2	0.30	"	Sandy loam	4.7	0.301	0.068	2.08	106	6243	63.14	627	4.11	1.5	35	35-323
C 3	0.36	400-300	Sandy Clay-loam	4.9	0.310	0.071	2.77	145	3936	61.08	691	5.62	1.5	35	63-750
C 4	0.02	1460	Sandy Clay-loam	4.5	0.455	0.077	1.67	38	15900	21.52	40.84	1.02	0.2	10	62-281
C 5	0.06	1190	Loamy Sand	4.8	0.134	0.021	0.57	47	4925	34.80	281	3.14	0.5	25	62-245
CD 1	0.16	470	-	-	-	-	-	94	2462	68.08	661	9.17	1.5	35	36-200
CD 2	0.12	400-300	-	-	-	-	-	95	2500	61.79	576	6.47	1.5	30	17-283
CD 3	0.10	414	-	-	-	-	-	36	2730	76.14	697	8.33	1.5	30	59-123

List of sample plots in Hainan. The minimum diameters at breast height of trees included in the enumeration are < 1 cm in C 1 to C 5 and 10 cm in CD 1 to CD 3.

SHIFTING CULTIVATION AND RESOURCE
DEGRADATION IN SARAWAK:
PERCEPTIONS AND POLICIES*

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The relationship between traditional farming systems and natural resource degradation is a matter of great importance to farmers and governments in many parts of the Third World. It is also an issue which gives rise to considerable controversy. Resource degradation can be defined as a reduction in the capability of a resource to satisfy a particular use (Blaikie and Brookfield 1987:4-10). This definition immediately highlights two reasons why the identification of degradation and its causes in any given case is problematic. First, the complexity of environmental systems makes it extremely difficult to measure changes in "capability" and to trace the factors (natural and human) involved in such changes. For example, the relationship between land management practices, soil erosion and crop yield varies greatly between soil types and climatic zones. Second, the complexity of social systems can make it equally difficult to specify the "use" the resource in question is supposed to satisfy. Almost invariably there will be conflicting views as to the appropriate use for a resource (relating to who uses it, for what purposes, how and when) so that a change in use will be seen by some groups in society as "degradation" while others regard it with indifference or see it as an improvement. These conflicting views can only be resolved through some process of collective choice, that is, politically.

Shifting cultivation has been frequently condemned as inherently destructive of natural resources (e.g. FAO 1957) - so frequently in fact that many accept this verdict as a truism. There can be no question, of course, that forest land utilized for shifting cultivation (or for any form of agriculture) has been diverted at some stage from its original use as natural forest or from its potential use as a source of commercial timber. The appropriateness of using particular tracts of forest land for shifting cultivation is not merely a technical question but depends on past and present social needs and valuations. The generalized criticism of shifting cultivation, however, goes beyond the obvious fact that, at least in its pioneer phase, it involves the felling of primary forest. It is also argued that shifting cultivation results in long-term land degradation, primarily through soil erosion, such that the land's agricultural capability is seriously, perhaps irreversibly impaired. Moreover, this on-damage is usually said to be linked to off-site or "downstream" degradation of both land and water resources.

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In recent years, however, an alternative view has emerged that shifting cultivation, when properly managed, is an ecologically balanced and sustainable system (that is, one that ensures that the agricultural capability of the land is maintained in the long term) and that efforts should be directed to understanding and improving it rather than abolishing it (Nye and Greenland 1960; Spencer 1966; FAO 1974; Goodland and Irwin 1975; Greenland 1975; Clarke 1976; Sanchez 1976; Chin 1977; Kunstadter *et al.* 1978; Grandstaff 1980, 1981; Dove 1983; von Uexkull 1984). Geertz, in his classic characterization of the shifting cultivation or "swidden" ecosystem in Indonesia, concludes that "despite the fact that secondary forest growth is, at least in the earlier phases of regeneration, notably less luxuriant than primary, if the period of cultivation is not too long and the period of fallow long enough, an equilibrated, nondeteriorating and reasonably productive farming regime (productive in the sense of yield to man) can be sustained..." (1963:23,24). As Eckholm observes, in many tropical areas "no alternative food production system to shifting cultivation has yet proven biologically and economically workable" (1976:139). On this view, shifting cultivation becomes environmentally harmful only when the growth or movement of population places the system under extreme stress. A key point is that "the effects of shifting cultivation are not the same everywhere. The lack of knowledge of the characteristics of the several types has proved the principal obstacle to determining how much shifting cultivation has contributed to ecological problems" (Grandstaff 1981:29). Hence calls from the Man and Biosphere Programme and the United Nations Environmental Programme for "a more informed approach to shifting cultivation, with careful definition of the scope and causes of the real ecological problems involved and an ensuing search for realistic solutions" (Grandstaff 1981:28).

Notwithstanding such calls, shifting cultivation in Sarawak continues to come in for blanket condemnation, not least because it is believed to be highly destructive of natural resources (e.g. Sarawak 1978). Iban farmers in particular are said to be addicted to clearing primary forest, resulting in the rapid and extensive depletion of this resource and of the valuable timber it can yield. Where shifting cultivation is practiced in secondary forest it is considered to be a highly fragile system of land use which readily breaks down when the forest-fallow period is reduced below a critical minimum, frequently said to be 12 or 15 years. Population pressure is supposedly forcing farmers to do just that by enclosing them in a vicious circle in which declining yields resulting from shorter fallow periods necessitate larger annual clearings to meet subsistence requirements, thereby further reducing the fallow period. The end result, said to be widely observed in Sarawak, is degeneration of the vegetative cover into an unproductive scrub or savanna climax, serious soil erosion, siltation of streams and rivers, and increased runoff leading to a higher incidence of flooding. Consequently (it is argued), the extensive areas of land involved in shifting cultivation could be used more profitably (and presumably with less degradation) in other ways, principally for plantation agriculture or commercial forestry.

This paper traces the commercial origins of the view that shifting cultivation in Sarawak is inherently destructive of natural resources, noting the policies and policy recommendations to which this view has given rise. At the same time it evaluates the evidence presented for such a view, finding that it has little or no empirical support. The paper concludes that this negative view of shifting cultivation is biased and suggests what some of the sources of this bias might be. A more open-minded approach is needed if shifting cultivation in Sarawak is to be properly understood and appropriate policies for shifting cultivation developed.

THE EARLY BROOKE PERIOD

The first writer on Sarawak to describe the system of shifting cultivation in any detail was Hugh Low.⁽¹⁾ A botanist by training, Low made his observations within what is now the First Division during the years 1845 to 1847 and published them in his book, Sarawak: Its Inhabitants and Productions, in 1848. Though tending to exaggerate the agricultural and commercial potential of Sarawak, no doubt to impress English investors that the fledgling state of his friend, James Brooke, was worthy of consideration, Low was a careful observer and his account of the shifting cultivation cycle was particularly detailed and (in the light of later research) accurate.

Low's attitude to shifting cultivation was remarkably sympathetic, notwithstanding his belief, held in common with almost all his contemporaries, that it represented a primitive stage along the path of human progress.

Though agriculture is so generally practiced by the Dayaks, they have not made in it so much progress as, from its necessity to their existence, might have been expected. The cause of their never having attained to greater perfection in this art is probably to be found in the immense productiveness of the soil they cultivate, which, with little care beyond the planting of the seed, yields such heavy crops, that the most moderate skill and attention are repaid so amply, that the inducements to improvement, which excite more civilized, but less favoured nations, have no existence here (1848:225).

In short, he saw no economic incentive for Dayak hill farmers to progress beyond shifting cultivation, a perspective more recently given theoretical respectability by Boserup (1966).

Low described the annual firing of the farms, the operation which, for later opponents of shifting cultivation, epitomized the destructiveness of the method, as "a scene of the most majestic beauty, which certainly equals, and probably surpasses, the burning of the grass on the plains of North

America" (1848:226). He derived similar aesthetic satisfaction from observing the farms at the harvest:

About March or April...the padi puts on the beautiful appearance which informs the delighted husbandman of the approach of the reward of his labours. At this season the field of the Dayak presents a more lovely picture to the eye than the farms of Europe. The yellow padi is everywhere relieved by the gaudy flowers of the bayam, a kind of vegetable, which resembles the *Amaranthus*, or prince's feather of our garden, and its large tufts of orange and crimson enhance the beauty of the pleasing scene (1848:230).

This can be contrasted with C.T.C. Grant's disparaging reference to "farms, which, bye-the-bye, are called farms because they occasionally produce rice, not because they bear the smallest resemblance to what we have been used to call by that name" (1864:28).

But it was not only the dramatic visual aspects of shifting cultivation which impressed Low. He clearly recognized the ecological rationale of the system in terms of nutrient cycling, referring to "the fertilizing properties of the burnt wood" (1848:227) and "the trunks of the large trees, which are now allowed to decay in the field, fertilizing it as they crumble into the earth" (1848:228). He also emphasized the crucial relationship between the labour requirement for weeding and the decision to shift to another plot, as the following passage demonstrates:

Every year the series of operations above detailed is repeated; the soil, perhaps, being exhausted by the enormous crop it sometimes produces in favourable seasons...The Dyaks themselves, however, do not suppose that the soil is in any way incapable of bearing further culture; but give always as a reason for deserting their farms, that the weeds and grass which immediately spring up after the padi has been gathered, are less easily eradicated, than ground occupied by old jungle is prepared. They never return to the same spot until after a period of seven years has elapsed, which they say was a custom of their ancestors; and then they find that the trees, which have, during that time, covered the ground, to the destruction of the deleterious *alang* grass and other weeds, are easily felled, and the ground prepared (1848:231,232).

These comments succinctly summarize the economic logic of shifting cultivation.

Low recognized that shifting cultivators had a preference for primary forest, stating that the crops from secondary-growth land "are not so abundant as those from the *utan tuah*, or old forest, which in consequence is, notwithstanding the greater proportionate amount of labour requisite to

bring it under cultivation, always, when procurable, preferred" (1848:232). Nevertheless he did not infer from this, as many later writers did, that shifting cultivators only cleared primary forest. "In parts of the forest more populous than others, it frequently happens that the Dyaks have not, in their territory, old jungle; or it is at such a distance from their houses, that the labour of carrying the produce to them would be very oppressive in a country where the services of no domestic animal are available for this purpose" (1848:227). It was in such circumstances that a carefully managed forest-fallow cycle as described above, with one year of cropping followed by at least seven years' fallow, became the dominant production system.

Low's "matter-of-fact" view of shifting cultivation was echoed in the passing references of other writers of the period, including James Brooke (in Mundy 1848), Spenser St. John (1862), Charles Brooke (1866), Alfred Wallace (1869), and Low's son, Hugh Brooke Low (in Roth 1896), though without the same sense of appreciation evinced by Low himself. This tolerant attitude was no doubt conditioned by the fact that shifting cultivation kept Sarawak as a whole self-sufficient in rice until the 1870's (when growth of the largely non-rice-growing Chinese population created a need for imports). More important, perhaps, was the apparent abundance of land, particularly forested land, and the Brookes' reluctance to promote plantation agriculture, hence the absence of any perceived conflict of interest with regard to land use.

Pringle writes of Charles Brooke that "the Rajah's personal familiarity with the Iban way of life disposed him to sympathize with the shifting cultivator's hunger for new land." Although "to a certain extent he did deplore the destruction of the forest... he seems generally to have regarded the land of Sarawak as an endless ocean which would never run dry" (1970:277). It is true the Brookes sought at various times to restrict Iban migration into virgin areas and eventually introduced a system of markers (pak) in the headwaters of certain streams, beyond which settlement was illegal. However, this was largely to maintain political control and was not primarily motivated by a desire to conserve the forest or prevent environmental degradation.(2)

The Brookes' view of shifting cultivation was not that it was environmentally destructive but that it was inefficient relative to other more intensive systems of smallholder agriculture. In a set of instructions issued to Residents in 1876, Charles Brooke urged the need to reserve virgin forest on hills, not for environmental reasons but "with a view of encouraging other cultures at a future day" cited in Porter 1967:39). Thus Brooke attitudes were not opposed to the felling of forest as such; on the contrary, they regarded forest land as ripe for the agricultural development, particularly by Chinese smallholders. Commenting on the first rajah's proposals for Chinese immigration, Charles Brooke wrote in 1867: "We want population to turn our wasteland into shape and create bustle and industry...[I want] to

see the jungle falling right and left and people settled over what are now lonely wastes and turning them into cultivated lands."(3)

From the Brookes' point of view, Chinese agriculture was seen as vastly superior to shifting cultivation. Charles Brooke wrote in the Sarawak Gazette in 1915:

Anyone who takes the trouble to study the difference of cultivation between Dayaks and Chinese will easily arrive at the conclusion that one Chinese garden is of more value to the country than fifty Dayak holdings, the former occupying permanently a plot of land from one to two acres in extent on which the gardener and his family live and it is hoped will continue to do so for many generations (cited in Crisswell 1978:139).

In line with this view, the second rajah issued an order in 1875 which allowed "squatters" to occupy without interference land cleared and abandoned by others (Porter 1967:37). The preamble to the order stated that "it is common practice among the native communities (sic) to make large clearings of old jungle, and afterwards abandon them." The order was apparently intended to make provision for the increasing number of Chinese and other immigrant farmers taking up land around Kuching, hence it would have had little effect on the majority of shifting cultivators in other parts of the country. However, as Porter remarks, the order "suggests a curious misunderstanding on the part of the Government, not simply of the practices permitted under native customary law but also of the biological demands the practices made on the land" (1967:37). This view of shifting cultivation was carried through into the judgments of the Second Division Resident's court, where it became the convention that hill land fallowed for more than seven years was considered "abandoned" and hence available for others to use with impunity (Cramb 1987), though, as reported by Low (1848), a seven-year fallow was considered by farmers to be the minimum fallow period required.

Such misunderstanding of shifting cultivation only became serious with the establishment of a number of Foochow farming settlements in the lower Rejang from 1901. The preference of the Foochow for clearing secondary growth rather than primary forest and their lack of any concept of farming which did not involve continuous cultivation led them to encroach on land which Iban shifting cultivators regarded as merely under forest-fallow and hence still subject to valid claims. The resulting tensions peaked in 1925 with the outbreak of violence in the Binatang area. As Pringle remarks:

The Binatang incident of 1925 was only one spectacular symptom of a more basic problem, that of accommodating large numbers of Chinese farmers in a country of shifting cultivators. The Second Rajah had clearly underestimated the political and administrative difficulties which

this would entail. That he should have done so is not altogether surprising...[E]ven today, when the population of Sarawak has greatly increased, it is easy to view the seemingly almost empty landscape and conclude that there must still be more than enough land for all (1970:313).

In other words, a genuine misunderstanding of shifting cultivation had led to conflict of interests over land use. This was perhaps the beginning of a cycle in which conflicts of interest reinforced the predisposition to view shifting cultivation in a negative light.

THE LATE BROOKE PERIOD

By the last decades of Brooke rule the view began to emerge that shifting cultivation was not only uneconomic relative to more intensive farming techniques but that it had adverse external effects as well which should be controlled primarily through the creation of forest reserves. An important and outspoken critic of shifting cultivation at this time (as well as in the early colonial period) was B. J. C. Spurway. In a paper presented at the Third Malayan Forest Conference in 1937, Spurway, who was then a Divisional Forest Officer and later became Conservator of Forest,(4) offered the opinion that "in the development of primitive countries the removal of the forest follows a natural course through the ignorance of the inhabitants. With the establishment of stable conditions, legislation to control uneconomic inroads into forest resources is too often absent from administrative policy" (1937:124).

Spurway subscribed to the belief that shifting cultivation in Sarawak was a "linear-shift" rather than a "cyclic-shift" system:(5) "Unless there is local restriction, when a community has destroyed the adjacent forest, it moves on to virgin forest elsewhere and will eventually migrate to another river or district. From this it will be realized that the stabilization particularly of the Iban population and the control of shifting cultivation is a matter of great urgency" (1937:125). In line with this view he asserted that secondary forest had no economic value: "It is in the dry inland areas that large tracts of country have been denuded of the original forest, which has been replaced by secondary growth composed of useless species" (1937:125). It cannot be denied that the Iban in particular had expanded their frontiers dramatically in the preceding century and that at the time of Spurway's remarks pioneer expansion into the Baleh tributary of the Rejang had been underway for scarcely 15 years (Pringle 1970; Freeman 1970). Nevertheless, Spurway ignored the obvious fact that, almost without exception, secondary forest resulting from shifting cultivation was still actively utilized in a cyclic, forest-fallow system.

Apart from the loss of valuable primary forest, Spurway emphasized the supposed indirect effects of clearing land for shifting cultivation, namely, increased soil erosion and run-off:

The signs of physical deterioration, if they are observed, are probably not attributed to their proper source. Since the farms lie completely exposed to the incidence of the heaviest rains, the run-off is very great and the topsoil is soon removed. A small proportion is carried down to the valleys and the riparian strips of the middle reaches of the rivers, but the greater part is carried in suspension to the lower reaches, where it is deposited with the slowing up of the flow. The river channels are being gradually silted up and cannot cope with a normal flow of flood water. The rivers themselves are tending to become wider and shallower. Year by year the banks are being undercut and eroded and large sandbanks forming, which will eventually greatly impede navigation. This is particularly evident already in the river Batang Lupar, in the basin of which there has been intensive disforestation. In the Rejang and Baram rivers, two of the largest in the State, there has been a steady increase in the number and severity of the floods during the last decade (1937:126).

This outcome was attributed to the inferior characteristics of secondary forest: "This secondary growth or damun, to give it its Dayak name, though apparently an effective cover and preventing serious gully formation, does little to hold up the run off. Through the absence of an absorbent layer of humus and the lack of height in its canopy, it cannot perform efficiently the function of high forest in arresting and breaking down heavy rain" (1937:126).

The problem with this exposition is that it cannot have been based on anything other than subjective impressions. The obvious difficulties of distinguishing between naturally occurring rates of erosion and runoff and the additional effects of shifting cultivation, particularly in the absence of any quantitative data, were not addressed. The inferences drawn from the observed structure of secondary forest were also without empirical support (see below).

Finally, Spurway invoked the spectra of a fire-induced deflection of the process of secondary succession towards a savannah climax dominated by Imperata cylindrica. He claimed there is an

increasing danger from fire, which will continue and eventually complete the destruction and deterioration commenced by man. Rain forest as a rule is too humid to burn and the danger from fire is remote. Repeated interference with the succession, however, leads to the establishment of very light growth, which dries out very readily in the event of a short drought. Fire becomes at once an important factor and

when of frequent occurrence rapidly brings about conditions ideal for the establishment of lalang grass (Imperata cylindrica). When lalang becomes established over a large area, that area becomes economically the equivalent of a desert (1937:126,127).

Once again, however, this outcome was entirely speculative in the Sarawak context where even today extensive areas of grassland created by shifting cultivation are rare.

These views, however, were considered authoritative and became part of the conventional wisdom of both Brooke and colonial government officers. In particular, they were reflected in an important internal review of Sarawak's administration, known as the Blue Report, written by C.D. Le Gros Clark in 1935. In considering past failure to establish extensive forest reserves, Clark wrote that "this lack of encouragement [for creating reserves] has probably been due to two main causes: (1) A reluctance to interfere with the customary shifting cultivation habits of the Dayaks; (2) The wish to avoid friction with the natives by restricting in any way their rights of entry into the forests for the taking of jungle produce and for the working of timber in a small way" (1935:29).(6)

Rather than follow "our present policy of non-interference," Clark recommended that

legislation should be introduced to confine the operations of the shifting farmer to secondary forest ... Forest areas should be classified, and a policy laid down putting aside suitable areas for agriculture ... Villages should be encouraged to demarcate Communal Forests, which would be permanently maintained and from which they would secure their requirements free of charge ... Having classified all forest areas, legislation should then be introduced to prohibit the felling of virgin forest except for permanent forms of agriculture (1935:31).

In his view, "the solution of the Dayak problem must be sought in the gradual conversion of the Dayak into a permanent cultivator of the land" (1935:47). If expert reports on the suitability of interior areas for permanent cultivation proved unfavourable, he argued, "we should not hesitate to move the Dayaks into areas down-river where the soil is more suitable and they can live in more settled conditions of agriculture" (1935:50).(7)

Clark's obviously sensible recommendation to expand the previously very limited area of reserved forest was implemented by the government. The total area of forest reserves, which had stabilized at 1.2 per cent of the state's land area by 1934, was increased to 5.5 percent by 1940.(8) However, the second and more radical strategy advocated by the Blue Report—the planned resettlement of shifting cultivators—was not taken up, though it was

repeatedly advocated as the primary solution to shifting cultivation in subsequent decades.

THE COLONIAL PERIOD

The hostile attitude to shifting cultivation which had emerged in the late Brooke period became entrenched in the British colonial period (1946-63). In 1949, Spurway, as Conservator of Forests in the colonial government, took part in a reconnaissance flight over the interior of Sarawak along with the Director of Agriculture and the Director of Lands and Survey. In their report the three heads emphasized the problems of forest, soil and water conservation caused by shifting cultivation. "The appalling devastation caused by shifting hill-cultivation is most impressive ... Iban hill-cultivation is spreading at an alarming rate into the headwaters of the Rejang system. Land in the vicinity of the longhouse was said to be 'grossly overworked' and 'no attempt is being made to observe a reasonable bush fallow period.' The report asserted that 'if shifting cultivation continues in its present form and on its present scale in this area [Upper Rejang] a great deal of the agricultural land in the Middle and Lower Rejang will become untenable owing to flooding in the very near future.'" With regard to the Lupat drainage system in the Second Division, the report observed that "the country in the upper Skrang and Lemanak streams is a nightmare of lalang and from a height of 3,000 feet, is reminiscent of the South Downs of England, with Dayak, houses scattered about like cattle sheds."(9) Spurway also reported on this aerial reconnaissance in the Malayan Forester, claiming that "in the more accessible forest areas, it was once more conclusively proved that the Iban or Sea Dayak with his method of shifting cultivation is the major forest pest of Sarawak."(10)

After a similar flight over the upper reaches of the Kemena River in 1952, Spurway's successor, F.G. Browne, claimed that "the spread of shifting cultivation and soil degradation can be all too easily observed."(11) It is clear, however, that what these commentators could have actually seen from the air was secondary growth and that from this they inferred forest degradation, soil erosion, siltation and flooding, based on their prior perception that shifting cultivation was environmentally destructive. More recent experience with aerial reconnaissance (at a considerably lower altitude) and the interpretation of aerial photographs suggests that it is extremely difficult to discriminate more than three types of fallow growth (based on tone and texture), namely, very young secondary vegetation (within three years or so of cultivation), young secondary forest, and older forest. As these represent successive stages of forest regeneration, any conclusion about over-cultivation would have to be based on estimates of the relative extent of each type of growth, correlated with field studies to discover the normal rate of transition from one to the other. It is highly doubtful, therefore, that th

earlier reconnaissance flights could have revealed the extensive degradation described.

Another prominent critic of shifting cultivation in the colonial government was B. E. Smythies, who also became Conservator of Forests. He wrote an article for the Sarawak Gazette in 1949 entitled "Tomorrow to Fresh Woods and Pastures New: A Policy for Shifting Cultivation" in which he stated his view that "the farming is irrational and there is little evidence of planning for more than one year ahead." According to him, "shifting cultivation ... as practiced by the Iban ... has devastated the soil over large tracts of the Second and Third Divisions." Smythies made reference to the view that shifting cultivation was viable if an adequate fallow period could be maintained and introduced the figure of 15 years which Freeman (1955) later adopted as a standard (see below). "There is no direct evidence on this point, but from observation of methods in other countries (12) it is generally agreed that a rotation of 15 years is permissible." Nevertheless, there was sufficient uncertainty on this point for him to accept a ten-year cycle as a safe minimum. He concluded his analysis: "Here then is the crux: to impose 10-year rotational farming on to the pattern of haphazard, irrational, magic-controlled farming that is now practiced." This characterization of shifting cultivation was completely at odds with the findings of field studies, beginning with that of Low, which show that pioneer shifting cultivation everywhere phases into a carefully managed cyclic system along the exact lines advocated by Smythies.

The policy suggested by Smythies involved a ten-year plan. In the first five years this would entail (1) a census of secondary-forest land using aerial photography; (2) research into soils, erosion, ecology, etc.; (3) development of wet rice cultivation in local swamps; (4) prevention of migration to "fresh woods" by boundary markers (pak) or "something stricter". In the second five years he envisaged (1) raising the rotation to ten years by administrative control or, in overpopulated areas, by transferring sufficient longhouses to "pastures new" in the Fourth and Fifth Divisions or by developing sufficient wet rice cultivation in adjacent swamps; (2) where the ten-year rotation had been achieved, reclaiming degraded lands by compulsory planting of fast-growing trees; (3) experimentation with animal husbandry, cultivation of crops using animal manure, and terraced cultivation; (4) if emergency demanded it, limited migration to "fresh woods" under government control.

Though the colonial government was opposed to shifting cultivation as such, the primary concern was with Iban shifting cultivation, the Iban being the most numerous and widely dispersed hill farmers in the state. The view, already held by Spurway, Smythies and others within the colonial service, that the Iban were semi-nomadic shifting cultivators who "seriously over-cultivate" the soil, have "a warrior's view of natural resources as plunder to be taken" and display a "superior indifference toward agri-

cultural proficiency" (Geertz 1963:27) was given wider currency and academic respectability by J. D. Freeman's (1955, 1970) anthropological report on the Baleh Iban. Though the detailed evidence presented by Freeman indicated a pattern of land use in transition from pioneer to established shifting cultivation, his more general statements depicted the Iban system of shifting cultivation as a prodigal devouring of virgin forest which leaves in its wake vast tracts of degraded and abandoned land. According to him, "the main incentive behind the remarkable migrations of the Iban has been a desire to exploit new tracts of primeval forest, and the tendency has been for communities to abandon their land as soon as a few lucrative harvests have been reaped, and move on to fresh precincts" (1970:76). In Freeman's view, "their whole policy was to exploit the stored-up fertility of virgin land by extracting from it two or three successive crops, and then to move on to fresh fields" (1970:151).

It is, however, difficult to see why the Iban, for whom "land is of pre-eminent importance" (Freeman 1970:283), should have knowingly destroyed its usefulness to them within a few short years. As Freeman rightly stated, "land is wealth, and upon its land holdings depend the prosperity and indeed, the very subsistence of a bilek-family [household]" (1970:283). That in the Second Division Iban shifting cultivation has proved a sustainable system of land use for three to four hundred years, and that no large area of Iban settlement in Sarawak has been voluntarily abandoned by them, seems a clear indication that, in Padoch's words, Iban land use is "not predicated on constant migration" and that "the natural resources of these [long-settled] areas have not been 'exhausted'" (1982:10-11).

Crucial to Freeman's argument was the assumption that Iban crop-fallow sequences led inexorably to forest degradation. Freeman's investigations revealed that it was normal Iban practice after clearing and farming primary forest to make use of at least part of the farm-site for a second successive rice crop (1970:276-305). The vegetation which springs up after the first harvest is called, in the Baleh, krukoh, and to slash and burn this scrub in order to plant rice again, Freeman termed krukoh farming. Although sometimes the whole of a farm would be cultivated for two years in succession, "the much more common system is to replant only about one-half of the old farm, and to make up the desired acreage by felling a further area of virgin forest" (Freeman 1970:284).

This method of partially overlapping the current year's farm with the previous year's farm enabled a household to make steady progress in felling primary forest without unduly straining its limited labour force. Further, given that primary forest needs a long drying period after it has been felled if it is to burn well, whereas krukoh can be fired after only a brief dry spell, combining the two types of land reduced the risk of a poor crop due to an especially wet year. Most importantly, perhaps, the yield obtained from second-year land was usually as good as or even better than the yield

from a new clearing. Much of the larger timber felled would not be fully burned in the initial firing and hence the nutrients it contained could be made available for crop growth through reburning in second or subsequent years. According to Freeman: "The Iban are fully aware that good virgin land is capable, under favourable conditions, of producing two consecutive crops of the highest quality" (1970:285).(13)

Freeman, however, condemned krukoh farming as a "deleterious practice" which "inflicts permanent injury on the land," and concluded that "if shifting cultivation in Iban pioneer areas is to be stabilized, it is of crucial importance that an attempt should be made to eradicate these prodigal methods" (1970:288, 286, 305). The basis of Freeman's objection was that forest regeneration after two successive burns "is of a markedly different type from that which follows a single crop taken from kampong [primary forest] land. Moreover, this difference persists and is reflected in the inferior quality of the damun [secondary forest] which ultimately results" (1970:301-302). Consequently, in Freeman's view, krukoh farming "has had a most deleterious effect on hundreds of square miles of land" (1970:282). Suttle subsequently made the even stronger claim that "over-cultivation of hill farms and the spread of Imperata cylindrica have created vast 'green deserts' in Sarawak" (1978:22).

Yet examination of aerial photographs and extensive field surveys in hill farming districts have failed to find evidence for this claim (e.g., Cramb and Dian 1979; Cramb 1987b). It is true that taking two successive crops delays the regeneration of the forest, but this does not necessarily mean that the land is permanently "derelict". Freeman used the Iban term, tanah kusi, to mean land which is permanently abandoned as useless. For example, he described a plot which he visited four months after the third successive harvest (an unusually intensive practice) as follows: "[I]t had become derelict (tanah kusi); there was scarcely a tree or shrub other than the common weed kemunting (Melastoma), the rest of the vegetation being composed almost entirely of the grasses, ferns and herbs that constitute the lalang association... [P]robably it will remain permanently in the grip of lalang and associated weeds... In three short seasons--and for very small return--Iban prodigality had reduced moderately productive land to a weed-infested waste" (1970:304).

This conclusion, however, was entirely speculative. Recent forestry studies in the Saribas have revealed that an association of Melastoma malabathricum and various herbs, ferns, and grasses, including the formidable lalang (Imperata cylindrica), invariably occurs at the beginning of the succession to secondary forest (Chai et al., n.d.). The light-demanding Melastoma appears to shade out the grasses, thereby permitting other tree species to become established, before itself being shaded out by these more vigorous species. Certainly land under Melastoma is temporarily "exhausted," in the sense that it cannot sustain immediate further cropping,

but, in general, this merely means that an extended fallow period, in which secondary forest becomes established, is required to restore the soil's productivity.[14]. Moreover, there are indications that, if left undisturbed such secondary forest will eventually succeed to its original climax (cf. United Nations, 1978: 216-232).[15]

If Freeman was correct in saying that "krukoh farming is a time-honoured Iban custom" (1970:282) then the long-settled Saribas and Lupar basins would have been subjected to the same form of land use during their pioneer phase. Nevertheless, established shifting cultivation has proved viable there for centuries, and only in the post-war period, with the pressure of population growth, is it coming under obvious stress in some upriver regions. That krukoh farming was indeed standard Iban practice in the Saribas and elsewhere is strongly suggested by present land use patterns when old secondary forest or senile rubber gardens are felled for hill rice. Almost invariably, two successive crops will be taken from such land, or three crops in the space of a few years (Cramb 1984). This is simply considered to be prudent farming practice, making the most of the extended fallow period, and is in no way thought to inflict "permanent injury" on the land. The normal sequence of secondary succession can be observed on such plots when they are fallowed again.

There seems to be good evidence, then, that a forest cover does establish itself even after krukoh farming, and that, although initially its dominant species are different from the original forest, it is capable of accumulating sufficient nutrients to permit subsequent cropping in a forest-fallow cycle. Moreover, this forest contains many plants of direct use to the Iban and is a favoured haunt of such game as wild pig and deer. It therefore seems inappropriate to talk of "permanent injury" to the land or of "inferior quality" forest. No doubt it is of inferior quality to the forest or the timberman, but it is still of considerable use to the Iban farmers.

A further key assumption in Freeman's analysis of Iban shifting cultivation was that a 12 to 15-year fallow period was the minimum necessary to sustain the system. According to Low, however, as already noted, a stable forest-fallow cycle entailed a single year's cropping followed by a minimum fallow period of around seven years. Brooke Low, perhaps following Low senior, concurred: "After having felled the old jungle and farmed on it once, they leave it for seven years to grow up again, and are then ready to use it a second time" (in Roth 1896:400). Other 19th century writers, referring more to the land Dayak, also mentioned fallow periods of from five to ten years (Bethune 1846; Grant 1864). Low saw the main function of the seven-year minimum fallow as the suppression of weeds. However, more recent evidence from other tropical areas indicates that a fallow period of from five to ten years is also necessary to accumulate sufficient nutrients in the living vegetation and the topsoil to sustain another year of cropping (Sabhasri 1975; Whitmore 1975:230; Clarke 1976; Sanchez 1976:351-354; United Nations

1978). Beyond this period the potential yield curve begins to flatten out, making further fallowing unnecessary from the farmer's point of view. Contemporary Iban farmers in the Saribas still regard a fallow period of seven to ten years as adequate, both to shade out grassy weeds, as Low observed, and to build up the potential yield (though a somewhat longer fallow is considered better still).[16]

In this light, Freeman's oft-cited minimum standard of a 12 to 15-year fallow period, below which serious degradation is supposed to set in, appears excessive. It should be noted that the basis of Freeman's guideline was nothing more than the Sarawak Department of Agriculture's Annual Report for 1949, where "it is laid down that: 'a reasonable bush fallow of say not less than 12 years' should be preserved between successive crops," and the opinion of two colonial officials (one from Burma) "that a cycle of 15 years duration is ideal" (Freeman 1955:79). If anything, a 12 to 15-year fallow may be the maximum desired by farmers rather than the minimum, ensuring maximum regeneration without allowing trees to get too big for easy felling.

Though the methodological problems involved in determining a minimum fallow period (which in any case will vary from site to site) are clearly immense, and hence debate about the desirable length of fallow may seem futile, it is important that inflated figures do not gain credibility as a basis for land use planning. The difference between twelve to fifteen years and seven to ten years in estimating the carrying capacity of a region is crucial, given that it may make the difference between concluding that the region is in equilibrium or is overpopulated, with resettlement the only solution. Freeman in fact calculated the carrying capacity of land under shifting cultivation to be no more than 51 persons per square mile and concluded that "in areas like the Saribas District, there appears to be no alternative but large scale development of wet padi cultivation and extensive re-settlement of the local Dayak population" (1955:81). The tenuous basis for these recommendations can be seen in that, although neither of them has been implemented, there is no indication even thirty years later that the land degradation which Freeman saw as "imminent" has actually occurred (Cramb 1984).[17]

Freeman further recommended that legal sanctions be imposed on such practices as krukoh farming, but only after an intensive propaganda campaign to gain Iban support for such a ban (1955:82,83). The government, however, had already indicated that it favoured a regulative approach, even if enforcement was impractical. In 1949 the Natural Resources Ordinance was passed, setting up a Natural Resources Board with power to order the owner or occupier of any land to adopt those measures considered necessary for the conservation of natural resources, including "the prohibition, restriction or control of the firing, clearing or destruction of vegetation, or the breaking up or clearing of land for any purpose." Failure to carry

out such an order rendered the offender liable to six months' imprisonment and a \$1,000 fine. The Sarawak Annual Report for 1949 regarded the ordinance as "of far-reaching importance to agricultural development in Sarawak," its object being "to control the destructive systems of shifting cultivation." [18] Similarly, the 1951 Report, after the routine condemnation of what it termed "shifting land robbing", remarked that "powers to control and rationalise this practice are now available under the Natural Resources Ordinance." [19]

There is no evidence, however, that the ordinance was ever widely used to regulate shifting cultivation, and indeed, given the government's view that this form of land use was inherently destructive of natural resources, any consistent attempt to enforce the ordinance would have soon filled Sarawak's jails to overflowing. The more significant regulatory policies implemented by the colonial government in respect of shifting cultivation were (1) extension of the area under forest reserves, from five percent of total land area in 1940 to 24 percent in 1960 (Smythies 1961); and (2) a total ban on the felling of primary forest for shifting cultivation, effective from 1958 [20], though these measures too have only been partially enforced. The government also set up an Internal Migration Committee in the late 1950s to coordinate the transfer of Iban shifting cultivators from the Second Division to more sparsely populated regions of the state. The results of this scheme, however, were considered disappointing (Cramb 1988b). In addition, the government introduced the Rubber Planting Scheme for smallholders in 1956, which was seen as "the first major step to break the vicious circle of subsistence dry padi farming which for generations has slowed down worthwhile development." [21] Thus the colonial government's approach included both regulatory measures and the encouragement of an alternative form of land use, albeit one which shifting cultivators themselves had already incorporated in their farming system (Cramb 1988b).

THE CONTEMPORARY PERIOD

The perception of shifting cultivation which dominated thinking in the colonial period and the set of policies resulting from that perception have been carried over largely unchanged into the contemporary period. If anything, the intensity of opposition to shifting cultivation has increased with the rapid spread of commercial logging operations into hill forest areas since the 1970s and the growing emphasis on plantation agriculture in government policy. Contemporary newspaper headlines declare: "Shifting Cultivation Destroys 100,000 Acres of Forest Annually"; "Shifting Cultivation Causes the Loss of 400m in Revenue"; and "Shifting Cultivation is Wiping Out Forest Diversity", though the accompanying articles invariably fail to substantiate these dramatic assertions. [22] In one writer's words, "current attitudes to shifting cultivation were handed down by colonial authorities who did not understand the system ... Today, as then, it is condemned

primarily by those who do not understand it and by those who profit by the exploitation of natural resources in forest areas."(23)

A workshop report produced by the Department of Agriculture in 1978 has exerted a major influence on current thinking about shifting cultivation (Sarawak 1978), yet the report contains numerous unsubstantiated and emotive claims, most of them differing little from Spurway's assertions 40 years earlier. In summarizing the loss of forest revenue attributed to shifting cultivation, the report exclaims that "for every log exported, one log in equivalent goes up in smoke through the activities of the shifting cultivator!" (1978:9-10). Moreover, "if an acceptable solution/alternative to shifting cultivation could be found then ... the roughly two million acres of secondary forest, currently within the shifting cultivation cycle would be released for settled agriculture where appropriate and ultimately, after reclamation, might be used once again for timber exploitation: (1978:10). The report continues:

It would appear that the aforementioned losses are, in their own right, staggering enough but this is by no means the whole picture and widespread destruction of the forest cover has many other effects. Additional and as yet incalculable damage must result from soil erosion and degradation, pollution of waterways and the air (during the burning season), siltation of waterways, damage to fish spawning grounds and downriver flooding (1978:10).

Among its recommendations (which include suggestions for research, extension and land-use planning) the report states that "resettlement of rural people presently engaged in shifting cultivation is seen as possibly the only answer for those conducting this activity in areas which cannot be considered in any way suitable for sustained agricultural use or improvement" (1978:17). Elsewhere the report states "it is clear that nearly 80% of the total State area is unsuitable for commercial or settled agriculture" (1978:4).

As with previous analyses of shifting cultivation, many of the actual claims made in this report can be readily challenged. Firstly, the report grossly exaggerates the extent to which shifting cultivation still involves the felling of primary forest, thereby leading to inflated estimates of the damage to such forest and the loss of timber revenue attributable to this source. In an appendix to the report, Lau and Chung (1978) claim, on the basis of a series of doubtful assumptions, that 60 percent of the area cultivated annually for hill rice is cleared from primary (or mature) forest; yet the results of a number of detailed surveys in pioneer areas contradict this view. Freeman defined an Iban pioneer area as "any hill region in which some of the Iban settlers are still felling and farming primary forest (kampong amat). If this criterion be accepted, pioneer areas may be said to exist in the Kanowit, Kapit, Oya, Mukah, and Bintulu districts, and even in certain of the remote hill districts of the Second Division" (1970:1520).

Freeman (1970:291-292) estimated for his case study community in the Baleh (in Kapit District) that 23.5 percent of the cultivated area was cleared of primary forest in the 1949-50 season, and nine percent in the 1950-51 season. Jiram Sidu (1981) recently surveyed 183 hill rice cultivators from throughout the Baleh and found that, in the 1980-81 season, 18.5 percent of a total of 211 separate farm plots had been cleared of primary forest. Cramb and Dian (1979), in a survey of the inland region of Julau District covering the 1976-77 season, found that 13 percent of a total of 77 plots enumerated had been cleared of primary forest. In a similar survey of the inland regions of the Bintulu and Mukah districts covering the 1977-78 season, they found that 20 percent of a total of 71 farm plots enumerated in the former district, and 17 percent of a total of 41 plots enumerated in the latter, had been cleared of primary forest.

Hence it can be concluded that in areas where pioneer shifting cultivation persists, primary forest accounts for only ten to twenty percent of the annual area cleared. Such areas, however, are not typical of Sarawak as a whole. In most regions (a conservative estimate would be 80 percent) no primary forest is available for shifting cultivation. It seems safe to conclude, therefore, that no more than four percent of the annual hill rice area is cleared of primary forest. This can be estimated at about 5,000 ha (24), less than one tenth of Lau and Chung's figure of 60,735 ha. Hence Lau and Chung's estimates of revenue loss due to shifting cultivation are also inflated by at least a factor of ten.

This is not to deny that shifting cultivators continue to encroach on forest reserves, particularly where timber roads have opened up access, both to recently logged and unlogged land. This problem is sensibly discussed by Lee (1978) in another appendix to the same report. However, such encroachment is simply not an option for the majority of shifting cultivators.

A second area in which the report make dubious claims concerns the response of established shifting cultivation to population pressure. The report asserts that

the shifting cultivation system is an extremely fragile one and easily breaks down under the impact of population pressure. In simple terms, the breakdown of the system can be likened to a vicious circle of events which once underway is extremely hard for the shifting cultivator to escape from. Land and population pressure forces the shifting cultivator to gradually shorten the bush-fallow period of his land. This in its turn leads to lower yields which the shifting cultivator then attempts to compensate for by slashing and burning larger areas annually. In its turn this leads to even lower yields and increased soil erosion problems (1978:2).

Yet no evidence is presented to support this version of events. In fact, the only field study included in the report's appendices (Cramb 1978) completely contradicts the report's conclusions on this score.

This study found that in the Saribas District, one of the more densely populated shifting cultivation areas, the trend in the previous decade had been to reduce the annual area cultivated by each household, thereby maintaining (or even increasing) fallow periods and crop yields in the face of population growth, and to divert labour into the cultivation of cash crops, principally pepper and rubber. Other studies have shown that such strategies have been combined in the past with spatial diversification onto swamp rice lands downriver and cyclic wage migration to urban centres, oil fields and logging camps (Cramb 1988a). The implausibility of farmers "slashing and burning larger areas annually" is readily seen when it is realized that the weeding operation sets an upper limit to the cultivated area one farm household can adequately manage (Freeman 1970). The widespread adoption of herbicide in recent years is only a partial substitute for hand weeding, particularly on larger, steeper farms, and in any case has been used as a labour saving device rather than a means to enlarge the area cultivated (Cramb 1984; 1988b). In many cases the system of land tenure also enables the local community to place a constraint on over-cultivation and prevent the emergence of the "vicious circle" supposedly identified by the report (Cramb 1987a).

Two further claims of the report—that "shifting cultivation is causing serious, long term damage to the fertility and integrity of Sarawak's soils" and that it is "also causing great damage as a result of increased incidences of downriver flooding and inundation and siltation and pollution of water-courses" (1978:1)—are also contradicted by the available evidence. The only erosion trials conducted in Sarawak suggest that, in fact, soil erosion and runoff from land under shifting cultivation are both minimal (Hatch 1982). As Table 1 shows, soil loss and runoff from land under secondary forest are less than under primary forest, totally contradicting a popularly held belief dating back at least as far as Spurway (1937). This result can be explained in terms of the lower height of the canopy in secondary forest and the greater density of the understorey vegetation. Moreover, there appears to be only a slight increase in soil loss and runoff from a cleared field, the lack of any marked change being attributable to the stumps, logs and other plant debris which remain in the field and the quick establishment of a range of crops which act as a low-level canopy. It is interesting to note that both soil loss and runoff are significantly greater on bench terraces—the only alternative to shifting cultivation which has been tested in Sarawak.

TABLE 1
Results of Soil Erosion Trials in
Kuching District, 1981-83

Treatment	Mean Soil Loss (tons/ha)	Mean Runoff** (%)
Primary Forest	0.14	4.86
Secondary Forest	0.05	2.51
Hill Rice Farm*	0.18	2.54
Hill Rice Terraces	0.52	13.93
Bare Plots*	24.67	40.42

Source: Soil Conservation Unit, Department of Agriculture, Kuching.

* One year's results only.

** Mean rainfall was 3498 mm.

Ironically, the suggestion is now being made in some quarters that logging of hill forests is a much more serious cause of land and forest degradation and water pollution than shifting cultivation (Hatch 1982; Sarawak Study Group n.d.). Hatch writes:

In recent years shifting cultivators have been blamed for a whole variety of environmental damaging effects. However, it now seems clear that logging and timber extraction must take a lot of the blame that was previously laid at the door of the shifting cultivator. Not only do traditional logging methods tend to destroy more trees than they harvest but they also lead to serious soil erosion, impeded drainage, siltation and flash flooding. All of the evidence available from studies carried out in Sarawak indicate that few if any of these undesirable effects can be laid at the door of the shifting cultivator (1982:146).

Such statements, however, have received much less publicity than the 1978 report.

The current policies of the government towards shifting cultivation include a continuation of the legislative restrictions on the felling of primary forest (imperfectly enforced) and a major new emphasis on large-scale commercial land development as an alternative to traditional forms of both food production and cash crop production. This land development strategy involves the proposed resettlement of shifting cultivation communities into

centralized townships. Progress in implementing this strategy, however, has been negligible (Cramb and Dixon 1988).

CONCLUSION

Shifting cultivation has been viewed as a primitive and inefficient form of land use since the early Brooke period, but the notion that it produces negative on-site effects which render it inherently destructive of natural resources emerged only in the interwar years. This view has intensified its hold on official opinion in the postwar period, despite the lack of supporting evidence. Indeed, there has been a progressive accumulation of significant evidence to the contrary. The policies advocated and, to varying degrees, implemented as a result of this negative perception have been of two types: (1) regulation of shifting cultivation, for example, through the creation of forest reserves, the placing of a ban on felling primary forest and the prohibition of certain cropping practices; and (2) the encouragement of alternative forms of land use, including wet rice cultivation, smallholder cultivation of cash crops and plantation agriculture, often implying the need for resettlement of the majority of shifting cultivators.

It is important to ask why this view and the associated policies have become so firmly entrenched, given the demonstrable lack of empirical support. Initially, the polemic against shifting cultivation in Sarawak arose from perceptions which were clouded by the cultural bias of European colonial officials. As Pringle writes, "To the average European administrator ... the spectacle of Iban agriculture would have been thoroughly distasteful. Semi-nomadic farming seemed inherently uncivilized to most colonial rulers, and when it resulted in the constant destruction of forest it appeared downright sinful" (1970:277). This biased view was no doubt confirmed by official reports from other British colonies in the markedly different environments of South Asia and Africa (25) and went uncorrected by any critical debate or empirical investigation within Sarawak. Indeed, the anthropological research of Freeman served in part to reinforce the prevailing view. The cultural perspective of Malay and particularly Chinese officials may have been consonant with the European view in this respect. The contemporary world-wide awareness of environmental issues may have added to the feeling with which the earlier concerns have been elaborated in recent years (at least until logging came to be identified as the major environmental concern).

In addition to these cultural biases, however, there is a political bias arising from the need of all governments in Sarawak since the Brooke period to concentrate rural dwellers in accessible locations and link them to government administration and services to facilitate political control; and an economic bias due to the contemporary government's desire to shift public opinion in favour of a development programme based on extensive planta-

tion agriculture and rapid timber exploitation -- two activities which bring the government into conflict with shifting cultivators. Hence perpetuation of the view that shifting cultivation is harmful to society and that restriction and resettlement are therefore justified is clearly in the government's interests. In considering a similar situation in Indonesia, Dove contends that official perceptions are "unconsciously deflected from empirical reality due to political and economic self-interest" (1986:239). Negative perceptions of shifting cultivation therefore constitute "an article of faith, a dogma" which are used to justify programmes of resettlement and agricultural intensification. "The government is then free to put the swidden cultivators' erstwhile territory to alternate use, whether this involves just watershed management or, more commonly, utilization of the land for industrial forestry, plantation agriculture, intensive food crop production, and/or transmigrant settlement" (1986:223).

Thus the perception that shifting cultivation in Sarawak leads inexorably to resource degradation is not based on an accumulation of empirical evidence demonstrating the relationship between shifting cultivation and its supposed on-site and off-site effects. Rather, this perception derives from the cultural biases of the ruling elite and it persists because it serves the interests of the current government's political-economic programme. Though the dogma itself has origins and continuing sources of nourishment (e.g. environmentalism) which are independent of such interests, it is ironic that the negative view of shifting cultivation in Sarawak now serves to rationalize and justify the government's increasingly controversial "development" programme, involving the rapid exploitation of hill forests for timber extraction and the resettlement of shifting cultivators into commercially managed plantations.

NOTES

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1. Low later achieved fame as Colonial Secretary at Labuan and then Resident of Perak.
2. Although "in 1868 he [Charles Brooke] issued an order forbidding Ibans to destroy forest areas containing the valuable ironwood tree" (Crisswell 1978:150).

3. Entry for 21 Feb. 1867, "Extract from the Diary of Charles Brooke"; cited in Pringle (1970:304n)
4. Spurway also served for a time as private secretary to the third rajah (Reece 1982:165n).
5. The terminology is Spencer's (1966).
6. Clark quoted the Senior Forest Officer (almost certainly Spurway) who argued that "the old method of shifting cultivation cannot be economically justified. They are wasteful of human energy, of timber and of soil fertility; they induce erosion and denudation; they encourage silting and flooding of rivers and they bring in returns in no way commensurate with the value of timber destroyed or with the potentiality of land when properly cultivated" (1935:29).
7. They could still make use of the hilly country, however, "to plant secondary crops such as maize, sweet potatoes, pineapples, coffee, sugar canes, tapioca, yams, fruits and spices" (Clark 1935:50).
8. Though the Forest Reservation Order of 1920 provided for the constitution and maintenance of Forest Reserves, by 1932 the total area set aside was 356 square miles, only 1.2 percent of the state's land area (Smythies 1961). Even so, local opposition to the total restriction on access to such forest had led the government to give instructions that no more reserves were to be proposed. By 1940, however, 5.5 percent of the total area had been reserved, including a new category, introduced in 1934, termed Protected Forests, which allowed limited access for hunting and gathering. In 1940, again in line with the Blue Report's proposal, legislation was introduced to provide for a third category of permanent forest, namely Communal Forest.
9. Sarawak Gazette 1949:163, 164.
10. Malayan Forester 12(1949):155.
11. Malayan Forester 15(1952):38.
12. Smythies had been in Burma before coming to Sarawak.
13. A variation on the krukoh system was to take two or three crops within the first five to seven years of felling the primary forest. Contemporary informants in the upper reaches of the Saribas, Kanowit and Lemanak rivers state that the customary practice was to farm a plot of virgin land three or four times, at increasing intervals, and then leave it to a long fallow or plant it with rubber (Field Notes 1979; October 1982, April 1985). In general, the practice was to utilize as much as possible of the

stored-up fertility in a plot of virgin land, thereby getting the best return on the arduous and hazardous work of felling the forest, until the decline in yield and the increase in weed growth made it more profitable in terms of the overall return to labour to move to a fresh plot. It would seem that the nutrient reserves in a plot of primary forest (including both the topsoil and the biomass) were sufficient to sustain several good crops in a relatively short period but that thereafter a longer fallow period was required between each crop if yields were not to decline below an economic level. Research in other tropical areas suggests that this yield trend is related to the progressive decline of soil organic matter towards an equilibrium level associated with a given crop:fallow regime (Nye and Greenland 1960:46-62; Sanchez 1976:368-372). A more intensive regime results in a correspondingly lower equilibrium yield.

14. Smythies, who was Divisional Forest Officer at the time of Freeman's studies, inspected the above-mentioned plot of tanah kusi together with Freeman and wrote: "The ground is now tanah kusi and will be given a rest while some other plot is farmed" (1949:252; emphasis added). The underlined words, which suggest that the land merely needed an extended fallow, were omitted by Freeman (1970:304) when he cited Smythies.
15. As Dove concludes in relation to the Imperata grasslands of Kalimantan (which experiences a drier climate than Sarawak): "In a frequently burned over environment, Imperata is more competitive than most other plants, due to its extensive root system and its quick rate of growth. In the absence of such burning, Imperata grasslands eventually and spontaneously succeed back to forest" (1986:229).
16. Andriess's (n.d.) recent analysis of soil nutrient changes during a 20-year shifting cultivation cycle does nothing to contradict this view, there being little change in measured nutrient levels throughout this period. Andriess concluded that, "as far as chemical fertility is concerned", the fallow period "serves mainly to accumulate sufficient plant nutrients in the living vegetation to sustain one crop." (Emphasis added.) As Andriess's study was confined to soil analysis, he could draw no conclusion about the minimum fallow period. It is therefore incorrect to say, as Hatch does, that Andriess "suggested that a fallow period of twenty years would be sufficient to reinstate the fertility of the soil" (1982:143).
17. Freeman quoted Allan (1949:1) to define land degradation as "a process which results in radical changes in the whole character of the land: loss of mineral foods, oxidation and disappearance of organic matter, breakdown of soil structure, degeneration of vegetation; and the setting up of a new train of land and water relationships."

18. Sarawak Annual Report 1949, pp. 34, 35.
19. Sarawak Annual Report 1951, p. 39.
20. Though the Land Code provided that Native Customary Rights could be acquired after 1 January 1958 by the felling of virgin jungle and the occupation of the land thereby cleared, this was only allowed on Interior Area Land and then only if a permit was obtained from a district officer. Anyone attempting to acquire customary rights without permission was deemed to be in unlawful occupation of crown land (Land Code, Laws of Sarawak, Chapter 81). An administrative circular issued in 1958 instructed district officers not to give permission for the felling of virgin jungle.
21. Sarawak Annual Report 1959, p. 53.
22. Agricultural and Rural Development Program (ARDPRO), Project Proposal, February 1983.
23. *Ibid.*
24. The Department of Agriculture reported that the area planted to hill rice in 1980-81 was 75,000 ha. It is known, however, that this figure is based on field reports of the quantity of seed planted and that a sowing rate of 5 gantangs per acre (29 kg per ha) is assumed in order to calculate the area planted. There is evidence, however, that a sowing rate of 3 gantangs per acre (17 kg per ha) may be more realistic (Cramb 1984), in which case the total planted area would be more like 125,000 ha. As argued in the text, no more than 4 percent of this, or 5,000 ha, is cleared from primary forest.
25. It is significant that Zuraina (1983) notes the emergence of similar views in Malaya in the inter-war years. See Blaikie and Brookfield (1987:110, 111) for a general account of colonial perspectives and policies.

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PROBOSCIS MONKEYS AND
THEIR SWAMP FORESTS IN SARAWAK*

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Proboscis monkeys, endemic to the island of Borneo, are declining in Sarawak. Their mangrove and peat swamp forest habitats are being degraded or destroyed and people continue to hunt them despite their protected status. Surveys between 1984 and 1986 established the status of this monkey and its habitats in this Malaysian state. The author who participated in the surveys, receiving some financial support from the Oryx 100% Fund, discusses the results and makes recommendations for future conservation action.

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Proboscis monkeys *Nasalis larvatus* are endemic to Borneo in South-East Asia and are largely confined to mangrove lowlands (David 1962; Payne et al., 1985). Populations are occasionally found much further inland next to major rivers (Jeffrey 1982; Chivers et al., 1986; MacKinnon 1986; C. W. Marsh, pers. comm.), and there are even less frequent reports of apparently nomadic animals passing briefly through hill forest areas in the Bornean interior (Bennett 1986). They are not resident in the extensive areas of lowland and hill dipterocarp forest throughout most of inland Borneo.

Until recently, no systematic surveys of the species had been conducted, and there were no reliable data on its status. More was known about the animals in the Malaysian state of Sarawak than elsewhere in their range (e.g. Salter and MacKenzie 1985). Indications were that numbers had declined sharply in recent years, but estimates were based on scanty data from few areas. It is not possible to extrapolate these data to estimate numbers in other areas because the occurrence and abundance of proboscis monkeys varies enormously in different patches of swamp forest, even if they appear superficially similar.

Between 1984 and 1986 a series of surveys of the proboscis monkey and its habitats was conducted in Sarawak in order to determine their status, to predict future trends, and to make recommendations to ensure their survival in this part of Borneo.

THE SURVEYS

Two types of survey were conducted. Firstly the availability of possible proboscis monkey habitat was assessed by flying a small helicopter or light aircraft over the peat swamp and mangrove forests in the coastal plain. Within these potential habitats, areas that were large enough to contain potentially viable populations of proboscis monkeys were identified. Since proboscis monkeys have home ranges of at least 9 sq. km (Bennett 1986), these areas had to contain an absolute minimum of 10 sq. km of relatively intact forest. Once they had been identified from the air, each was surveyed by boat to discover whether proboscis monkeys occurred there, and if so the approximate size of each population. Proboscis monkeys invariably sleep next to rivers every night (Bennett 1986). It is possible, therefore, to establish their presence in an area and to obtain a rough index of abundance by going along the rivers immediately before dusk and after dawn, and counting the number of proboscis monkeys encountered (both individuals and groups) (for details of methods see Bennett, 1986).

STATUS OF THE HABITATS

Peat swamp forests are widespread in Sarawak, occupying approximately 14,736 sq. km or 11.9 per cent of the land area. They were, however, among the first areas to be logged. Mechanical logging started in 1947 and,

for many years after that, peat swamp forests were the State's major source of timber. By 1979, almost all peat swamp forests had been licensed for timber extraction (Lee 1981), and by the year 2000 they will all have been logged (Chan et al. 1985).

Logging of peat swamps is generally less damaging to the soil than logging in dipterocarp forests, largely because logs are removed on railway tracks rather than roads. This requires a narrower path through the forest, and also causes less soil compaction. Regeneration is slow, however (Chan et al., 1985). Mixed species stands, presumably the best for wildlife, regenerate better than pure stands. Regenerated forest will not be as productive as the first cut (Forest Department, pers. comm., in Chan et al., 1985), and the long-term effect of logging on wildlife in peat swamps is totally unstudied. In some areas of logged peat swamp forest, proboscis monkeys survive at relatively high densities (e.g., in Tanjung Puting National Park, Kalimantan). It is not known if this is a short-term phenomenon, or dependent on proximity to a primary forest 'reservoir'.

Another problem is that, in Sarawak, some peat swamp forests are subjected to silvicultural treatment following logging. This involves poisoning non-timber trees (many of which are important food sources for mammals and birds) with the aim of increasing timber yield on the second cut. This is likely to render the forest uninhabitable for many species of wildlife, including the proboscis monkey.

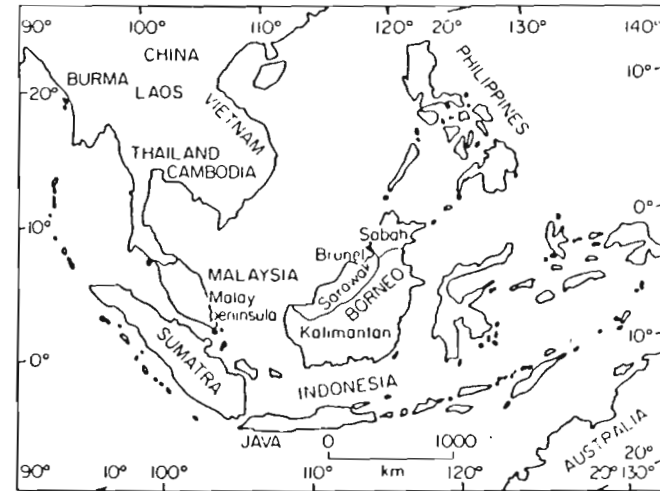


Figure 1. South-East Asia, showing the major geographical and political regions.

However, it is difficult and expensive to convert forest growing on deep peat to agriculture (Anon 1976). Where the peat is shallower, swamp forest has been converted to rice and pineapple fields, and coconut and sago plantations. So far this has only taken place on a relatively small scale, but with the advent of comprehensive rural development schemes in certain areas, peat swamp is likely to be converted to agriculture on a wider scale in the near future (Chan et al., 1985).

Mangroves are more limited in extent than peat swamps, occupying only 738 sq. km or 1.4 per cent of Sarawak's land area. Mangroves have been used in many traditional ways for a long time. The main products extracted have been poles for construction, firewood and the production of charcoal: fronds of the nipa palm for making thatch; sugar from nipa flower stems for producing alcohol; and tannin from the sap of mangrove trees for waterproofing fishing nets (Chai 1982; Gervis 1986). In addition, the mangroves support major inshore and offshore fisheries; many species of fish and prawns are dependent on food and shelter from the mangroves for all or part of their life-cycle (Whitten et al., 1984; Chan et al., 1985; Kam and Leong 1985; Gervis 1986). All of these uses, if carefully controlled, are fully compatible with the continued existence of the mangrove forests and their wildlife.

Since 1969, however, commercial exploitation of mangroves has proceeded at a great rate, mainly to provide woodchips for export to Japan, and also cordwood for export to Taiwan (Chai 1982). The minimum legal felling girth for timber extraction in mangroves is 23 cm, but up to 90 per cent of all trees are larger than this, so areas are virtually clear felled (Chai and Lai 1980). As a result, approximately 20 sq. km are lost each year to woodchip production (Gervis 1986). Regeneration is negligible in heavily logged areas because few mature trees are left to supply seeds and suitable environmental conditions. (Chai and Lai 1980; Chan 1984). The Forest Department has replanted some areas and conducted experiments in improving regeneration but, so far, with limited success (Chai and Lai 1980).

Some of the few remaining patches of relatively intact mangroves are under threat from commercial aquaculture schemes. These involve total clearance of an intact area of mangrove and the building of ponds in which fish or prawns are reared. Such ponds have a high failure rate due to acidic soil conditions (Ong 1982; Kam and Leong 1985). Moreover, the natural fisheries productivity of mangroves is unlikely to be matched by that of prawn culture within the area (Ong 1982). In Sumatra, for example, a coastal fishpond produces 187 kg of fish/ha/year, but a loss of 1 ha of mangrove to a pond leads to a net loss of 480 kg of offshore fish and shrimp/ha/year (Whitten et al. 1984).

The overall effect of these changes is that the area of habitat for the proboscis monkeys in Sarawak has been depleted severely in recent years.

Remaining areas large enough to contain potentially viable populations are listed below (see Figure 2).

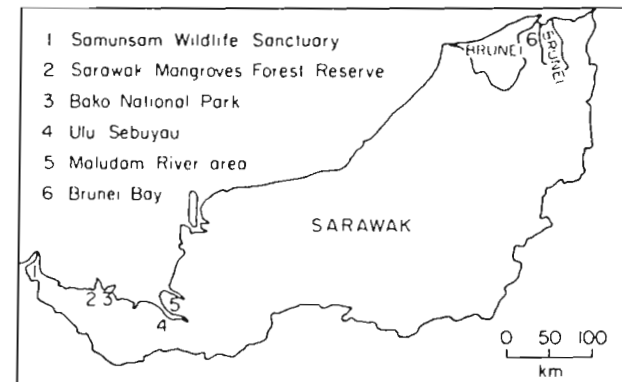


Figure 2. Sarawak, showing the main centres of population of the proboscis monkeys.

Samunsam Wildlife Sanctuary and environs, a totally protected area of 60.9 sq. km and surrounding forest. The area comprises a mixture of mangrove, riverine, health and lowland forests.

The Sarawak Mangroves Forest Reserve, a mangrove area exploited for traditional products and commercial poles. If carefully controlled, these can continue to be collected on a sustained-yield basis without unduly harming the wildlife. Clear-felling for an aquaculture scheme threatens 12 per cent of the 131 sq. km forest reserve.

Bako National Park and environs, a totally protected 24 sq. km area of mangrove, health and lowland forests.

The Maludam River area, a peat swamp forest of 434 sq. km. This is being selectively logged on a 25-year cycle, and non-timber trees are being poisoned after logging.

The mangroves of Brunei Bay, a large area of mangroves, traversing the boundary between Sarawak and Brunei Darussalam. The sections in Sarawak are under threat from commercial and coconut schemes.

Other patches of intact habitat do remain, but they are probably too small to contain viable populations of proboscis monkeys.

STATUS OF THE PROBOSCIS MONKEYS

The major cause of the recent decline in the number of proboscis monkeys in Sarawak has undoubtedly been habitat destruction. An additional problem in some of the remaining areas had been hunting. In the inland areas of Sarawak rural people are strongly dependent on hunting wild meat for much of their protein supply (Caldecott 1986). In mangrove areas, however, hunting is predominantly for sport, by townfolk who enter the area in speedboats. The proboscis monkeys' habit of sleeping next to rivers makes them extremely vulnerable to hunters, and this has reduced numbers considerably in some areas. Such hunting is illegal because the species is totally protected by law.

The only areas with sizeable populations of proboscis monkeys remaining in Sarawak are Samunsam (approximately 160 animals), Maludam (maybe up to 200 animals), Sarawak Mangroves area (population unknown but certainly not more than 200 animals; this could increase if hunting were stopped) and Bako National Park (106-144 animals; Salter and MacKenzie 1985). The population in Brunei Bay is divided between Sarawak and Brunei, and it is impossible to determine the number of living exclusively in Sarawak. There are probably no more than 300 animals in the whole Brunei Bay area, and the Sarawak population is almost certainly less than half of the total. In about 1979, there was a population of up to 200 individuals in Ulu Sebuyau, (Figure 2), but they are likely to have been subjected to hunting pressure and their current status is unknown (Banggan Empulu, pers. comm.; Jawa bin Bakar, pers. comm.). There are undoubtedly other pockets of population elsewhere, but they are certainly extremely small and unlikely to be viable.

These figures are highly provisional and must be treated with extreme caution, but it seems likely that the total population of proboscis monkeys in Sarawak might be as low as 1000 individuals. This is bound to decrease unless action is taken. The only populations that are protected are those in Samunsam Wildlife Sanctuary and Bako National Park. The survival of neither of these is fully assured: both are too small at present to guarantee that they could contain a viable population if isolated (Bennett 1986). The overall conclusion must be that proboscis monkeys are endangered in Sarawak, and that immediate steps need to be taken to guarantee their survival.

CONSERVATION IMPLICATIONS

Three main spheres of action are required to ensure the survival of proboscis monkeys in Sarawak: protection of more areas of habitat; enforcement of anti-hunting laws; and increasing public awareness about the value of the animals and their habitats.

In terms of protected areas, the Sarawak Forest Department established Samunsam Wildlife Sanctuary in 1979 specifically to protect its proboscis monkeys. The sanctuary is currently not large enough to protect its population effectively (Bennett 1986), but plans to extend it are already under way (Anon. 1985). The protection of totally new areas is inevitably difficult because of the large number of other pressures on the land: the coastal lowlands are the most heavily populated areas of the state. Centres of population are generally around river mouths and deltas, the main habitats of the proboscis monkeys. In mangrove sites in particular, protecting land exclusively for the preservation of rare animal species is unlikely to prevail against other demands on the area. The only feasible approach is to protect mangrove areas for integrated use by local communities and wildlife alike. Essentially, this means areas would be protected against outsiders logging the area or destroying the mangroves for other schemes. The local residents could continue to fish and extract poles and nipa fronds from certain zones, and protection from outside schemes would guarantee that they could do so. Simultaneously, the habitat would be protected for wildlife. The high natural productivity of mangroves means that they are ideally suited for such integrated use schemes.

Preliminary plans are being made to protect at least one area of mangrove in this way (the Sarawak Mangroves Forest Reserve seems the ideal candidate), and also to protect at least one area of peat swamp forest.

The National Parks and Wildlife Office of the Sarawak Forest Department is also increasing anti-hunting patrols in certain key areas. In addition, it is initiating a major campaign on conservation education. Education on proboscis monkeys, their habitats and the laws protecting them will be integrated into this.

These measures are set against a background of considerable interest in wildlife and its conservation, both amongst members of the public (particularly in rural areas) and members of government. In 1984, for example, a Special Select Committee of the Sarawak Legislative Assembly was set up. Its brief was specifically to look into the problems of declining wildlife in the state. Such interest means that there is at least a good chance of the remaining populations of proboscis monkeys in Sarawak being protected.

As a final note, the status of proboscis monkeys in other parts of their range is largely unknown. Two-thirds of their range lies in Kalimantan (Indonesian Borneo). Considerable areas of swamp forest remain there, but no systematic surveys of proboscis monkeys have ever been conducted. As outlined above, it is impossible to estimate abundance by extrapolating from densities in a few known areas. Surveys are urgently needed to determine their status and the action needed to conserve the animals in these other parts of their range.

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B O R N E O N E W S

REGIONAL NEWS

Long-term Effects of Selective Logging Operations on Vertebrate Populations in Rain Forest

Within a few years, the entire lowland forest of Peninsular Malaysia, and much of Sabah, are likely to be cleared for plantation agriculture, with the exclusion of only a few Reserve areas. However, Peninsular Malaysia plans to retain 41,000 km² of mixed lowland/upland forests, as sustained-yield forestry reserves. This amounts to 31 percent of the original forests of Peninsular Malaysia and 37 percent of the original forests of Sabah. This project forms part of a longer-term research programme investigating the extent to which vertebrates are able to persist in such logging areas, and possibilities for the integration of wildlife conservation and forest management strategies.

The project is being directed by Drs. A. D. Johns and A. G. Marshall (both of Aberdeen University). Fieldwork is being undertaken by Dr. Johns, with the cooperation of the Forest Research Institute Malaysia (in the Peninsula) and the Wildlife Section of the State Forest Department (in Sabah). Funding comes from NERC and the Royal Society. The World Wide Fund for Nature (formerly World Wildlife Fund International) is also participating.

From March to June 1987, studies were conducted in the Tekam Forest Reserve, Peninsular Malaysia, a site of previous studies by Dr. Johns. Data have been extended to cover the initial effects of logging operations on wildlife and their recovery in forests logged up to 12 years previously. It was discovered that the most critical factor affecting the regeneration of both animal and plant communities following logging was the extent and type of damage caused. Logging using tractors causes different forms of damage from logging using overhead cables, and animals respond differently. The greater soil exposure caused by the latter technique, and associated microclimatic changes, can set back regeneration processes at least ten years. This particularly affects terrestrial and understory birds, which rely upon a closed canopy to create the dark and cool conditions in which they forage most efficiently. Most larger mammals and birds, however, are little affected by logging. Primates vary more in abundance through space (i.e. according to local conditions or historical factors) than through time - even

when the time period includes a logging event. Terrestrial browsing species, such as deer or elephants, preferentially use logged forests because of the greater abundance of browse close to the ground. The data set collected from Tekam now represents the most extensive of its kind, and has excited considerable international interest. WWF International published an editorial concerning the project in a major 1987 release on rain forest conservation, and have expressed an interest in supporting further work at the site. Negotiations are currently under way with this organization and with the Forest Research Institute Malaysia aimed at setting up a major collaborative project examining commercial and conservational aspects of forest management.

Since July 1987, Dr. Johns has been based at Danum Valley in Sabah. Dr. Marshall has visited the site twice to discuss the establishment of study areas in this region. Work has so far been directed towards aspects of forest management and wildlife conservation that cannot be addressed satisfactorily at Tekam, Principal among these is the question of proximity to unlogged forest as a controlling factor for animal population recovery. If a logged area close to unlogged forest contains a greater abundance of intolerant understorey species than an equal-aged logged area isolated from primary forest, then outward recolonization is indicated. If they support equal populations, then recolonization must occur from the small unlogged patches that any typical logging area contains (small patches left on steep slopes, along watercourses etc.). Information so far collected suggests the second case. Even small 1-5 hectare patches within logged forest contain high densities of such intolerant species as understorey birds of the babbler and pitta families.

Also scheduled for investigation during 1988 is the persistence of wildlife in forests logged more than once. If the logging cycle is shorter than the time taken for a full diversity of rain forest vegetation to regenerate, which seems certain, then progressive cycles would see progressive and, perhaps, unpredictable changes in the form of forest regeneration and the responses of animals to it. This research is to be conducted in the Silabukan-Lumerau Forest Reserve close to Danum Valley, where forests have already been logged twice or even three times.

Work at Danum Valley is also designed to continue in the long-term. Hopefully, study sites currently being set up can be monitored over many years. Current fieldwork includes a training element; staff from the Sabah Forest Department are being instructed in wildlife survey techniques as part of a collaborative research programme. Expansion into other animal groups is also planned at this site. Work on insects is of particular importance; insects are highly diverse, often highly specialized, generally less mobile; communities are likely to show far more changes over the logging process than do vertebrates. (A. D. Johns, Zoology Dept.)

"The Dayaks: People of the Borneo Rainforest"

"The Dayaks: Peoples of the Borneo Rainforest," the first major American exhibition devoted entirely to the interior peoples of Borneo, known collectively as Dayaks, opened February 25, 1989 at The University Museum of Archaeology and Anthropology, University of Pennsylvania. More than 500 ethnological objects, collected in the late 1890s and given to The University Museum, illustrate selected aspects of Dayak cultures, and present a unique picture of the life of the Dayak peoples nearly a century ago.

Visual highlights of the exhibition include spectacular materials associated with war and headhunting such as fighting caps with feathers of hornbills and argus pheasants, and painted shields decorated with human hair. Ceremonial blankets, jackets and skirts dyed with the *ikat* technique and beaded ritual clothing will also be on display. Sculpture will be represented by groups of masks, carved ritual objects, and architectural pieces. Also featured are objects used by the Dayaks in slash and burn rich cultivation, fishing and hunting, blacksmithing, and domestic life. The late 19th century was a time of booming international trade in the products of the Borneo forests, and the importance and implications of such trade are explored in the exhibition.

The exhibition also features the collectors themselves: William Henry Furness 3rd (1868-1920), Hiram Milliken Hiller (1867-1921), and Alfred Craven Harrison, Jr. (1869-1925). These three "gentleman travellers" from Philadelphia made the collections on trips to Borneo in 1896 and 1897-98. Furness and Harrison belonged to wealthy and prominent Philadelphia families, who financed the expeditions. Photographs made by the collectors and excerpts from their journals are incorporated into the exhibition, which is presented in a style suggesting the period in which the collections were made. Although the three men were not trained in anthropology (a discipline that was yet in its infancy), they undertook to combine with their adventures the mission of collecting information and ethnological specimens from the rapidly changing "primitive" cultures of interior Borneo.

"The Dayaks: Peoples of the Borneo Rainforest" is the first exhibition to occupy the Museum's new Dietrich Gallery. When The University Museum opened in 1899, this space held "Ethnological objects of Asiatic origin." Since then it has been used for such diverse purposes as the Hall of Man, the Performing Arts Gallery, and most recently as a workroom for the Museum's Exhibits staff.

Through the generosity of William B. Dietrich, this section of the southwest wing has been restored as an innovative changing gallery.

Dr. William Davenport, Curator of The University Museum's Oceanian section, and Adria Katz, Keeper of the Oceanian collections, are Co-curators of the exhibition. Virginia Greene is the Museum's Senior Conservator, and John Murray is Exhibit Designer. Funding for the exhibition is provided by a major grant from the National Endowment for the Humanities.

The University Museum of Archaeology and Anthropology, University of Pennsylvania, is located at 33rd and Spruce Streets in Philadelphia. Museum hours are Tuesday through Saturday, 10 a.m. to 4:30 p.m., and Sunday 1 to 5 p.m.; closed Mondays, holidays, and summer Sundays. Admission donation is \$3 for adults; \$1.50 for students and senior citizens; free for Members, University of Pennsylvania faculty, staff and students, and children six and under. For more information, call The University Museum at (215) 898-DIGS.

The Journal of Southeast Asian Studies is updating and expanding its list of book reviewers and also its list of referees for manuscripts. Persons who are willing to be included are encouraged to send their names and addresses, their country, discipline, special interests, and languages of books they can review to:

The Editor
Journal of Southeast Asian Studies
c/o National University of Singapore
10 Kent Ridge Crescent
Singapore 0511

Tropical Rain Forest in South-East Asia: A Pictorial Journey, by Ken Rubeli, is available from The Publisher, Tropical Press, Sdn. Bhd., 29, Jalan Riong, 59100 Kuala Lumpur for Ringgit \$58.00, or from GH Services, Glemham House, Great Glemham, Saxmundham, Suffolk, 1P17 1LP, United Kingdom, for L18.95.

KALIMANTAN NEWS

ANNE SCHILLER is currently in Indonesia as the Director of the Cooperative Southeast Asia Program at IKIP Malang. She plans to be in Central Kalimantan in January, 1989 and in the summer of 1989. Her mailing address is: Anne Schiller, Resident Director, Cooperative Southeast Asia Program, Fakultas Pasca Sarjana, IKIP Malang, Malang 65114, Jatim, Indonesia.

SABAH NEWS

Deaths of Sumatran Rhinos: Six Sumatran rhinoceros Dicerorhinus sumatrensis died in 1987 in Sabah, Malaysia. In March one was captured alive in a pit trap by Sabah Rhinoceros and Wildlife Conservation Committee workers, but it later died. The Committee was ordered to submit a report on how it died. Poachers killed five more in eastern Sabah in April. The total rhino population in Sabah was estimated at about 20 animals before these six deaths were reported. Malayan Naturalist 41:1.

SARAWAK NEWS

HENRY CHAN, a Sibuan Chinese, is a Master of Philosophy student at Institut Pengajian Tinggi (Institute for Advanced Studies) at the University of Malaya. Chan did a two-month graduation exercise on "The Kayan Response to Christianity" at Rumah Kahai, in the Belaga District, and plans to do six to eight months fieldwork for his master's thesis to be entitled, "Regional Development and Land Tenure in Middle Balui of the Belaga District."

JENNIFER ALEXANDER, formerly a Research Fellow in the Department of Anthropology and Comparative Sociology at Macquarie University, Sydney, carried out nine months' fieldwork among the Lahanan of Long Panggai, Belaga District, during 1987-88. The research on social and demographic change was funded by the National Research Fellowships Advisory Committee. She is now a Research Fellow associated with the Comparative Austronesian Study Project in the Anthropology Department, Research School of Pacific Studies at the Australian National University, Canberra. She plans a further fieldtrip at Long Panggai in 1989-90.

BOOK REVIEWS, ABSTRACTS, AND BIBLIOGRAPHY

SMITH, E. D. Counter-Insurgency Operations: 1. Malaya and Borneo (Ian Allan, London, 1985). ISBN 0 7110 1462 0. No Index. 112 pp. Price L9.95. Review by A. V. M. Horton

This is a concise, well-illustrated, tri-service account of counter-insurgency operations in Malaya (1948-60) and Borneo (1962-66). Brigadier Smith, who retired from the British Army in 1973, served in both campaigns, suffering the amputation of an arm (without anaesthetic) in the forests of Borneo.

The writing, although of exemplary military clarity, is very much from the orthodox British point of view. Brigadier Smith makes little attempt to probe deeply the motivation of our opponents.

The chapter devoted to the Brunei Revolt of 1962 is useful, and highlights just how close the Tentara Nasional Kalimantan Utara came to success. With better planning and sharper execution by the rebels before the arrival of British reinforcements from Singapore, "the story of Brunei and the Confrontation that followed would have been very different" (p. 48). (A.V.M Horton, 4 January 1989)

ROUSSEAU, Jérôme. Central Borneo. A Bibliography. Kuching: Sarawak Museum. Special monograph no. 5, 1988.

This bibliography focuses on central Borneo, which can be defined in terms of ecological and socio-cultural factors. Central Borneo is the area from which the Kayan, Mahakam, Murung, Kapuas, Rajang and Baram rivers originate. The core of central Borneo consists of the Apau Kayan, the upper Mahakam, the upper Rajang, and the upper Baram. (With the exception of the Punan Penyawung, the groups of the Murung are part of the distinct cultural area of Kalimantan Tengah). Central Borneo is populated by related ethnic groups, most of whom identify the Apau Kayan as their place of origin. Some of them have moved closer to coastal areas, especially in the Kayan and Baram basins.

The bibliography is a by-product of a comparative study of central Borneo groups (to be published by Oxford University Press), but it does not limit itself to anthropology. After an introduction to the regions and ethnic categories of central Borneo, it is organized in three parts. The introduction is illustrated with 12 maps, which show the location of central Borneo villages around the turn of the century and circa 1970 in the various river basins, and 11 tables, which record the distribution of ethnic categories by region through time. Given that one side of central Borneo is in Sarawak, and the other side in Kalimantan, the literature which deals with it is very scattered. Most references are in English or Dutch, although there are also a number of items in Indonesian, Malay and German; other languages such as Japanese, Russian, Italian, and Scandinavian languages, are represented only by a few references.

i- The main part lists 1700 published references organized into topical sections. At the end of each section a cross-index identifies relevant items in other sections. References are organized under the following categories: 1. General works and articles; 2. Travelogues; 3. The natural environment (Geology; Botany; Zoology; Ecology); 4. General works on specific ethnic groups (Kayan, Busang and Kayanic Bahau; Kenyah;

Kajang and related groups [and the relation between Melanau and Kajang]; Kelabit and related groups; Penihing/Aaheng; Long-Glat/Long-Wai/Modang/Segai/Ga'ai; Nomadic groups; Other cultural Borneo groups); 5. Languages; 6. History (and Prehistory); 7. Material culture and food production; 8. Agriculture and land tenure; 9. Demography; 10. Health; Physical anthropology; 11. Social organization (General; Kinship and marriage; Economy and trade; Ethnicity; Warfare; Relations with groups outside central Borneo); 12. Religion; 13. Art; 14. Oral literature and mythology; 15. Recent changes (General; Timber exploitation; Missionary activities); 16. Material on authors who wrote about Central Borneo; 17. Varia.

- ii- In a second part, 900 monthly reports of administrative officers published in The Sarawak Gazette are listed by region (Third Division; Sibul; Rejang; Lower Rejang; Upper Rejang; Kapit; Belaga; Bintulu; Oya and Dalat; Tatau; Fourth Division; Miri; Baram). This section covers the period 1870 to 1941. These reports are a mine of information.
- iii- The third part describes 600 archival items in various locations (Harrison archives in the Sarawak Museum, Archives of the Ministry of Colonies in the Hague, Manuscripts in the Koninklijk Instituut voor de Tropen in Amsterdam, Nieuwenhuis archives in the Leiden University Library, Archives of the Koninklijk Instituut voor Taal-, Land- en Volkenkunde in Leiden, and various manuscripts).

TILLEMA, H. F. A Journey among the Peoples of Central Borneo in Word and Picture. Edited and with an introduction by Victor T. King. 190 x 250 mm., 300 pages, 200 halftones, maps 0 19 5889363, September 1989, Oxford University Press. S\$75.00.

Hendrik Tillema (1870-1952) was a well-known Dutch writer and traveller who devoted much of his distinguished career as a hygienist to the study of the then Netherlands East Indies, Borneo in particular. To try to fulfil Tillema's ambition to be published in English and to ensure for him a place in the study of culture, Professor King of the University of Hull's Centre for South-East Asian Studies had the happy idea of producing this English edition of Apo-Kajan, Tillema's most important work on Borneo published in 1938, and to illustrate it with over 200 truly remarkable photographs taken by the author himself.

In striking contrast to the sensationalism and extravagances of many popular travel books about Borneo with their headhunters, barebreasted women, orang-utan, Rafflesia, and exotica, Tillema's book, now published as A Journey among the Peoples of Central Borneo in Word and Picture, while also written for a general readership, demonstrates that the author was a serious scholar, much aware of the need to understand Dayak ways of life

in their own terms. His insight and sympathetic portrayal of life and culture all help to produce a deeply fascinating record of Borneo.

But if any excuse was necessary for reviving Apo-Kajan in translation, its accompanying illustrations would surely provide it. They reveal Tillema's considerable skills as a photographer and his many arresting images, in themselves an ethnographic resource, add greatly to the importance of the work as a whole and fully deserve to be made more widely available.

This edition includes a lengthy introduction to the author and his work, a glossary, and bibliographies.

DOVE, Michael R., editor. The Real and Imagined Role of Culture in Development, Honolulu, University of Hawaii Press, i, 289pp., maps, photographs, bibliography, 1988, 0-8248-1080-5

This edited volume challenges explicit and implicit assumptions development agents make about traditional indigenous societies and cultures, viz. that such cultures and lifestyles are impediments to change and symptoms of the maladaptive behaviors of "underdeveloped" societies. Challenging these assumptions in his Introduction, the editor contends that

(t)he error (of development agents). . . lies in viewing culture as excess baggage that is borne by society but has no relationship to its basic processes of self-perpetuation, except insofar as it disrupts them. In contrast, I maintain that traditional culture is intimately bound up with and directly supports the basic social, economic, and ecological processes of society. (p. 1)

Dove analyzes the integrative functions of the ideologies, economies, and adaptations of the nine case studies based upon field research in each society. The intimacy of information represented by most of the authors of the studies is fundamentally different from what the editor describes for planners and change agents.

" . . . (T)he misinterpretation and misrepresentation of traditional cultures in development planning is made possible by, and indeed necessitates, a profound lack of knowledge about (the societies). (p. 33)

There is little if any interest among planners in learning about those societies targeted for development.

The reason for its absence is implicit in the official term for the principal interface between officials and peasants in Indonesia,

penyuluhan, (extension)—meaning a situation in which the officials talk and the peasants listen (or pretend to listen, as is more often the case). So long as this is the case, development planners will not hear what they apparently do not want but nevertheless need to hear from their peasant clientele, namely, the peasants' own accounting of what they need—and what they do not need—to improve their way of life. (Ibid.)

Three of the case studies analyze Bornean societies and the other six, other Indonesian peoples. Carl L. Hoffman describes his hypothesis of the retrogressive "'Wild Punan' of Borneo and the economic relations they have retained with sedentary agricultural groups. The Punan, according to Hoffman, function as "specialized collectors of forest products within large trade networks" (p. 89), former farmers who abandoned agriculture for gathering and hunting. This chapter is a restatement of Hoffman's dissertation, book, and article he has published, the subject of critical reviews by Peter Brosius, B.J.L. Sellato, and Lars Kaskija in the Bulletin (20:2). The problems these critics identify recur in the present chapter.

Michael Dove analyzes ceremonial drinking among the Kantu' of West Kalimantan. The subject of criticism by non-Kantu', in particular government officials, drinking traditionally has been limited to festivals and is not a practice of regular abuse. The Kantu' are swidden farmers, and their adaptation has resulted in small dispersed communities. Festive occasions provide the major occasions for these communities gathering to reaffirm their ethnic identity, and drinking is a critical feature of such occasions.

By facilitating such exchanges (of grain and labor among these units prior to and during festivals) on a regional basis, ceremonial drinking helps to redress the disjunctions inherent in this swidden society. (p. 139)

In "Social Rank and Social Change among the Maloh of West Kalimantan," Victor T. King describes a traditional system of stratification which has been transformed during the colonial period. With no appreciation for the social system of the Maloh, Dutch officials imposed their own political, administrative, and religious beliefs and behavior, to remake the indigenous society according to Dutch ways. In the post-independent period, the Indonesian government has continued the subversion of Maloh society in their efforts "to 'democratize' village life." (p. 219)

Other chapters in the book analyze religion and the Wana of Sulawesi, rural Javanese, land use in East Sumbawa, the Mentawai, and the people of central Flores. A final chapter, "Costing Social Change", by G.N. Appell, identifies both hidden and unexpected costs of development, and makes a plea for planners to develop an appreciation of the knowledge of local communities. In light of widespread experiences of psychosocial stress in

rapidly changing societies, Appell urges more research to assess the high prices native peoples are paying for development.

MERING, T. H. Gregorius. Luma' Umaa': Suatu Kajian Perladangan Ulang Alik Orang Kayan Di Desa Padua Kecamatan Putussibau Kabupaten Kapuas Hulu Propinsi Kalimantan Barat, XI + 222 pages, maps, figures, 1988, Depok: Universitas Indonesia, Fakultas Ilmu Sosial dan Ilmu Politik.

This Master's Thesis (skripsi sarjana) consists of a study of the swidden agriculture system developed by the Kayan people at the village of Padua (District of Putussibau, Regency of Kapuas Hulu, Province of West Kalimantan). It is considered that this new agricultural adaptation forms a response to a modernization process. The impact of formal education, conversion to Catholicism since the 1930s, as well as the recent operations of timber companies, starting in the 1970s, have been instrumental in this. The main changes are: (1) the disappearance of the longhouse (umaa' aruu'), a major Kayan social institution and (2) the narrowing of the old swidden system (luma' suu or luma' saan) because the more fertile farming areas are being exploited by timber companies.

In considering these problems, the adaptation approach demonstrated by Marshall D. Sahlins was used with a special emphasis on the familial mode of production (or domestic mode of production). The data were collected by using simple observations and participant observation, in-depth interviews and time-allocation analyses. The results of the research showed that the families continuing to practice the old swidden system, in which field location necessitated a minimum of two hours travel from the village, were faced with several risks. Among the risks were: (1) their houses were left unwatched, (2) their rubber gardens could not be maintained and tapped properly, and (3) one or more family members had to stay in the village to look after the school children, while others spent the night (saan) at the farm hut (lepo luma').

Actually, the three risks mentioned above did not have the same influence on each family. It depended rather on the type of household and its composition. Household composition had a clear influence on the intensity of work-force utilization. With a reduction in the work-force, the total production of the old swidden system decreased. Thus, modifications resulted in the practice of a "commuting" swidden system known as luma' umaa', "swidden (at the) village." In this latter form of agriculture, the fields are located closer to the village area than they were previously. This proximity permitted villagers to go back and forth during the day. Even though new problems arose, for instance a decrease in crop production and soil fertility around the village, nonetheless, the development of the luma' umaa' system was considered most suitable because it could cope with the limited household work force.

By instituting the luma' umaa' system the Kayan were able to allocate time and work force in order to increase the family income. This was achieved mostly by extending the household's rubber hectareage and intensifying its tapping, and by developing new banana and coffee gardens and taking up wage labor. One result has been that the villagers are able to give more attention to the education and socialization of their children. (Antonio Guerreiro)

KIPP, Rita Smith, and Susan Rodgers, editors. Indonesian Religions in Transition, Tucson, Arizona, University of Arizona Press, 1987, IX, 304 pp., bibliography, illustrations, maps, tables. (Papers from the Tenth Annual Indonesian Studies Conference, August, 1982, Columbus, Ohio).

This collective volume contains essays concerning the process of religious change as seen in aspects of Indonesian life, ritual, and belief. Chapters include: David Hicks, "Space, Motion and Symbol in Tetum Religion;" Eric Crystal and Shinji Yamashita, "Power of Gods: Ma'bugi Ritual of the Sa'dan Toraja"; Joseph A. Weinstock, "Kaharingan: Life and Death in Southern Borneo"; Patricia B. Henry, "The Religion of Balance: Evidence from an Eleventh-Century Javanese Poem"; John Bowen, "Islamic Transformations: From Sufi Doctrine to Ritual Practice in Gayo Culture"; Janet Hoskins, "Entering the Bitter House: Spirit Worship and Conversion in West Sumba"; Toby Alice Volkman, "Mortuary Tourism in Tana Toraja"; Jane Monnig Atkinson, "Religions in Dialogue: The Construction of an Indonesian Minority Religion"; Anna Lowenhaupt Tsing, "A Rhetoric of Centers in a Religion of the Periphery"; Mahadi, "Islam and Law in Indonesia"; Basyral Hamidy Harahap, "Islam and Adat among South Tapanuli Migrants in Three Indonesian Cities"; and Jessica Glicken, "Control, Obedience and Social Location in West Java."

LINDBLAD, Thomas, "Koelies in Kalimantan: Sociale Segregatie en Economische Expansie (1900-1930)," IN, Onderscheid en minderheid: sociaal-historische opstellen over discriminatie en vooroordeel, aangeboden aan professor Dik van Arkel bij zijn afscheid als hoogleraar in de sociale geschiedenis aan de Rijksuniversiteit te Leiden, red. Herman Diedekriks, Chris Quispel. - Hilversum: Verloren, 1987, pp. 303-314.

Economic expansion in the Netherlands Indies was often based on small European enclaves surrounded by an apparently traditional indigenous society. Certain social aspects also frequently played a role in this economic situation. A wide gap existed between non-Western coolies within the enclave and indigenous coolies outside. Basing his argument on case studies from enterprises engaged in petrol, coal, and rubber in South Kalimantan, the author demonstrates how coolie labor enhanced economic dualism. He focuses on eight variables: 1) the coolies' origins; 2) the

contractual basis of the tenure; 3) level of wages; 4) working times; 5) treatment of the coolies by the supervising personnel; 6) housing; 7) health care; 8) consumers' pattern.

MACANDREWS, Colin, editor, Central Government and Local Development in Indonesia. Singapore, Oxford University Press, 1986 - XV, 253 pp., maps, tables.

This collective volume contains the following contributions: Colin MacAndrews, "Central Government and Local Development in Indonesia: An Overview"; Colin MacAndrews, "The Structure of Government in Indonesia"; Michael Morfit, "Pancasila Orthodoxy"; Michael Morfit, "Strengthening the Capacities of Local Government: Policies and Constraints"; Anne Booth, "Efforts to Decentralize Fiscal Policy: Problems of Taxable Capacity, Tax Effort and Revenue Sharing"; James R. Kern, "The Growth of Decentralized Rural Credit Institutions in Indonesia"; Diane L. Wolf, "The Rural Development of Modern Manufacturing: A Case-study from Central Java"; Timothy Babcock, "Transmigration: The Regional Impact of a Miracle Cure"; Thomas R. Leinbach, "Transport Development in Indonesia: Progress, Problems, and Policies under the New Order"; and Michael R. Dove, "The Ideology of Agricultural Development in Indonesia."

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INFORMATION FOR AUTHORS

Research Notes: These should be concerned with a summary of research on a particular subject or geographical area; the results of recent research; a review of the literature; analyses of the state of research; and so forth. Research Notes differ from other contributions in that the material covered should be based on original research or the use of judgment, experience and personal knowledge on the part of the author in the preparation of the material so that an original conclusion is reached.

Brief Communications: These differ from the foregoing in that no original conclusions are drawn nor any data in consisting primarily of a statement of research intentions or a summary of news, either derived from private sources or summarized from items appearing in other places that may not be readily accessible to the readers of the Bulletin but which have an interest and relevance for them. They will be included with the contributor's name in parentheses following the item to indicate the source. Summaries of news longer than one or two paragraphs will appear with the contributor's name under the title and prefaced by "From".

Bibliographic Section: A Bibliography of recent publications will appear in each issue of the Bulletin, and, consequently, reprints or other notices of recent publications would be gratefully received by the Editor.

Other Items: Personal news, brief summaries or research activities, recent publications, and other brief items will appear without the source specifically indicated. The Editor urges those contributing such news items to send them in the form in which the contributor wishes them to appear rather than leaving this to the discretion of the Editor.

Working Papers: Research reports or papers exceeding 10 double-spaced pages will be published as Working Papers. Authors who submit such papers will be consulted by the Editor who, upon obtaining an author's consent, will edit and process the paper for distribution by private order. A list of Working Papers, with the cost of each, will be included in each issue of the Bulletin.

All contributions should be sent to the Editor, Borneo Research Bulletin, c/o Department of Anthropology, College of William and Mary, Williamsburg, VA 23185, U.S.A.

STYLE FOR CONTRIBUTIONS

Please submit all contributions double-spaced. Research Notes and Brief Communications should be limited to approximately eight double-spaced pages. Footnotes are to be avoided wherever possible. Bibliographies should be listed alphabetically by author at the end of the contributions: author should appear on a separate line, then date, title of article, journal, volume number, and pages. For books, include place of publication and finally publisher. References in the body of contributions should be cited by author's last name, date, and page number as follows: (Smith 1950:36-41). For punctuation and capitalization refer to Bibliographic Section.

Names mentioned in the News Section and other uncredited contributions will be capitalized and underlined.

Artwork is to be submitted in professionally prepared, camera-ready copy. Costs incurred by the Council in reproducing maps or illustrations will be charged to the author.

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