Dayaks and Forests of Interior Borneo

TIMOTHY C. JESSUP
ANDREW P. VAYDA

Borneo, largest of the Greater Sunda Islands in the Indonesian archipelago (Fig. 2a,b) and the third largest island in the world (after Greenland and New Guinea), is home not only to the richest rainforests on earth but also to a fascinating diversity of peoples. We will be concerned mainly with this area and with the varied social and land-use practices of the Dayak peoples who live there.

Although the area is remote, the lives that people lead there are by no means static or unchanging and their cultures are not tidy bundles of traditions handed down intact from generation to generation. On the contrary, their long history of mobility, intergroup contacts, intercourse with outside traders, as well as changes in group affiliation and group boundaries have resulted in a wide but irregular distribution of traits and customs commingled with other items peculiar to each small community.

People have lived in and used the resources of Borneo's forests for at least 40,000 years, that is, since the last Ice Age, when the Greater Sundas were connected by a land bridge to the Asian mainland. Borneo then was, in the words of Tom Harrisson, "at the far fringe of the fully walkable world" (1972:385). Compared to the history and prehistory of mainland Southeast Asia, there is frustratingly little known about the people of Borneo before the 19th century. From the great Niah Cave in Sarawak and a few other sites comes archaeological evidence of past human activities; however, most of what we know about the island's history in all but the most recent times comes from travelers' accounts and indirect evidence from China and elsewhere.

Borneo is sometimes portrayed as a historical backwater, but that is not, of course, the perspective of its inhabitants. Creation myths of the interior peoples place the origin of humanity in the forests at the heart

Dayak farmers spend a good deal of time hunting, fishing, and collecting forest products far from home. Even deep in the forest, a meal is not complete without a big pot of rice.
of the island. To highland peoples such as the Kenyahs, we "downriver" folk are all foreigners (dok). As such, we begin our account here, at the island's periphery, as did the early Indonesian, Chinese, and European voyagers.

A Turbulent History

Since the 1st millennium A.D. political and economic influences from outside powers such as China and Java have ebbed and flowed across Borneo's coastal regions. The effects of these outside contacts have seeped into the interior by means of trade, migration, warfare, and colonial hegemony. Principalities situated near the coast by navigable rivers have from time to time risen to local prominence, flourished for awhile, and then, for the most part, lapsed into obscurity or fallen into ruins. A few, such as Kutai on the east coast and Banjar-

masin in the south, were absorbed during the colonial period into the Dutch East Indies. Since its early history in the 7th century A.D., only the Sultanate of Brunei has managed to survive intact the vicissitudes of trade, war, piracy, and colonial domination (see Brown, this issue). The coastal kingdoms and sultanates depended for their survival on overseas trade and alliances beyond the island. The raison d'être of the cities and smaller trading towns located at the mouths of Borneo's rivers, however, was the flow of valuable forest products, collected by people in the hinterland. These heterogeneous interior peoples, commonly known as Dayaks, are the focus of this article.

Human Geography

According to a recent estimate (Ave and King 1968:8,13), Borneo has roughly 3 million people who can be classified as Dayaks. This is somewhat less than a third of the island's population. The remaining two-thirds are mostly Muslim peoples dwelling near the coast (Malays, Banjars, Kutes, Bugis, Javanese and others) and a significant number of Chinese. We include as Dayaks the nomadic and semi-nomadic peoples of the forests, such as the Burmans and Bukitans, who probably comprise less than one percent of the Dayak population. Numerous linguistic and ethnic groupings exist within the broad category of Dayaks. These are geographically distributed with little regard to the political boundaries that divide Borneo into the Malayan states of Sarawak and Sabah, the Indonesian provinces of East, South, Central, and West Kalimantan, and the independent nation of Brunei Darussalam. Even the natural barrier formed by the rugged central spine of mountains has not stopped the migration of peoples between highlands and lowlands and from one side of the island to the other.

Five great rivers flowing out of the central highlands—the Barito, Kapuas, Rejang, Kayan, and Mahakam—serve as highways for migration and trade, although the upper reaches are fraught with dangerous rapids which must be circumvented by overland portages. Transverse movements between the different river systems are blocked in the interior by densely forested ridges or, in the southern part of the island, by vast swamp forests. In the very center of Borneo, however, trails link the headwaters of the several rivers. In the past these were...
the routes for headhunters, as well as for collectors of forest products and occasional peddlers who were bold enough to venture into the highlands.

Now the trails and rivers of the interior are traveled in peace by itinerant traders and parties of Dayaks on their way to and from the lowlands where they work as loggers and plantation laborers, and by others who collect forest products to exchange in downstream markets for salt, steel, cloth, tobacco, and other goods. Such trade expeditions can be long and arduous, lasting for more than a year and requiring months of travel. It is therefore not surprising that most necessities of life for the interior peoples probably have been obtained from local sources. Even salt and iron were produced and exchanged by people in the remote highlands, where trade with the coast was unreliable until well into the 20th century. People in these areas still depend on nearby forests for food, building materials, and a variety of other products. Before discussing the ways in which forests are used, we will briefly describe some aspects of Dayak societies.

**Social Organization**

Kinship is the basis for much of Dayak social and political organization. Members of a community acknowledge a common descent, or affinity through marriage, relationships which not only unite the community as a people but also serve to define its limits. Generally speaking, kinship is reckoned bilaterally through male and female lines. Affinity and differences between ethnic groups are cast in terms of kinship, with genealogies purporting to show the common descent of groups, such as the various Kayan communities. Slaves captured in war in former times were for the most part prohibited from marrying with their captors and so remained genealogically "outside" those societies. But the occasional adoption of captive children was an exception to this rule.

In many Dayak societies, especially in the central highlands and surrounding areas, people belong to different social strata or classes, although such differentiation is by no means universal. Nomadic Penan (or Peman) in Sarawak have no social classes of their own but are considered an inferior class by some neighboring cultivators with whom they trade forest products. Among the farming peoples, Iban are noted for their egalitarian ideology, although individuals can attain positions of prestige through travel (bridal), including expeditions to collect forest products, the accumulation of wealth, and in former times success in headhunting.

Social stratification is more pronounced among the Kayans and neighboring peoples such as the Kenyahs. The leadership exercised by aristocratic (warau) chiefs in those societies can be traced quite strongly, especially in the past when chiefs commanded the labor of slaves during the marriage ceremony. Women of commoners (pangun and bajup) were not worth two chickens, especially in the early part of the 20th century. Especially notorious as headhunters were the Kenyah and Kayan (Fig. 17), but headhunting and the capture of heads were approved through the end of the 19th century except in the southern part of the island. Successful headhunters enhanced their own prestige, in part because their actions were perceived to contribute to the prosperity of kin communities through the performance of certain important rituals. Such rituals, such as the Iban Kenyabang and the Kenyah menur, required fresh human heads for their performance.

Usually the heads were taken from members of neighboring groups, but at times there were opportunities to collect heads in Sarawak. This was most dramatically so for the Iban who had settled in the lower reaches of the Segat and Skrang rivers of Sarawak in the late 18th and early 19th centuries. Because of disorder along Borneo's western coast, Iban were able for several decades to paddle down the rivers in their war canoes and settle in the interior, making headhunting raids on Malay and Chinese coastal settlements and small villages to the interior. The explorer was partly a result of the fact that the Dutch, who had been policing the coast, made no attempt to interfere. During the Napoleonic and immediately post-Napoleonic period because of wars elsewhere (Nevat 1984:64-66). Wars of conquest were waged by Kayans, Modinos, and others migrating from the A'go and Kayan in the 18th and early 19th centuries. These fierce hilltribes held took heads, slaves, and agricultural lands from less numerous or less warlike peoples. Of those who were not killed, captured, or driven off, some retained their original ethnic identities under the sway of conquering chiefs. Others either forged links to the invaders through marriage and ethnic "conversion" or else resisted the invaders by forming loose alli- wax, and other forest products brought down to the coast to their trading posts. Successful headhunters sometimes got to the city of Borneo or traded directly to the traders. A Kayan "army" of some 3,000 warriors actually besieged the city of Borneo and marched in triumph to the demand for booty (St John 1982:1398; and 1159).

Despite headhunting, together with headhunting and "piracy," as the British and Dutch called the unregulated trade of the time, threatened their economic and political interests, was largely suppressed during the 19th century. This was accomplished through the joint efforts of the colonial powers—including forces led by James Brooke, most successful of the English merchant adventurers and self-styled "White Rajah of Sarawak" (see Brown, this issue)—and some of the sultanes in Borneo and Java (Fritige 1970).

**Diversity of Forest Resources and Their Use**

Between the coastal belt of mangroves and the timberline high up in the mountains, the natural vegetation over almost all of Borneo is tropical rainforest. No part of the island is more than about 20 kilometers from the sea, and in most places the annual rainfall is high, at least 2,500 millimeters. The annual temperature at sea level ranges between 23 and 27 degrees C. The altitudes range from 500 to 1,000 meters. The annual rainfall is high: at least 2,500 millimeters in most areas and up to 4,000 millimeters (55 inches) in the more mountainous interior. In contrast to the strong seasonal pattern of wet and dry monsoons that occurs in mainland Southeast Asia and parts of eastern Indonesia, rainfall in Borneo is evenly distributed throughout the year, except in some areas near the coast. Nevertheless, droughts do occur occasionally. In 1982 and 1983 a climate anomaly associated with the El Niño phenomenon affected the world's
weather, causing severe drought throughout Indonesia. This, together with a spate of land-clearing and intensive logging, led to widespread forest fires in East Kalimantan and Sabah (Malenge 1997). Such climate events, it is estimated, occurred once in a century or so in the case of the drought in East Kalimantan, may have profound effects on the evolution and distribution of rainforest species. There are, however, few long-term or even medium-term studies by which to assess the consequences of aberrant natural disturbances for forests and their use by humans.

Borneo’s forests are extremely diverse in number of species and in the variety of forest environments. In a recent study of lowland forest trees in East Kalimantan, nearly 200 species were found on less than 5 hectares (about 5 acres), even excluding the smaller trees (Whitmore 1984:3). While no thorough survey of economically useful plants and animals has been made for Borneo, the number for the nearby Malay Peninsula has been calculated to be about 2,400 (Jacobs 1982:377-379, based on Borkl 1955). Two major sources of variation in tropical forests are differences in altitude and drainage. Forests in the lowlands, below about 750 (2,400 feet), can be broadly divided into wetland or swamp forests and dryland forests. The dryland forests are dominated by dipterocarps, and a large and abundant family of big trees economically important for timber, resin, and oil-bearing nuts. Their timber is harvested or collected by Dayaks for their own use and for commercial trade, although the activity has been mechanized by the early 1970s has led to the replacement in the timber industry of the small-scale procedures by the Dayaks to the operation of heavy machinery.

Dipterocarpus species become progressively less important and are replaced by other species in the upper slopes, laurel, myrtle, and heath (rhododendron) families, together with scattered stands of conifers. Human settlement extends regularly into the lower montane zone, from about 750 to about 1,500 (5,000 feet) but rarely to higher elevations. (In Borneo there are few areas above 2,000 m in any case.) The most valuable rattans (Calamus species) occur in lowland and lower montane forests. Sago palms (Metrodora and other species) are most abundant in the lowlands, both in swamp forests and cultivated stands. The Melanu Dayaks in Sarawak formerly relied on these carbohydrate-filled palms for their subsistence; now they grow them as cash crops. Sago palms in the highlands are the staple of nomadic Penans.

In the sparsely populated interior, hunting and fishing provide most of the animal protein eaten by settled as well as nomadic peoples (Figs. 8-10). Domestic pigs and chickens are raised mainly for ceremonial occasions. Dogs are kept and are specially bred for hunting by some Dayaks. The principal game animals are the bearded pig (Sus barbatus) and sandhar jaguar (Cervus unicolor); a variety of other mammals, birds (Fig. 13), reptiles, fish, insect, crustaceans, and mollusks are also hunted for food and other products. Dayak hunters use spears, blow-pipes, shotguns, traps, and snares. Their fishing techniques include the use of lines, throw nets, weirs, traps, dams, and plant-derived poisons.

Because of the large quantities of fat they carry, wild pigs are the favorite prey of Dayak hunters (Fig. 8). Fossil remains of the bearded pig have been found in caves at Niah, Sarawak, where they are very abundant. The pig is an important game animal since the earliest period represented there, the late Pleistocene between 19,000 and 33,000 years ago (Majdi 1982:134-136). Although a few pigs can usually be found in April through September, there is a peak in August when they are most abundant during mass migrations which are made across the central lowlands and rainforests with the irregular fruiting periods of oak and dipterocarps (Callcott and Caldecott 1955).

Minor Forest Products

For more than 1,000 years the principal exports from the forests of Southeast Asia were such products as gums and resins, rattan, nuts and fruit, sugarcane, aromatic woods, bones, animal skins, teeth, claws, horns, and other items. The historical trade in these products dates back to at least the 5th century B.C. (Dunn 1975:111-112). Since then, the trade routes have been extended to India, the Middle East, Europe, and America. The plant and animal products mentioned above are now called "minor forest products" in contrast to timber, which is a commodity that has passed them in volume and value. Nevertheless, non-timber products are still much more significant as a source of livelihood for people in the interior, China and Southeast Asia that they fetch remarkably high prices on the world market. For example, high-quality nuts sold for $200 to $400 a kilogram (about 100 nuts) on the Upper Mahakam River in East Kalimantan and for around $1,000 a kilogram in Singapore in 1979 and 1981 (Jessup and Pelsie 1986:510). Caves are guarded day and night during the birds' breeding season. Collection and sale of the nests are controlled by government regulations, even in some areas where they are not widespread.

The collectors of these products in Bornean forests are mostly Dayaks, both farmers who collect intermittently and nomads who spend a great deal of their time collecting. Some specialize, at least temporarily, in a particular product, and some claim proprietary rights to certain resources. Generally, however, Dayak collectors range widely and collect a variety of forest products in accord with their availability and the prices offered for them.

Longhouse Construction

The building of longhouses illustrates the skill with which Dayak artisans use materials from the forest. The "pound for pound [forest products] exceed in value the edible nests of certain cave-dwelling swiftlets" of Borneo and other forested areas of Southeast Asia, both as articles of trade and for subsistence (Fig. 11). Rattan is now the most important commercial minor forest product in the total value of its exports, but pound for pound few if any exceed in value the edible nests of certain cave-dwelling swiftlets (Aquodromus species). These nests are so avidly sought by gourmets in

China and Southeast Asia that they fetch remarkably high prices on the world market.
Dayak children contribute to their families' subsistence. These Kenyah girls and boys are equipped for fishing. The girls catch small fish with their nets and put them in the gourds tied to their heads. The boys have a homemade spear gun powered by a rubber band cut from an old inner tube.

Not all Dayaks live in longhouses, and even among longhouse dwellers there is considerable variation in building materials and techniques, architectural styles, and technical skills. The most impressive houses, which we will take for our example, are those made by Kayans, Bajans, Kenyahs, and other peoples of the central highlands and surrounding areas (Hose and McDougall 1912: 155ff., 203-210; Kelhling 1933). Some of these great dwellings were 1,000 feet long and housed 300 or more families in a single structure (Fig. 14). In the 19th century, when warfare and headhunting were endemic, houses were built on fortified hilltops or raised as much as 12 m (40 feet) above the ground on massive hardwood piles.

Houses are now more easily accessible, though heavy piles, beams, and boards are still used in their construction. Until quite recently, wooden house parts were all made by hand with steel axes and adzes, themselves the products of skilled village blacksmiths. New mechanical saws are sometimes used.

Different species of timber trees, palms (whose leaves are sometimes used as roofing material), and rattan (used to fasten the other parts) are selected to make the various parts of a house. Bornero ironwood (Kanderrayoh kenggyan) is prized where durability is important, as in shingles and piles, while lighter wood with a clear, straight grain (such as that of dipterocarps and of the coniferous Podocarpus species and Aguaba species) is preferred for making floor boards. Altogether, a great many species are used for building materials. For example, more than 40 were identified among plants collected in the vicinity of just one village in the Apo Kayan (Noodtito 1982: table 5).

Each family is responsible for preparing the parts of their section of a longhouse, and all must contribute to the chief's central section, which is the largest and most elaborate. These preparations include selecting various kinds of timber and other materials for different house parts, felling and dressing the timber, and transporting the finished pieces to the house site. All this can take several years, as the work is done intermittently between the agricultural seasons and may be delayed by various distractions, misfortunes, or bad omens. On the other hand, unless the builders are pioneering far from their previous home or their old house was destroyed by fire, some parts of an old house can usually be used again in the new structure. Even heavy timbers and piles can be lashed to canoes and floated downstream to be erected again at a new site. During the 19th century, when village migrations were more frequent than now, Kayans in Sarawak generally moved gradually downstream, taking their houses with them from one site to the next.

Once all the parts of the house have been assembled at the building site, the actual erection of the structure is remarkably swift. The heavy piles and beams are raised into position by gangs of men, then fitted by means of mortised joints, and lashed together with rattan. After the framework of the house is in place, each family, working on its own section, lays down the large floor boards and ties the lighter wall boards and shingles in place with rattan. Each section consists of a walled cooking and sleeping area in the rear, leading to a covered veranda in front, divided by a partition beneath the ridge of the roof. Neighboring sections adjoin to form a series of closed apartments on one side of the house and an extended veranda or gallery on the other. The

A longhouse may appear to be a communal dwelling, but in fact it is a series of individual family apartments. This Iban house, like most longhouses, is built close to a river. (Reproduced courtesy of the Sarawak Museum.)
Against the views that shifting cultivation (both open-field and terraced) is a form of monoculture, we refer to a study in the Apo Kayan. From this conclusion was drawn that, while there is no evidence of permanent forest destruction by the activities of Kayan, the repeated use of farm sites over a period of generations may have led to changes in the composition of secondary forests, specifically toward a greater proportion of trees well adapted to fire-cutting and other disturbances associated with shifting cultivation (Mackie et al. 1989). Stated in a different manner, we do, however, take deliberate action to conserve resources and to exploit them more fully. Thus Padoch found that the Iban of Sarawak were able to "use resources more efficiently than we," and in this respect, when altered circumstances made a change in behavior desirable (Padoch and Vayda 1983:309).

Variability within particular ethnic groups of shifting cultivators has been shown by Rousseau, who has posed the question, "Is there Kain or is there a Kain?" (1987:51). A common assumption is that particular groups (Kayan, Iban, and Kenyah) have very similarly defined systems of agricultural land-use that are uniform for each group and apparent across regions because of the contrary position and notes that in the Bay region of Sarawak certain principles of tenure are shared by different groups in the same geographic areas but differ between areas. He also observes that some commonly acknowledged rules can nevertheless yield different practical results in different societies, and that the point is made in this study.

A technological revolution in agriculture is currently taking place, and many other aspects of human life are changing with it. In Malaysia and elsewhere, the manufacture of bronze was fully developed by 4,000 years ago, and ironworking began by around 2,500 years ago (Bayard 1984). These technologies presumably reached Sarawak by land or sea trade. As noted by Freeman (1970:174-175), iron tools are a great boon to farmers who are not used to the techniques of mechanized timber-cutting and transport (Kartawinata et al. 1981:90, Kartawinata and Vayda 1983:9).

Another revolution in the technology of forest exploitation, one much more recent than the advent of the Iron Age, has come to Borneo forests with the introduction of来访 episodes of "boom and bust" in Borneo's forest products trade. The first is that of aloes wood, or
We mention these examples to show, once again, that instability and irregular changes in people's use of forest are not simply phenomena of our own time, but rather are characteristic of a world in which human activities have great impact. These changes are, however, not always for the worse. Many species of wildlife that are threatened with extinction are actually thriving in other areas of the world. The same is true for many forest products, such as rubber, which are now being cultivated in other parts of the world. In some cases, the cultivation of these products may even be beneficial to the environment, as it can help to reduce deforestation and protect the habitats of rare species.

17 Headhunting and warfare were prevalent in central Borneo until the present century. Here, a Kayan chief from the Apyan, dressed in his old fighting garb, entertains the photographer.